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Research Article

The Application of DEMATEL-ANP in Livestream E-Commerce Based on the Research of Consumers' Shopping Motivation

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With the rapid development of e-commerce in China and the global pandemic of COVID-19, more and more sales personnel and brands have abandoned the physical retail industry and started investing in e-commerce. The consumer culture of livestream e-commerce is becoming popular in China. However, a report from Southern Finance Omnimedia Corp of China pointed out that among China's top 1,000 livestream sellers, the top 20 sellers have contributed to nearly half of the gross merchandise volume (GMV), using three major Chinese streaming platforms: Taobao, Douyin, and Kuaishou. Moreover, a novice in livestream e-commerce knows less about the important impact factors of the realm. Akin to the adage, "well aware is well prepared," knowing more about the influencing factors of livestream e-commerce more will be the chances to promote the commercial value. A benchmark research is needed to systematically trace out the most important and influencing factors and to make possible the rising of selling with less effort, hence this study. The research intends to sort out the relevant influencing factors that affect consumers' shopping motivation in livestream e-commerce by reviewing previous related literature. Then, through the Delphi method, eight experts constructed the 14 main influencing factors that affect consumers' shopping motivation in livestream e-commerce. Through DEMATEL-ANP, we can not only find the key factors but also sort out the causal relationship between the main key factors, forming a preliminary evaluation model of the commercial value of livestream sellers. The importance-performance analysis (IPA) of these impact factors found that "seller popularity" is the most critical factor affecting consumers' shopping motivation. At the same time, product discounts, product quality, and the attractiveness of the sellers are being included in effects by the "seller popularity." The investigation followed in this study revealed that characteristics of the livestream seller are one of the most influencing factor achieving a total weight of 0.3020, whereas the streaming platform is the least influencing factor (total weight is 0.1333). The assessment made the study explore the sustainability of livestream e-commerce in China, and the proposed evaluation model can be used for the preliminary business value evaluation of people engaged in livestream sellers and related industries.

1. Introduction

With the continuous progress of multimedia technology and network technology development, information dissemination has evolved from text to pictures to live video [1, 2]. The audience's message acceptance mode has also changed from passive acceptance to two-way interaction, and interactions with the publishers of information receive faster feedback. Under the trends of technology, mainstream social media and e-commerce sites (Facebook and China's Taobao and Douyin) have enabled real-time streaming (live video streaming) [3].

With the popularization of a myriad of streaming media platforms, individuals can do freely produce and publish content. Some users have attracted thousands of followers based on their specific personality traits. They exert great influence on their followers and that is why they are called social media "influencers" (also known as SMIs) [4]. Among

opinion leaders, some have more accurate product information and are better accepted and trusted by related groups. They use streaming media technology to conduct live web activities [5, 6]. On social media platforms, live video broadcasts are used to spread information about new products and use it to attract more followers and consumers. They are different from traditional social media opinion leaders since they specialize in using live streaming platforms. These specific online content producers are called livestream sellers [7]. Livestream e-commerce is a new form of influencing consumers' shopping behavior through live broadcasting on streaming media.

Livestream sellers carry out livestream e-commerce through online videos. The live streaming process uses a two-way interactive way to encourage consumers to watch. Consumers can more intuitively immerse themselves in the experience and idea offered by the products are more comprised about these livestream sellers than what they are promoting [8]. According to the latest data from CNNIC, the number of online shopping users in China reached 749 million. As of June 2020, the number of live e-commerce live broadcast users was 309 million. e-Commerce live streaming has become one of the most important online activities [9]. In China, livestream sellers such as Wei Ya, Li Jiaqi, and Luo Yonghao have a huge commercial value. In 2019, Li Jiaqi was named one of the top 50 opinion leaders in China by Forbes. Luo Yonghao attracted 48 million viewers in a live shopping and generated 110 million yuan in revenue [10]. This online activity has become an emerging profession at the moment.

However, according to GMV (gross merchandise volume) data of the 2020 livestream sellers recently announced by China's three major e-commerce platforms (Taobao, Douyin, and Kuaishou), the top 1,000 sellers have accumulated 255.7 billion yuan in goods. The top 20 sellers have accumulated 106.44 billion yuan in goods, contributing to 41.7% of the top 1,000 sales. However, GMV distribution is still very uneven in the Chinese market [11]. It makes sense to hypothesize that, while many newcomers flock to this industry, most people are at the bottom of it. Therefore, it is of great significance to create a comprehensive evaluation framework to understand better how livestream sellers affect the purchasing motivation of consumers since they have such a huge influence on social business capital [12].

Livestream e-commerce aims at introducing one or more products through livestream sellers and showing them to consumers through a live broadcast hosted in streaming media platform. Under the explanation of livestream sellers and the interaction with consumers, that have generated purchase motivation and produced new purchase behaviors. After confirming the order, the manufacturer then delivers the product to the consumer to be evaluated, ultimately generating the commercial value. Therefore, in this complete consumption process, the main participants are the product providers, the livestream sellers, the streaming media platforms, and the consumers.

While e-commerce livestream has gradually grown into emerging consumer culture in China, it has begun to attract scholars' attention in recent years. Some scholars have already proposed methods to investigate livestream e-commerce but those are limited. A number of studies have been published in recent years to focus on the fact that a single influencing factor or multiple influencing factors have a certain relationship with consumers' purchasing motivation [10, 13–17]. However, this concept is not clear enough to fully understand the industry practice. There is no way to form a comprehensive evaluation framework for the live streaming industry. There's no strong explanation for the extremely unbalanced GMV distribution of the existing livestream sellers. Secondly, there is a lack of paired comparison system between impact factors in the current live streaming industry. Particularly, those who enter the industry do not know which impact factors they should focus on to better promote their commercial value of livestream sellers. We urgently need an evaluation standard to evaluate the commercial value of livestream sellers, so that people entering this industry can correctly judge and estimate it. This will reduce the market manipulation phenomenon in the live streaming industry.

In summary, we explore the following issues in this research:

RQ1: what key factors do livestream sellers use to influence shopping motivation?

RQ2: what are the dimensions of livestream sellers affecting consumers' shopping motivation and what is the weight of each key factor under different dimensions established?

RQ3: what is the causal relationship between the key factor affecting shopping motivation?

RQ4: what are the key factors that should be prioritized to improve consumer satisfaction?

RQ5: what is the reason for the uneven distribution of GMV of livestream sellers among the major e-commerce platforms in China? Based on this research, what are the recommendations for decentralization for the sustainable livestream e-commerce cultural industry?

The rest of the article is organized in 6 sections. In Section 2, the literature review is presented. The details about the research method are covered in Section 3. Section 4 deals with the research results, whereas in Section 5, a detailed discussion is presented. Possible limitations of the framework are elaborated in Section 6. Conclusion and future work are presented in Section 7.

2. Literature Review

2.1. Livestream E-Commerce and Livestream Sellers. After 2010, live streaming media, a multimedia entertainment method based on interactivity, was rapidly popularized worldwide [18]. Live e-commerce shopping is an activity developed based on this multimedia entertainment. Previous academic studies [19] discussed how virtual immersive technology can increase sales innovation. Live shopping was taken as an independent concept in [20] to explore the relationship between e-commerce shopping and consumers in terms of utilitarianism and hedonism. In [13], the authors noted that live e-commerce shopping could reduce consumers' psychological distance and perceived uncertainty, thereby increasing their online purchasing. Another study

[3] used the structural equation research method and took the Facebook platform as an example to explore how live e-commerce live shopping can establish a trust relationship between consumers and livestream sellers. [14] discussed the consumer behavior promoted in live broadcasts based on the theory of uses and gratifications (U&G).

2.2. Theater Theory. Because the shopping behavior of live e-commerce is an interactive relationship between livestream sellers and consumers through the streaming media platform, it is essentially a comprehensive service marketing experience. The key to success lies in whether the livestream sellers can impress consumers through the display on the network platform. This article adopts the theater theoretical framework proposed by [21]. This framework was applied to the service marketing experience by [22] and to interactions with consumers in the service experience by [23].

In the case of live shopping on Taobao, the livestream sellers are actors and include all of the personal characteristics in their role as anchor. Consumers who watch live shopping are the audience. Taobao's live streaming mainly provides the environment for consumer and livestream sellers to participate in live broadcasts. The performance dimension includes the livestream seller's behavior in this performance, the product form, and process, as shown in Figure 1.

2.3. Actors and Performances: The Role of SMIs in livestream E-Commerce. How do livestream sellers, as the main actors in live e-commerce shopping shows, influence consumers through their personal charm and performance? With the rapid development of social media today, it is a common phenomenon for companies to cooperate with social media influencers (SMIs). Companies use SMIs on social media platforms to promote their brands and products [6]. According to [24], SMIs have several types of marketing influence on social media platforms. The first is their language style, which includes the aspects of specificity, precision, interactivity, and intimacy (relevance), and the second is taste. In another study [25], the taste is defined as aesthetic ability. It is believed that SMIs should have taste leadership to lead consumers' taste. According to [6], it is easier for SMIs to gain trust than other KOLs, and SMIs have more content expertise and professional knowledge of products [26]. Another key factor is the number of followers, which is based on the SMI's popularity [6, 27].

2.4. Theater and Performance: Why Consumers Should Use Livestream E-Commerce to Shop. The livestream e-commerce platform is the stage for the performance. Why should consumers use this platform? Based on previous academic research findings [28], the reason why people use social networking platforms has to do with their we-intentions, attitudes, social interactions, entertainment, and social enhancement [29, 30]. [31, 32]. In the research [33, 34], the unified theory of acceptance and use of technology (UTAUT) is introduced. The technology acceptance theory [35] has been widely used in the study of new information technology since its development. Studies like [36–38] have also been carried out to explain why consumers use e-commerce platforms for consumption.

2.5. Audience and Performance: Perceived Value of Consumers. In the live e-commerce shopping link, how do ordinary viewers perceive the value of products and services? Thaler first proposed transaction utility theory [39]. Thaler [40] claimed that the perceptual value is the consumer's subjective judgment, which determines the value of a product. As described in Zeithaml's research, saving money (product discounts), saving time, service quality, and product diversity are the main considerations when consumers are calculating the perceived value [41]. According to [42], the perceptual value has two dimensions, experience value and practical value, where the former is related to the entertainment, overall visual, indulgent, and interactive nature of the product, and the latter is related to saving money (product discounts), saving time, service quality, and diversity.

2.6. Dimensions and Related Influencing Factors of Livestream Sellers in E-Commerce Live Shopping That Affect Consumers' Purchasing Motivation. Following the *theater theory,* in this research, we used each aspect as a search keyword and found relevant papers on the influencing factors of each of the aspects in the WOS and Scopus literature databases, as described in Sections 2.2–2.5. The key factors described in the relevant literature that affect consumers' shopping motivation are shown in Table 1.

3. Research Methods

As shown in Table 1, we verified that live e-commerce shopping is a complex marketing activity that involves a combination of multiple objects and links. The influencing factors mentioned here are directly related to each other. For example, trust in the livestream sellers is intertwined with trust in the platform, and consumer interaction also depends on the interactivity of the livestream sellers. This is why it can be challenging to separately explain the specific relationship between influencing factors through previous research methods.

Based on exploring how livestream sellers affect consumers' shopping motivation, as well as the overview and analysis of the existing research, this research first established a comprehensive evaluation framework regarding how livestream sellers influence consumers' shopping motivation during livestream e-commerce shopping by collecting opinions of relevant personnel in the industry.

In order to find the main influencing factors contained in each aspect, this study adopted a modified Delphi method [75]. Delphi is an expert group decision-making method. Experts were tasked with scoring semistructured questionnaires to determine the specific factors that affect consumers' purchasing motivation in live e-commerce activities.

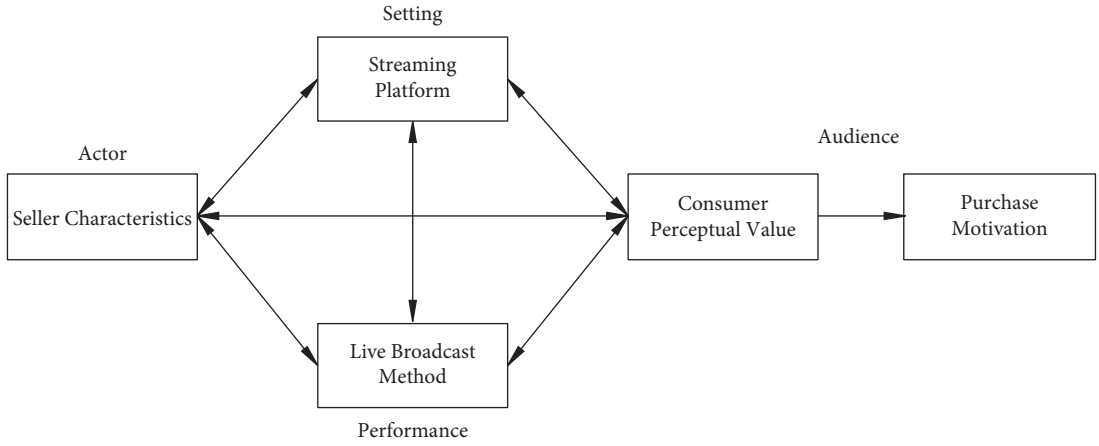

Figure 1: Livestream e-commerce culture introduces the theater theory.

Table 1: Possible factors.

Aspect	Criteria	References
Seller characteristics	Taste	[25, 43, 44]
	Popularity	[6, 25, 27]
	Preciseness	[6, 24]
	Attractive	[4, 6, 24, 24, 45]
	Trust	[6, 45]
	Professional	[4, 25, 26, 46]
	Concreteness	[6, 24]
	Similarity	[4, 46]
Streaming platform	We-intention	[28, 47, 48]
	Subjective attitude	[28, 49–51]
	Social promotion	[28, 52]
	Availability	[37, 37, 51, 53, 54]
	Platform convenience	[42, 51, 53, 55, 56]
	Platform trust	[3, 57, 58]
Consumer perceptual value	Save money (product discount)	[42, 55, 59]
	Product quality	[51, 58, 60, 61]
	Product awareness	[62–64]
	Entertaining	[30, 42, 45]
	Service quality	[38, 42, 60]
Performance	Product diversity	[25, 42, 65]
	Overall vision	[4, 42, 66, 67]
	Interactivity	[17, 24, 25, 30, 42, 68–70]
	Immersion	[71–74]
	Creativity	[15]

According to [76], DEMATEL can solve complex and tangled problems and sort out the relationships between various influencing factors. Therefore, in the study, we used DEMATEL technology to enhance our understanding of the multifactorial problem of live e-commerce shopping. The ANP method was used to normalize the matrix relationship generated by the influencing factors to test the weight between various influencing factors [77]. Different from the traditional combination of these two methods, the DANP method based on the DEMATEL results can be directly used as an unweighted super-matrix, avoiding the need for cumbersome pairwise comparison in traditional ANP technology [78, 79]. Due to the excessive fatigue load of the questionnaire respondents, the question of consistency tests the questionnaire results [80]. The purpose is to determine the causality of influencing factors through the traditional DEMATEL method and at the same time use ANP to calculate the weights of various aspects and influencing factors, so as to create a complete live e-commerce shopping evaluation system that affects consumers' shopping motivation (Figure 2).

3.1. Delphi Method: Find Main Influencing Factors That Affect Consumers' Purchasing Motivation in Livestream E-Commerce. According to the focus of this research, previous literature on e-commerce, e-commerce shopping, SMI, and livestream shopping, a series of influencing factors that might affect consumers' shopping motivation on livestream links are found in Table 1. In order to determine the main influencing factors, we found eight experts who are closely related to the industry and formed a group, as shown

in Table 2. During the visit, the experts were given a semistructured questionnaire in which they scored the influencing factors listed in Table 1 based on importance (0–100). The higher the score, the higher the importance. The consensus difference threshold set by the expert group was CDI <0.1 [75]. In stage 1, the experts were asked to score the importance of factors related to the dimensions in the questionnaire.

3.2. DANP: Investigate Degree of Correlation between Influencing Factors

3.2.1. Questionnaire Test. According to the unanimous suggestion of the experts, this study selected 120 college students, professionals, and practitioners in related fields who had three or more live e-commerce shopping experiences as the main group for this survey. Before filling out the questionnaire, the meaning of the dimensions and related influencing factors were again explained to ensure that the subjects accurately understood their content.

3.2.2. Scoring Scale. According to [81], DEMATEL is mostly designed on a scale of 0–5. However, due to the large number of test questions in this study, in order to prevent confusion for the subjects in the process of comparing criteria, we adopted the questionnaire used in the study of [82] for DANP and used 0–3 points as the scoring scale, as shown in Table 3.

3.2.3. DEMATEL Analysis. The algorithm to obtain weight from a super-matrix is given as follows:

Step 1. Generate the direct influence matrix.

(i) a_{ij} = influencing factor,
where a_{ij} represents the degree of influencing criteria.

(ii) Let, impact range = {0, 1, 2, 3, 4}

(iii) $Z = \begin{bmatrix} a_{11} & a_{1j} & a_{1n} \\ a_{il} & a_{ij} & a_{in} \\ a_{n1} & a_{nj} & a_{nn} \end{bmatrix}$,
where n represents the number of criteria.

(iv) $Z = \begin{bmatrix} 0 & a_{1j} & a_{1n} \\ a_{\mathrm{il}} & 0 & a_{\mathrm{in}} \\ a_{n1} & a_{\mathrm{nj}} & 0 \end{bmatrix}$, where a_{ij} denotes the average value.

(v) For n number of criteria, the direct influence matrix is given as $Z = a_{ijn\times n}$

Step 2. Calculate normalized matrix.

(i) Let $S = \min[1/\max\sum_{j=1}^{n} a_{ij}, 1/\max\sum_{i=1}^{n} a_{ij}]$.

(ii) Let $X = S \times A$, and $0 \le X_{\mathrm{ij}} \le 1$.

(iii) $\mathrm{Nm} = X_{\mathrm{ijn}\times n}$, where Nm denotes the normalized matrix.

Step 3. Calculate the total impact matrix.

(ii) $T = \lim_{k\longrightarrow\infty} (X + X^2 + \ldots + X^k) = X(1 - X)^{-1}$,

(iii) $T_{\mathrm{im}} = T_{\mathrm{ij}}$,
where $\mathrm{T_{im}}$ represents the total impact matrix.

Step 4. Generate weighted matrix.

(i) Let, $U_{\mathrm{sm}} = T_{\mathrm{in}}$,
where U_{sm} represents the unweighted super-matrix and T_{in} is the total influence matrix.

(ii) $\mathrm{NT_{in}}$ = Go to Step 2 passing $\mathrm{T_{in}}$ as argument,
where NT_{in} denotes the normalized total influence matrix.

(iii) $W = \mathrm{NT_{in}}$.

Step 5. Generate limit of super-matrix.

(i) From $i = 1$ to $i <= L$.
Repeat $W^* = W^* \times W$,
where L is an explicitly defined constant and W^* is the super-matrix limit to obtain the weight of each element.

3.2.4. Calculate Importance and Relevance. Each column of the total influence matrix can be summed up to obtain the D value, and each row can be summed up to obtain the R value. The sum of rows and columns $(D + R)$ of each element is the importance, which represents the strength of influence of various factors in the final problem. The difference between each element's rows and columns (D–R) is the degree of association. If the rank difference is positive, then this influencing factor is biased toward active influence as the cause; if the rank difference is negative, it is biased toward affected as the result.

3.3. IPA: Analyze Advantages and Disadvantages of Various Factors That Affect Consumers' Shopping Motivation.

Importance-performance analysis (IPA) is a method that was proposed by [83] for comparing relative positions of items. While conducting the DANP questionnaire, we asked the participants to rate their satisfaction with the performance value of each influencing factor (full score is 100 points). Finally, we obtained the average score of all participants' performance satisfaction for each influencing factor. IPA allows us to understand the advantages and disadvantages of the various factors that influence consumers' purchasing motivation in livestream e-commerce according to the relevant participants [84]. Finally, the importance $(D + R)$ calculated by DANP was taken as the vertical axis and the respondents' performance scores for each influencing factor were taken as the horizontal axis of the two-dimensional quadrant. The average scores of importance and influencing factors were taken as two cutting lines, forming four performance areas: possible overkill, low priority, concentrate here, and keep up the good work [83, 85, 86].

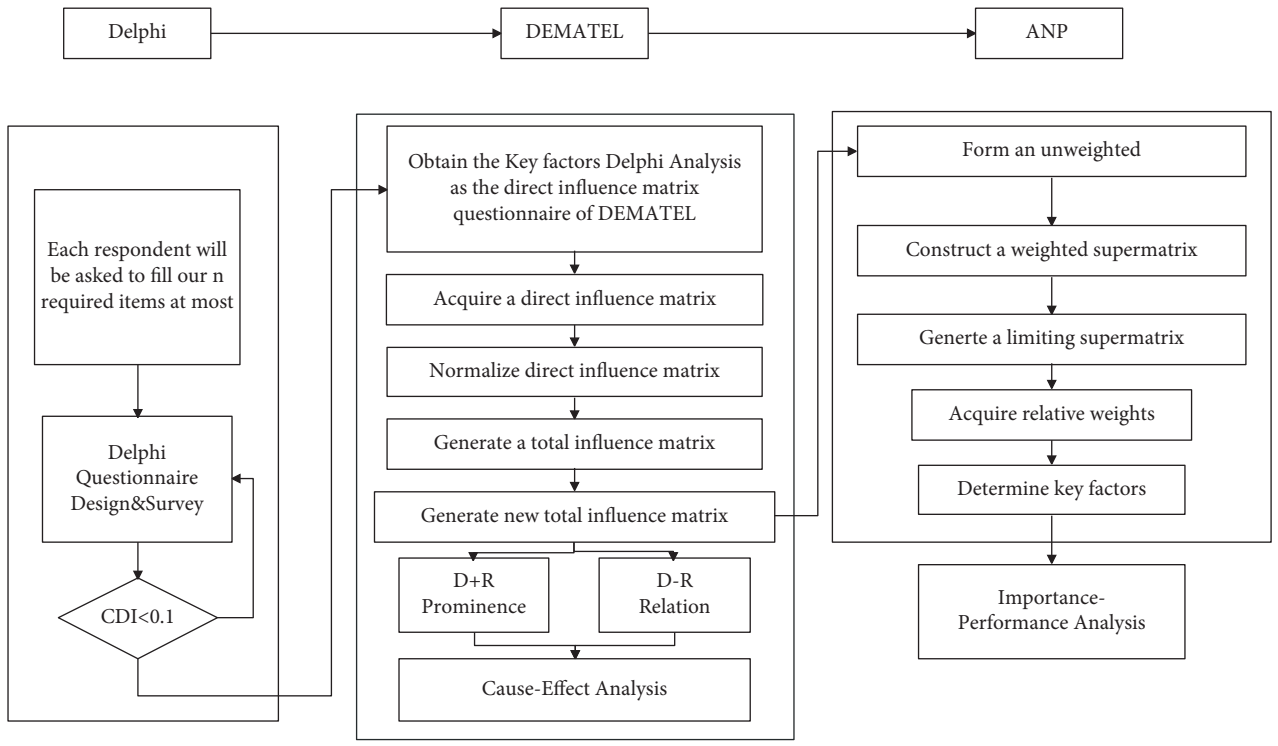

Figure 2: Delphi, DEMATEL, and ANP important performance analysis (IPA) flowchart.

Table 2: Background of Delphi respondents.

	Profession	Experience
1	Live streamer	CNRmall professional live streamer with 2 years of e-commerce live streaming experience
2	Live streamer	CNRmall professional live streamer with 2 years of e-commerce live, 2 years of TV shopping sales experience
3	Multichannel network (MCN) manager	3 years of work experience, responsible for signing contracts with live streamers, looking for cooperative enterprises, and negotiating details of cooperation
4	e-Commerce company general manager	5 years of work experience, responsible for signing contracts with live streamers, looking for cooperative enterprises, and negotiating details of cooperation
5	University teacher	15 years of work experience, PhD in communication, associate professor; research fields: Internet celebrity economy, e-commerce, online consumer behavior
6	University teacher	10 years of work experience, PhD in advertising, associate professor; research fields: advertising and marketing, Internet communication, e-commerce
7	Consumer	28-year-old veteran online shopper with 6 years of long-term habitual online shopping and 2 years of live e-commerce shopping
8	Consumer	35-year-old veteran online shopper with 10 years of habitual online shopping and 3 years of live e-commerce shopping

Table 3: Rating scale.

Criterion	0	1	2	3
Association	No effect	Some effect	Strong effect	Extreme effect

4. Research Results

4.1. Determining the Formal Live E-Commerce Shopping Evaluation Framework That Affects Consumers' Shopping Motivation. The evaluation framework of livestream sells influencing consumers' shopping motives in live e-commerce shopping links was established after two rounds of Delphi questionnaires. After listening to some of the experts' suggestions in the first round of the expert questionnaire, "live broadcast time" was added as an influencing factor in the performance dimension. The consensus was not reached in the first round. Based on expert opinions and the results of the first round of questionnaires, a new impact factor scale was developed, and the second round of questionnaires was initiated. In order to ensure the validity and consistency of the matrix comparison, a limited number of impact factors should be included [87]. Therefore, after the agreement of the expert group, a consensus was reached in the second round of questionnaires. We retained the impact factors with an average of 70 points and above, and included 14 key impact

factors. The CDI values of the evaluation criteria for the 14 impact factors were all <0.1. Based on the results of the second round, the impact factor scale was once again formulated, and the results are shown in Table 4.

4.2. The Importance and Weight of Key Factors Affecting Various Aspects of Consumer Shopping Motivation in Livestream E-commerce. Based on a paired comparison questionnaires from 120 participants in the first test, 102 valid questionnaires were recovered, the average value of each pairwise comparison was calculated according to the arithmetic mean method, and the direct influence matrix A was obtained, as shown in Table 5.

According to the above formula, the matrix was transformed into normalized total influence matrix T, as shown in Table 6.

After summing each column of the total influence matrix to unity, they were self-multiplied three times to obtain a limiting super-matrix containing the weight of each aspect and influencing factors. The result after sorting is shown in Table 7.

According to the total influence matrix, the importance $(D + R)$ and relevance (D–R) of each influencing factor are finally obtained, as shown in Table 8.

The importance ranking of influencing factors calculated by DEMATEL and the weight ranking of influencing factors calculated by ANP are used to count the votes by the Borda count method to obtain the final sequence of importance, shown in Table 9, as the final importance ranking of this research.

4.3. Establishing a Network Causality Diagram. In order to clarify the causal relationships between the various influencing factors, total influence matrix T is used to simplify them, taking the maximum value in each row. Similar to the multiple regression equation, the independent variable with the largest impact strain is taken to select the top seven major influencing factors in DEMATEL and draw a network causality diagram, as shown in Figure 3.

It can be seen from Figure 3 that the popularity of the livestream sellers and trust in the sellers are the two most important factors, and they have a mutual influence relationship. However, because the (D–R) value of the seller's popularity is positive, it is a relationship that actively influences others, so it is the most important source in the cause and effect diagram.

4.4. Importance-Performance Analysis (IPA). At the same time as the DANP questionnaire, we also collected the IPA questionnaire, collecting 108 in total, and obtained a performance satisfaction value of 14 influencing factors in the live e-commerce shopping process, represented on the Y-axis. The importance weight of $(D + R)$ in DEMATEL was used as the X-axis. The average importance of 14 factors is 14.66. The average performance is 80.42 as the center line of the X-axis and Y-axis, and the final result is shown in Figure 4 and Table 10.

5. Discussion

This research uses the theater theory as the basic theoretical framework to sort out 24 influencing factors that may have an impact on consumers' shopping motivation. Later, through the Delphi method suggested by eight experts in the industry, the 14 influencing factors affecting the shopping motivation of the anchors with the goods were screened out. Some of them are livestream sellers' popularity, product discounts, livestream sellers' attractiveness, trust, and product quality. Product popularity, host taste, live broadcast time, product diversity, service quality, subjective attitude, platform convenience, host audience interaction, overall vision, and popularity are the most influencing factors, with a weight of 0.0808. All weights are shown in Table 7.

We found through the framework of the theater theory that seller characteristics are very influential, with a weight value of 0.302. Ki and Zhang et al. [13, 25] both verified that in the live shopping process of livestream transactions, the personal characteristics of the sellers have a strong influence on consumers' shopping motivation.

It is very interesting that according to this research, the weight of the consumer's perceived value dimension is lower than that of the livestream seller characteristic dimension, and the weight of the perceived value is 0.2986. Compared with the perceived value of the product itself, the role characteristics of livestream sell can trigger consumers' motivation to purchase the product. We will explain this point later.

The weight ratio of the streaming platform aspect is relatively low, only 0.1333. This also shows that Chinese consumers are generally traditional to online shopping compared with traditional TV shopping, and online platform live shopping is already a fairly common form of shopping in China. In addition, the impact of streaming platforms on consumers is relatively small.

The performance aspect is a relatively controllable feature in which livestream sellers can make technical improvements directly after entering the industry. The weight value of this variable is 0.2662. This aspect is related to whether a livestream seller who is new to the industry can quickly generate commercial value by improving their own technology.

5.1. High Importance and Low Satisfaction. In the livestream e-commerce field, the key factors are livestream sellers' popularity, product discounts, anchor trust, and product quality. [6] Their research pointed out that popular Internet celebrities have a more significant influence on consumers. However, Internet celebrities with a large popularity may not be the best marketing choice to promote different products. However, we have verified that livestream sellers are different from traditional Internet celebrities. To mobilize consumers' shopping motivation, they must increase their popularity, improve product quality, and lower product prices. In Figure 3, we can see that the popularity of livestream sellers is the source of causality. The livestream sellers

Table 4: Research aspects and influencing factors.

Aspect	No	Criteria	Description	AVG	SD	CDI
Seller characteristics	A1	Seller taste	Livestream seller can actively share the latest trends and designs or products with high style and taste to peer consumers through live broadcasts	86.25	6.94	0.0728
	A2	Seller popularity	The number of followers owned by the livestream seller	92.50	5.35	0.0560
	A3	Seller attractive	Seller's own language, appearance, temperament, and charm	79.37	5.63	0.0590
	A4	Seller trust	Trust level of livestream seller	85.37	5.45	0.0571
Streaming platform	B1	Subjective attitude	The degree of subjective recognition of live shopping	71.25	7.50	0.0786
	B2	Platform convenience	The purchase process feels smooth and convenient	83.75	9.16	0.0961
Consumer perceptual value	C1	Product discount	Discounts on purchases	95.38	3.93	0.0411
	C2	Product quality	Quality perception of purchased products	91.50	8.33	0.0874
	C3	Product awareness	Awareness of the product	81.62	5.45	0.0571
	C4	Service quality	Service attractiveness and service reputation in the overall process of live shopping.	85.38	7.05	0.0739
Performance	D1	Product diversity	Increase the customer's choice of products	75.63	6.23	0.0653
	D2	Overall vision	The overall visual effect shown to consumers in live shopping	76.88	5.94	0.0623
	D3	Sellers-customer interactivity	Can livestream seller mobilize interaction with consumers	80.00	4.63	0.0485
	D4	Live broadcast time	Number and duration of livestream conducted by the livestream seller	85.00	3.51	0.0368

Table 5: Direct influence matrix.

No.	A1	A2	A3	A4	B1	B2	C1	C2	C3	C4	D1	D2	D3	D4
A1	0.0000	1.5196	1.3392	1.5686	1.0333	1.0529	1.3725	1.6471	1.4490	1.2902	1.2549	1.2294	1.0314	1.4922
A2	1.4627	0.0000	1.7784	1.5980	1.1510	1.1118	1.6706	1.4608	1.5275	1.5601	1.2941	1.4106	1.4804	1.8137
A3	1.1706	1.5569	0.0000	1.4078	1.2804	1.0314	1.9510	1.4608	1.0373	1.1902	1.3235	1.3098	1.5490	1.3686
A4	1.2529	1.2275	1.2275	0.0000	1.5588	1.4412	1.3627	1.5686	1.5282	1.3078	1.3824	1.2000	1.0686	1.4412
B1	1.0922	1.2196	1.5392	1.3686	0.0000	1.3235	1.2647	1.4608	1.2314	1.2098	1.2255	1.1216	0.9608	1.2961
B2	1.5627	1.1200	1.1784	1.5980	1.1118	0.0000	0.8824	0.8314	1.0980	1.3392	1.1706	1.0804	1.4412	0.8529
C1	1.1706	1.6569	1.9609	1.4078	1.5725	1.3039	0.0000	1.6196	1.4314	1.2216	1.5137	0.9745	1.6529	1.5529
C2	1.2529	1.1275	1.2275	1.6059	1.5000	1.3922	1.5294	0.0000	1.6333	1.5667	1.4314	1.2294	1.2824	1.0412
C3	1.4804	1.5784	1.5392	1.5588	1.4118	1.3333	1.4122	1.3255	0.0000	1.4980	1.3922	0.9804	1.0824	1.0588
C4	1.1118	1.4902	1.2706	1.4176	1.5688	1.5804	1.0431	1.1882	1.4078	0.0000	1.0431	0.9706	1.2098	1.2157
D1	1.2843	1.4706	1.4902	1.3725	1.3039	1.3725	1.3922	1.3627	1.0216	1.3922	0.0000	1.3020	1.0725	1.3608
D2	1.1980	1.3176	1.3471	1.1392	1.1196	1.0020	0.8941	1.1294	0.8184	0.8098	0.9043	0.0000	0.9314	1.3941
D3	0.9725	1.7490	1.2882	1.3588	1.0098	1.1020	1.5216	0.9314	1.0706	1.0294	1.0529	0.9216	0.0000	1.0294
D4	1.1667	2.0039	1.7451	1.8529	0.4510	1.0843	1.1510	0.2059	1.5627	1.3765	1.0412	1.5653	1.3725	0.0000

Table 6: Total impact matrix.

No.	A1	A2	A3	A4	B1	B2	C1	C2	C3	C4	D1	D2	D3	D4
A1	0.4542	0.6017	0.5919	0.6101	0.5035	0.5044	0.5573	0.5355	0.5432	0.5343	0.5129	0.4916	0.5058	0.5479
A2	0.5724	0.5859	0.6679	0.6680	0.5565	0.5549	0.6230	0.5750	0.5965	0.5959	0.5624	0.5455	0.5749	0.6129
A3	0.5188	0.6132	0.5371	0.6118	0.5227	0.5112	0.5924	0.5354	0.5324	0.5374	0.5240	0.5025	0.5381	0.5511
A4	0.5199	0.5936	0.5921	0.5403	0.5320	0.5270	0.5611	0.5363	0.5511	0.5398	0.5232	0.4943	0.5119	0.5497
B1	0.4824	0.5582	0.5712	0.5710	0.4273	0.4915	0.5248	0.5015	0.5062	0.5040	0.4862	0.4624	0.4773	0.5119
B2	0.4755	0.5210	0.5213	0.5478	0.4536	0.3992	0.4767	0.4451	0.4704	0.4801	0.4552	0.4332	0.4701	0.4623
C1	0.5533	0.6574	0.6690	0.6525	0.5697	0.5577	0.5377	0.5765	0.5856	0.5749	0.5667	0.5201	0.5770	0.5945
C2	0.5257	0.5959	0.5987	0.6236	0.5363	0.5311	0.5751	0.4681	0.5618	0.5574	0.5315	0.5006	0.5274	0.5378
C3	0.5347	0.6145	0.6113	0.6201	0.5304	0.5265	0.5691	0.5313	0.4825	0.5531	0.5284	0.4885	0.5173	0.5378
C4	0.4876	0.5750	0.5636	0.5781	0.5064	0.5073	0.5188	0.4930	0.5185	0.4494	0.4818	0.4590	0.4925	0.5123
D1	0.5124	0.5945	0.5939	0.5961	0.5115	0.5148	0.5534	0.5184	0.5188	0.5342	0.4475	0.4910	0.5038	0.5377
D2	0.4292	0.4958	0.4956	0.4926	0.4232	0.4183	0.4455	0.4276	0.4271	0.4253	0.4135	0.3532	0.4178	0.4565
D3	0.4477	0.5487	0.5268	0.5360	0.4480	0.4519	0.5056	0.4486	0.4686	0.4654	0.4494	0.4253	0.4011	0.4702
D4	0.4926	0.6028	0.5887	0.6002	0.4575	0.4861	0.5272	0.4510	0.5274	0.5176	0.4836	0.4890	0.5029	0.4576

Table 7: Impact weight.

Aspect	No	Criteria	Weights	Total
Seller characteristics	A1	Seller taste	0.0730	0.3020
	A2	Seller popularity	0.0808	
	A3	Seller attractiveness	0.0744	
	A4	Seller trust	0.0738	
Streaming platform	B1	Subjective attitude	0.0689	0.1333
	B2	Platform convenience	0.0644	
Consumer perceptual value	C1	Product discount	0.0798	0.2986
	C2	Product quality	0.0747	
	C3	Product awareness	0.0745	
	C4	Service quality	0.0696	
Performance	D1	Product diversity	0.0723	0.2662
	D2	Overall vision	0.0597	
	D3	Sellers-customer interactivity	0.0643	
	D4	live broadcast time	0.0699	

Table 8: Relevance and importance.

Criteria		D (Influences)	R (Effects)	$D+R$	D–R
Seller taste	A1	7.4944	7.0064	14.5008	0.4879
Seller popularity	A2	8.2918	8.1581	16.4500	0.1337
Seller attractiveness	A3	7.6282	8.1293	15.7575	−0.5011
Seller trust	A4	7.5722	8.2481	15.8203	−0.6758
Subjective attitude	B1	7.0759	6.9786	14.0545	0.0973
Platform convenience	B2	6.6113	6.9820	13.5933	−0.3707
Product discount	C1	8.1924	7.5677	15.7601	0.6247
Product quality	C2	7.6710	7.0434	14.7144	0.6276
Product awareness	C3	7.6454	7.2902	14.9357	0.3552
Service quality	C4	7.1433	7.2688	14.4121	−0.1254
Product diversity	D1	7.4282	6.9662	14.3944	0.4619
Overall vision	D2	6.1213	6.6562	12.7775	−0.5349
Sellers-customer interactivity	D3	6.5934	7.0179	13.6113	−0.4245
live broadcast time	D4	7.1842	7.3400	14.5241	−0.1558

Table 9: Importance ranking.

Criteria		DEMATEL	ANP	Borda Score	Final Sequence
Seller taste	A1	8	7	15	7
Seller popularity	A2	1	1	2	1
Seller attractiveness	A3	4	5	9	4
Seller trust	A4	2	6	8	3
Subjective attitude	B1	11	11	22	11
Platform convenience	B2	13	12	25	12
Product discount	C1	3	2	5	2
Product quality	C2	6	3	9	5
Product awareness	C3	5	4	9	6
Service quality	C4	9	10	19	10
Product diversity	D1	10	8	18	9
Overall vision	D2	14	14	28	14
Sellers-customer interactivity	D3	12	13	25	13
live broadcast time	D4	7	9	16	8

Wei Ya and Li Jiaqi, who benefit from the live broadcast e-commerce, had entered the industry early as 2016, when the e-commerce livestream field was still in its embryonic stage. They have the initial exposure, and the support from the platform is what helped them achieve their current commercial value. Moreover, the famous livestream seller Luo Yonghao, who entered the Douyin platform in March 2020, was once a talk show actor in China, and also the CEO of Smartisan, so he already had a certain foundation. Taobao recruited more than 300 Chinese film and television stars for live streaming in June 2020. The names chosen by the brand were also already popular in China.

Hence, apart from the popularity of livestream sellers, can discounts and product quality also improve consumers' purchasing motivation? Hou et al. [59] mentioned that consumers' perception of product discounts and product

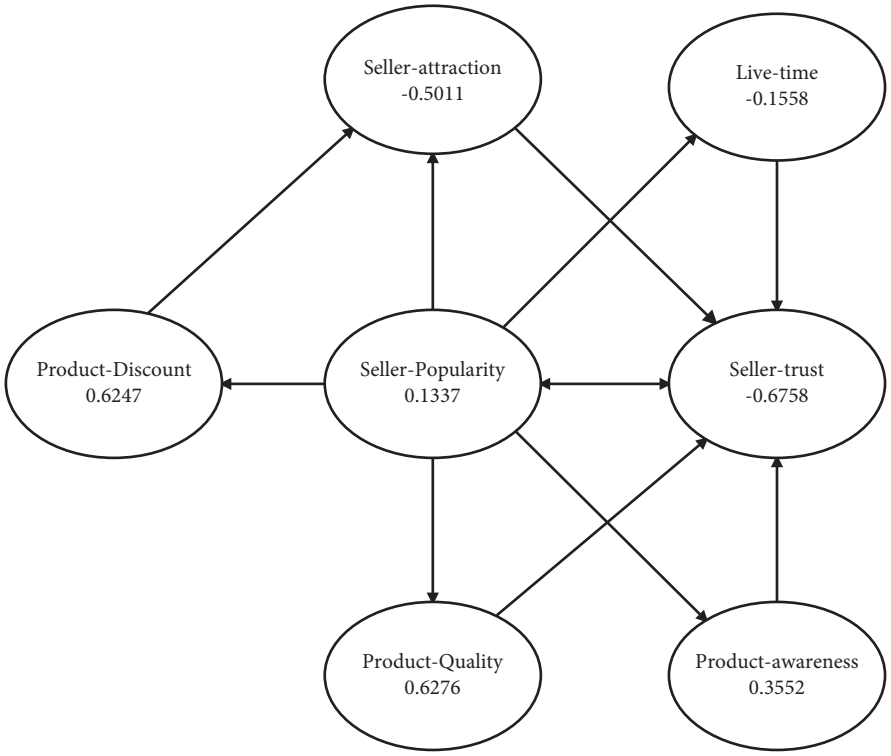

Figure 3: Causality diagram.

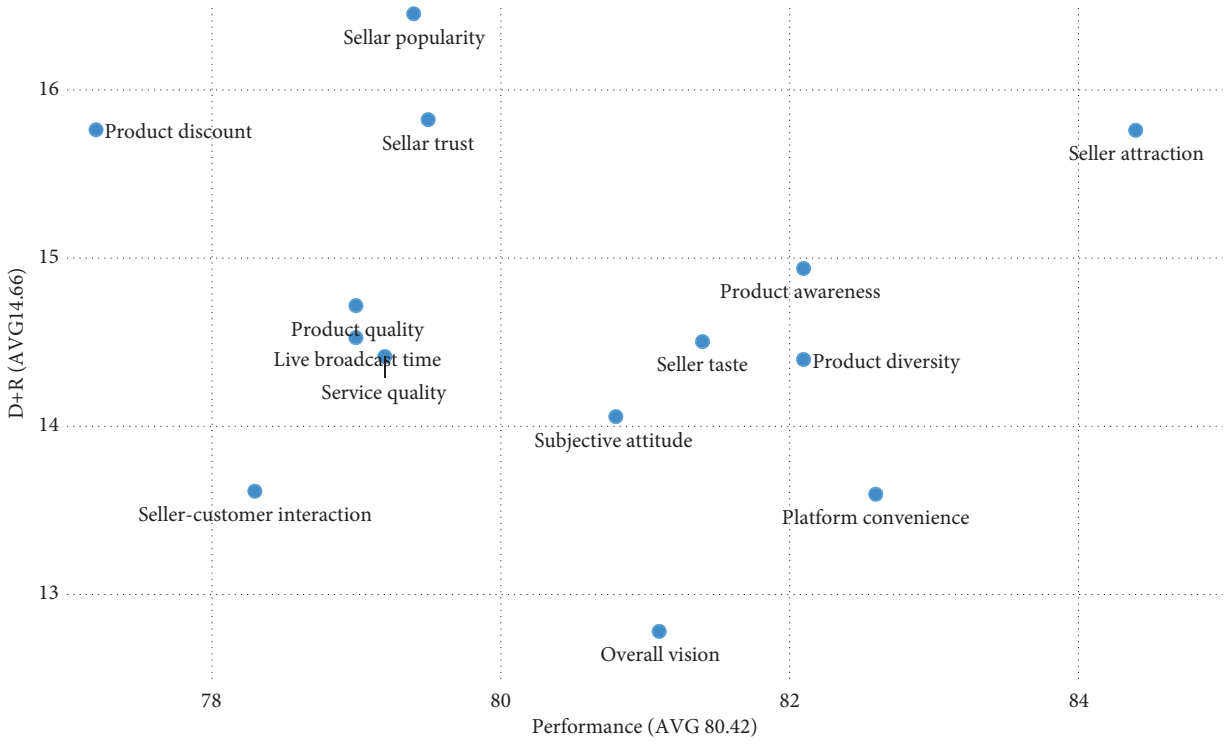

Figure 4: Importance-performance analysis.

quality can improve their purchasing motivation. However, as shown in Figure 3, we found that both aspects are affected by the sellers' popularity. In other words, merchants only provide the best quality products and the most favorable discounts to the most popular livestream sellers. In this case, it can be said that the reliability and popularity of livestream

Table 10: Performance values for 14 criteria of customer' experience.

	Impact Factor	Criteria total AVG	Dimension total AVG
Seller characteristics	Seller taste	81.4	81.2
	Seller popularity	79.4	
	Seller attractiveness	84.4	
	Seller trust	79.5	
Streaming platform	Subjective attitude	80.8	81.7
	Platform convenience	82.6	
Consumer perceptual value	Product discount	77.2	79.4
	Product quality	79	
	Product awareness	82.1	
	Service quality	79.2	
Performance	Product diversity	82.1	80.1
	Overall vision	81.1	
	Sellers-customer interactivity	78.3	
	live broadcast time	79	

sellers interact with each other. So, the most popular livestream sellers need to find the best products to increase their trust in consumers, since they have a strong sense of trust in the seller.

5.2. High Importance and High Satisfaction. The attractiveness of livestream sellers and product awareness are among the most influencing factors. These two influencing factors have high satisfaction for consumers, but satisfaction can be subjective and vary according to these factors. This is the part that needs to be maintained in the entire e-commerce live shopping process. According to Figure 3, product awareness is affected by the popularity of livestream sellers, which is the source influencing factor. Therefore, as a merchant, in order to maintain and improve the popularity of their products and occupy a larger chunk of market, they need sufficient motivation to provide their products at the most favorable price to popular livestream sellers. Generally, the higher the seller attractiveness is, the higher the seller popularity should be. As real two elements influence with each other. In fact, the average score of satisfaction against seller popularity is 79.4 points and that of seller attractiveness is 84.4 points, indicating that customers have more demand for seller popularity. In other words, for top livestream sellers, you only need to maintain the existing seller attractiveness.

5.3. Causality of High-Importance Factors. From the perspective of the entire high-importance factor, live streaming has formed a closed loop centered on the popularity of livestream sellers. The product discount and product quality in the consumer's perception of the product are completely determined by the livestream seller's popularity. In other words, if a new livestream seller just entered the industry, it might be very challenging to build a new space in it without a previous popularity base.

5.4. Low Importance and Low Satisfaction. We can see that "service quality" and "seller-customer interaction" are not as important, but, for consumers, satisfaction is low. A large number of studies have pointed out that the intensity of interaction between livestream sellers and consumers have a direct impact on consumers' purchasing motivation [17, 24, 25, 30, 42, 68–70]. The outcomes of this research pointed out that quality of service and the interaction between the seller and the customer are less important than the aforementioned key factors; however, the satisfaction of consumers is low. At the same time, according to Figure 3, improving service quality can also increase consumer trust in livestream sellers. For livestream sellers with insufficient popularity, improving service quality and increasing interaction with consumers are very limited feasible means that can increase the commercial value of livestream sellers.

After expert advice, we added the impact factor "live broadcast time," which was not used in previous studies. Through empirical research, we found that consumers' satisfaction with live broadcast time is still relatively acceptable at this stage. According to Figure 3, it can be seen that the (D-R) value of time is −0.1558, which is a passive influencing factor. That is, as the popularity of the livestream seller increases, they must maintain a certain amount of live broadcast time to increase consumers' trust. In fact, top livestream sellers such as Li Jiaqi, Wei Ya, and Luo Yonghao usually create 2–4 hours of live content, which indirectly affects their popularity. So, it can be said that maintaining a certain amount of live broadcast time is an indispensable factor for improving consumers' shopping motivation.

5.5. Low Importance and High Satisfaction. The taste and product diversity of livestream sellers are high for consumers. Ki et al. [25] reflected out that improving the taste ability of livestream sellers has an impact on consumers' purchasing motivation. McQuarrie & Phillips [42, 43] also verified that increasing the customer's choice dimension can improve consumers' purchasing motivation. However, our results showed that, in live shopping, the importance of taste and product diversity of is slightly less important than the other six influencing factors. However, in China's multiple live streaming platforms, we can also see that many livestream sellers have entered the segmented product field that is suitable to their own personal characteristics. This is the best strategy to increase the customer's choice dimension

and at the same time improve the sellers' possibility so they can grow in the industry. For example, there are livestream sellers of special liquors and livestream sellers of outdoor specialties.

Subjective attitudes and platform convenience belong to the dimensions of streaming platforms. According to a research on China's mobile e-commerce market, subjective attitudes and platform convenience have a positive effect on consumers' use of mobile e-commerce platforms [25]. However, we have observed that e-commerce live shopping is different from the previous e-commerce consumption model. Intended to the rapid development of large e-commerce sites such as Taobao and JD.com, Chinese consumers got used to this new consumption model of online shopping. In the process of moving from the traditional e-commerce model to e-commerce live shopping, most consumers can fully recognize and adapt to the new streaming platforms of related websites. Several streaming platforms often carry out livestream activities at the same time to pursue the maximum exposure of livestream sellers.

6. Possible Limitations

As actors in an emerging type of industry, it can be quite challenging for livestream sellers to build their way into it. The results of this study may trigger new research questions that can be further verified, for example, how to avoid top livestream sellers from manipulating the e-commerce market, so that more people can engage with it can engage with it? Is it possible to intervene with other influencing factors to prevent new sellers from finding unfair competition among the most popular ones? This research provides reference suggestions for other scholars and researchers who want to enter the field. However, livestream e-commerce is an emerging field, the sampling scope of this study is limited to mainland China, so the outcomes presented here are limited. In addition, based on the comprehensive consideration of the overall sample data, this study is specific to different consumer groups. And for livestream sellers, the weights of the impact factor will be different.

7. Conclusions and Future Work

At present, since the COVID-19 pandemic is still affecting the world, the physical retail industry continues to decline. More and more consumers are turning to e-commerce, since physical transactions are constantly affected by the restrictions brought by the health crisis. Many people who enter the live streaming delivery industry have insufficient knowledge of the livestream e-commerce industry, so they waste lot of time and capital. From the perspective of consumers' shopping motivation, this research builds on the theater theory often used in the service experience to construct four major influence dimensions and important influence factors for better understanding the commercial value of livestream sellers. This research is more focused on establishing a comprehensive judgment standard for evaluating the commercial value of livestream sellers. Through an in-depth analysis of the 14 impact factors and its respective weights, combined with the causal relationship between the main impact factors, this study brings useful information for livestream sellers who want to enter the industry, so they can make preliminary business value judgments based on their own circumstances.

At the same time, this study sorts out the relationship between the factors that livestream sellers have on consumers' shopping motivation. This study points out that the popularity of livestream sellers is a key factor to be considered when entering the industry. This study explored that the uppermost task is to accumulate sellers' popularity before they enter the industry and boost sellers' trust at the same time. Later, they can get the most favorable product discount. Meanwhile, they can also select the relevant subdivisions based on their fans' characteristics. Therefore, the personal features of livestream sellers are more important than consumers' perception of the value of online goods. We have also found that the fan characteristics of livestream sellers can be used to select relevant subdivisions. And also to improve seller's taste and product diversity in this field to generate more purchasing motivation, improving the interactive relationship between livestream sellers and customers and the quality of service are also effective means to create more motivation.

In the overall e-commerce livestream industry, livestream sellers are data producers. This study finds that if the platform traffic recommendation is made by using the popularity click rate as the only measurement metrics, it is easy to cause overcentralization of the industry. Therefore, for streaming platforms, it is possible to enhance the popularity of a certain category of anchors by manifesting the correlation between the content that reflects the taste of related products and the activities of anchors for the category of goods, so as to achieve the effect of industry decentralization and facilitate the sustainable development of the livestream industry as a whole.

As the international livestream e-commerce continues to mature, this basic evaluation framework can provide ideas for research related to subfields in the future. As our future strategy, we are determined to enhance the framework and to apply it on other cyber-related domains.

Data Availability

No data were used in this study.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Authors' Contributions

Hao-Nan Cheng, Jesheng Huang, and Yi-Ting Huang conceptualized and designed the study; Hao-Nan Cheng collected and analyzed the data; Hao-Nan Cheng wrote the manuscript; and Jesheng Huang provided guidance and revised the article. All authors have read and agreed to the published version of the manuscript.

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