

Research on the Relationship between Information Accessibility on Live E-commerce Platforms and Satisfaction of Deaf Consumers

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Abstract

This study is based on the TAM model, employing 317 deaf consumers from Chinese livestreaming e-commerce platforms as empirical research subjects. Employing the SPSS 26.0 software suite, a series of multiple regression analyses alongside mediation effect examinations are carried out to substantiate the relational impacts between the variables within the model. The conclusions drawn are as follows: Perceived usefulness and perceived ease of use are positively impacted by information accessibility. Customer satisfaction is positively influenced by both perceived usefulness and perceived ease of use. The positive impact of information accessibility on customer satisfaction is partially established. Additionally, the mediating effects of perceived usefulness and perceived ease of use on the relationship between information accessibility and customer satisfaction are partially established. Based on the aforementioned analytical findings, a detailed discussion and analysis of satisfaction among deaf users and the information accessibility of live-streaming e-commerce platforms are provided. Furthermore, specific development recommendations are proposed.

Keywords: Live-streaming e-commerce, deaf consumers, information accessibility, customer satisfaction, technology acceptance model

1. Introduction

With the continuous development and popularization of Internet technology, live-streaming e-commerce has rapidly emerged as an innovative e-commerce model. Following Alibaba's Taobao platform, which pioneered the introduction of live shopping modules in March 2016, the "online live streaming + e-commerce shopping" marketing model has become a focal point for major e-commerce platforms. Live-streaming e-commerce platforms, through real-time broadcasting, enable consumers to watch product demonstrations, interact with hosts, and directly purchase goods online, injecting new vitality into traditional e-commerce models. According to the "2022 China Live-streaming E-commerce Market Data Report" published by the Network Economy and Society, the average annual consumption per person in the live-streaming e-commerce industry in 2022 was 7,399.58 yuan, a year-on-year growth of 59.48%[1]. The 53rd "China Internet Development Status Statistical Report" released by the China Internet Network Information Center indicates that as of December 2023, the scale of online live streaming users reached 816 million, an increase of 65.01million compared to December 2022, accounting for 74.7% of the overall online population[2]. In recent years, the live-streaming e-commerce industry has achieved significant growth, attracting considerable attention and participation from users across various sectors, including a substantial number of individuals with disabilities. According to statistics from the China Disabled Persons' Federation, more than 68,000 people with disabilities achieve online employment through e-commerce, live

streaming, and other information technologies annually. The number of people with disabilities engaged in online employment and entrepreneurship on various e-commerce platforms has exceeded 200,000. Individuals with disabilities have become active participants in the live-streaming e-commerce industry, particularly those with hearing impairments. Phrases like "sign language anchors" and "silent anchors" have become trending topics in major media.

China has the world's largest population of people with disabilities, with over 85 million individuals. Among them, approximately 20.47 million people experience hearing impairments[3]. The Convention on the Rights of Persons with Disabilities clearly stipulates that "persons with disabilities have access to information and communication on an equal basis with others", promoting the development of information accessibility. However, with the advancement of digital technology, there has been an explosive growth in multimodal, multi-source information. The efficiency of information interaction and knowledge acquisition has rapidly increased. The issue of the "digital disability divide" is becoming more pronounced[4]. Individuals with different types of disabilities face various obstacles in participating in e-commerce activities. For instance, those with hearing impairments may lack interactive methods such as video/audio subtitles or sign language, while individuals with limited hand function may lack intelligent access methods. Visually impaired individuals may face challenges in accessing and understanding product images and complex visual content[5]. Therefore, information accessibility is a crucial element for people with disabilities to participate equitably and experience e-commerce activities. It represents a vital manifestation of ensuring that individuals with disabilities enjoy or exercise all human rights and fundamental freedoms. E-commerce activities that do not meet the requirements for accessible access and shopping can be considered as a form of "disability discrimination"[6].

This study focuses on deaf consumers to investigate the impact relationship between information accessibility on live-streaming e-commerce platforms and the satisfaction of deaf consumers. The aim is to provide essential theoretical support and practical guidance for the development of information accessibility on live-streaming e-commerce platforms and the satisfaction of deaf consumers in live shopping.

2. Literature Review

2.1 Information accessibility

"Information Accessibility" aims to address differences in physical abilities, environmental conditions, and other aspects through information technology, ensuring that anyone—regardless of their health status, including both able-bodied and disabled individuals, as well as people of all ages—can access, interact with, and use information equally, conveniently, and safely[7]. Since the 1980s, Information Accessibility has garnered attention in developed countries[8], with governments actively working to provide equal opportunities for disabled individuals to access information and enjoy technological products.

In 1997, the W3C initiated the WAI with the aim of developing guidelines for web accessibility. By 1999, the W3C had concluded the development of and endorsed the Web Content Accessibility Guidelines (WCAG 1.0), recommending them for use in the design of accessible websites. On December 11, 2008, WCAG 2.0 was released and widely adopted for more advanced technologies. The latest version, WCAG 2.2, was promulgated on October 5, 2023, while the Accessibility Guidelines WCAG 3.0 released an updated working draft on July 24, 2023, marking a new exploration stage in many aspects. WCAG 2.2 encompasses four major principles: Perceivable, Operable, Understandable, and Robust. In recent years, China has made significant progress in various aspects of Information Accessibility, including legal regulations, standard specifications, key technologies, exemplary applications, and talent development. Notable milestones include the implementation of the first national standard for Internet Information Accessibility, GB/T 37668-2019, in 2020, the issuance of the "Barrier-free Environment Construction Implementation Plan" in 2021, and the enforcement of the "People's Republic of China Accessibility Environment Construction Law" in 2023. These efforts have provided a certain level of guarantee for the information rights of disabled individuals. The continuous improvement and development of domestic and international laws, regulations, and standards related to Information Accessibility offer a comprehensive basis for assessing the information accessibility of live-streaming e-commerce platforms.

Individuals with hearing impairments are commonly referred to as deaf individuals due to their diminished ability to perceive external auditory information. Given their hearing loss, they rely primarily on sign language and visual cues to convey and acquire information. According to Sohaib & Kang (2016), who analyzed 30 Australian B2C websites based on the WCAG 2.0, many e-commerce websites lack subtitles or audio content identification features in product descriptions and promotional videos. The interfaces also lack visual distinctiveness, making it difficult for deaf consumers to access and understand relevant product and other crucial information. In a study by Cao et al. (2023), a semi-structured interview analysis of deaf hosts on live-streaming platforms suggested that live platforms should provide real-time speech-to-text functionality to facilitate communication between deaf and hearing individuals, promoting effective interaction between both parties[9]. Cardoso et al (2015) proposed developing inclusive e-commerce systems based on accessibility requirements. These systems should incorporate sign language translation functionality and emphasize visual representation to ensure that deaf consumers can enjoy the convenience provided by e-commerce systems[10]. Building on the aforementioned research and considering the characteristics of live-streaming e-commerce, this study focuses on two dimensions of information accessibility for deaf individuals. One dimension involves accessibility accessing for static pages, and the other pertains to accessibility for shopping interactions during live broadcasts.

2.2 Live-streaming e-commerce and customer satisfaction

The rise of live-streaming e-commerce has revolutionized traditional online shopping methods, enhancing consumers' experience in making online purchases. Currently, there is a lack of unified understanding regarding the definition of live-streaming e-commerce, with academia generally considering it as part of online live broadcasting. Zheng (2019) points out that live-streaming e-commerce is a form of online live broadcasting primarily focused on selling goods and promotional recommendations[11]. Teng (2021) believes that live-streaming e-commerce is a marketing strategy where salespersons sell products through online live broadcasting channels[12]. It can be observed that live-streaming e-commerce, oriented towards consumers and primarily focused on "bringing goods," has the fundamental attribute of being consumer-centric. However, when we watch live streams on e-commerce platforms such as Taobao, JD.com, Douyin, and Kuaishou, live-streaming e-commerce has evolved beyond a mere method of promoting products. It now exhibits features of entertainment, interaction, and social engagement[13]. Hosts not only provide comprehensive and detailed introductions to the quality, performance, appearance, usage details, and after-sales service of products but also share their interesting experiences, current affairs, entertainment gossip, and occasionally invite popular celebrities to the live stream. This approach brings hosts closer to users, increases user engagement, and makes the shopping experience more entertaining[14]. This study focuses on "bringing goods" as the guiding principle for live-streaming, a type of live streaming that is more conducive to becoming a marketing model with broader development prospects in the future. Therefore, in this paper, live-streaming e-commerce is defined as a marketing model that utilizes mobile internet and live streaming technology, with "bringing goods" as the primary objective, integrating sales and entertainment. Information accessibility for the sales and entertainment functions of live-streaming e-commerce platforms must meet the needs of deaf consumers.

Research on customer satisfaction in the academic field was initially proposed by Cardozo (1965), who believed that consumers' psychological expectations during product purchases would influence their perceptions and evaluations of the product[15]. Howard & Jagdish (1969), Belkin (1976), and Hunt (1977) all mentioned in their studies that consumers' psychological expectations and the actual experience are the two core elements determining customer satisfaction. If consumers' actual perceptions of product and service quality exceed their expectations, they experience satisfaction; otherwise, they feel dissatisfied[16-18]. Oliver (1980) introduced the "consumer actual experience - consumer expectation" model, which aligns with the conclusions drawn by the aforementioned researchers[19]. In their study, Kelley & Skimier (1990) pointed out that customer satisfaction is also related to the level of consumer involvement in the shopping process. The higher the consumer involvement, the higher the satisfaction, and vice versa[20]. Han et al. (2003) conducted an extended study on customer satisfaction, suggesting that besides whether product quality or service experience meets consumers' expectations, customer satisfaction is also associated with consumers' subjective feelings during the shopping process (ordering, payment, after-sales, etc.)[21]. Through the above research, we can identify that product quality, service quality, and the shopping process experience are key factors influencing customer satisfaction. In live-streaming e-

commerce, hosts showcase products through real-time videos, interact with the audience, address their queries, and encourage them to place orders. Viewers can interact with hosts in real-time through bullet comments, comments, etc., actively participating in the shopping decision-making process. Therefore, in this paper, customer satisfaction for live-streaming e-commerce is divided into three dimensions: product satisfaction, service satisfaction, and process satisfaction.

2.3 Technology acceptance model

The TAM model theory proposed by Davis in 1989 [22], is illustrated in Figure 1. Initially, this model was primarily used to study users' acceptance of computers. As TAM theory continued to evolve, it has been widely applied to investigate users' acceptance of new technological advancements. The model identifies the two key determinants of technology acceptance as PDU and PEOU. PDU refers to the extent to which users believe that the adoption of a particular information system enhances their job performance or quality of life. On the other hand, PEOU is the subjective perception of how convenient it is for users to employ a certain information technology. These two factors, influenced by external variables, collectively impact users' behavioral intentions, subsequently influencing their actual usage behavior.

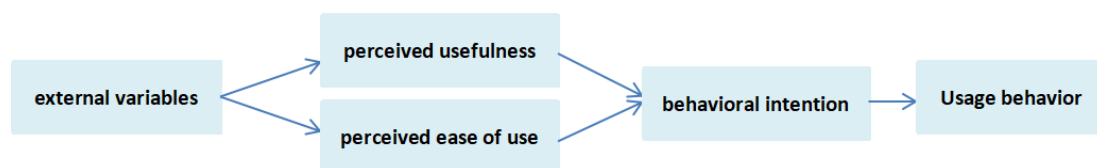


Figure 1 TAM model

The TAM model has also been employed by scholars to investigate the impact of user satisfaction with new technology usage. Mazuri et al.(2017) applied the TAM model, combined with variables such as customer service and customer satisfaction, to analyze the issue of continued usage intention in HBL Bank's online banking in Pakistan. The study found that PDU, PEOU, customer service, and customer satisfaction significantly influence the continuous use of online banking, with customer satisfaction playing a crucial mediating role among these factors [23]. Isaac et al. (2018) applied the TAM model to analyze satisfaction and performance issues among Yemeni government employees using the internet. By extending the TAM model with two output factors—user satisfaction and actual usage—the study found that the PDU, PEOU and actual usage of internet tools by government employees in Yemen have a positive and significant impact on their satisfaction with internet use [24]. Han & Sa (2021) also utilized the TAM model in the education sector to analyze the satisfaction and acceptance intentions of South Korean students towards online courses during the COVID-19 period. The results indicated that the PDU and PEOU of online courses both have a significant positive impact on educational satisfaction, and student educational satisfaction similarly has a positively significant influence on acceptance intentions [25]. The aforementioned prior research provides a crucial foundation for this study's application of the TAM model to analyze information accessibility and its impact on the satisfaction of deaf consumers on live commerce platforms.

3. Research Model and Hypotheses

This article, based on the TAM model, establishes an evaluation model for examining the impact relationship between information accessibility and satisfaction of deaf consumers on live commerce platforms. Through empirical research to validate the model's effectiveness, practical recommendations are provided for enhancing information accessibility and satisfaction among deaf consumers on live commerce platforms. Building upon prior research, this article identifies several latent variables, including information accessibility, PDU, PEOU and customer satisfaction. In consideration of the specific needs of deaf individuals regarding information accessibility and the operational characteristics of live commerce platforms, this study further breaks down information accessibility into browsing accessibility and shopping accessibility. Similarly, customer satisfaction is dissected into product satisfaction, service satisfaction, and process satisfaction.

3.1 The relationship between information accessibility and customer satisfaction

In this study, information accessibility refers to the ability of live commerce platforms to compensate for the hearing impairment of deaf consumers, enabling them to access, interact with, and use shopping information equally, conveniently, and safely. It primarily encompasses two dimensions: access and shopping. Customer satisfaction in this context is defined as the perception of a gap between the shopping experience on live commerce platforms and users' expectations among deaf consumers. It includes three dimensions: product satisfaction, service satisfaction, and process satisfaction. Gonçalves et al.(2018) confirmed that the accessibility and usability of most e-commerce platforms in Portugal impact the usage by users with disabilities, emphasizing the significant influence of improved information accessibility on user satisfaction among individuals with disabilities [26]. Merritt & Zhao (2020) suggested that establishing interactive technologies online and creating diverse user experiences, particularly providing interfaces for special needs, can effectively enhance user experiences and boost customer satisfaction in omnichannel retail, especially for people with disabilities [27]. Trielsa&Angeline (2023) confirmed that e-commerce websites in Indonesia, through inclusive design for accessibility, can significantly increase satisfaction among individuals with disabilities, leading to increased website traffic and sales volume [28]. Based on the literature mentioned above, we propose the following research hypothesis:

H1: Information accessibility (accessibility accessing and Accessible shopping) positively influences customer satisfaction (product satisfaction, service satisfaction, process satisfaction).

3.2 Relationship between information accessibility and perceived usefulness, perceived ease of use

In this study, PDU refers to the expected performance and cognitive utility generated by deaf consumers through live commerce shopping. PEOU can be considered as the degree of ease and simplicity with which deaf consumers quickly learn to shop on live commerce platforms. Davis (1989) has already confirmed that external variables simultaneously influence PDU and PEOU [22]. Paul (2003) in his analysis of consumer acceptance of e-commerce, confirmed that trust significantly influences PDU and PEOU[29]. Igor et al.(2018) in the field of e-commerce also confirmed that information quality, service quality, system quality, and modern technology, as external variables, significantly positively influence both PDU and PEOU. This implies that providing high-quality information and services can increase users' PDU of e-commerce shopping, and the use of modern technology can enhance consumers' shopping efficiency and convenience [30]. Azizah et al. (2022), in their analysis of consumer decision-making in e-commerce purchases, confirmed that social influence factors, external environmental factors, and personal factors all have a significant impact on PDU and PEOU[31]. Given the above studies, we propose the following hypotheses:

H2: Information accessibility (accessibility accessing and Accessible shopping) positively influences perceived usefulness.

H3: Information accessibility (accessibility accessing and Accessible shopping) positively influences perceived ease of use.

3.3 Relationship between perceived usefulness, perceived ease of use, and customer satisfaction

In this study, customer satisfaction refers to the feelings and evaluations of deaf consumers regarding products, services, and the shopping process after engaging in purchasing behavior on live commerce platforms. The research results of Devaraj et al.(2002) on customer satisfaction in the B2C model of e-commerce indicate that PDU and PEOU Substantially affect customer satisfaction [32]. Wallace & Sheetz (2014) confirmed the influence of PDU and PEOU on the satisfaction of software measurement tools [33]. Wei et al. (2014), in their analysis of the intention to continue using running applications, confirmed that PDU and PEOU both have a significant positive impact on user satisfaction with running apps[34]. In the study by Liu & Zhang (2020) regarding the factors influencing the continuous usage intention of mobile news applications, it was confirmed that PDU and PEOU have a significant impact on user satisfaction with mobile news apps[35]. Kurniawan et al. (2021), in their analysis of e-commerce consumer satisfaction levels, found that 77% of respondents considered e-commerce to be very simple, effective, and efficient, and 82% of respondents found e-commerce transactions to be very easy,

practical, and simple. This further confirmed that positive evaluations of PDU and PEOU have a significant impact on enhancing satisfaction [36]. Based on the above analysis, we propose the following hypotheses:

H4: Perceived usefulness has a positive influence on customer satisfaction (product satisfaction, service satisfaction, process satisfaction).

H5: Perceived ease of use has a positive influence on customer satisfaction (product satisfaction, service satisfaction, process satisfaction).

H6: Perceived usefulness mediates the relationship between information accessibility (accessibility accessing and Accessible shopping) and customer satisfaction (product satisfaction, service satisfaction, process satisfaction).

H7: Perceived ease of use mediates the relationship between information accessibility (accessibility accessing and Accessible shopping) and customer satisfaction (product satisfaction, service satisfaction, process satisfaction).

The proposed research hypotheses relationships are illustrated in the research model constructed as shown in Figure 2. Latent variables are represented by ellipses, and the relationships between latent variables are depicted by straight arrows.

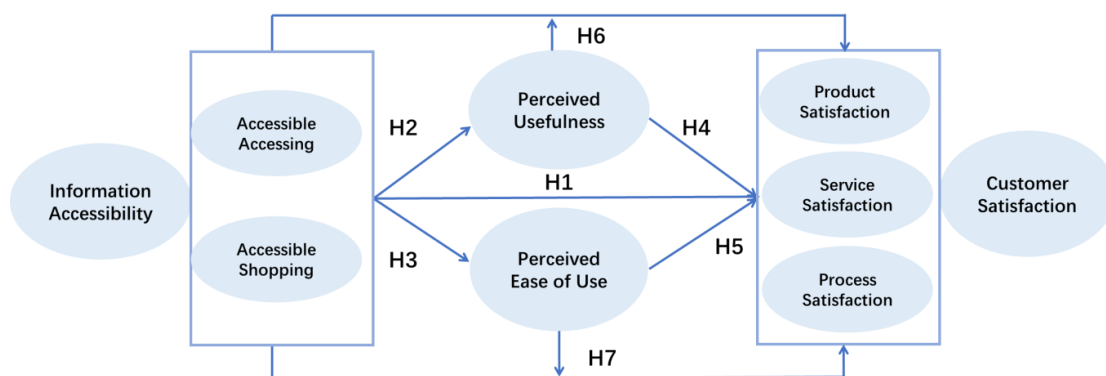


Figure 2 Research Model on Deaf Consumer Satisfaction in Live E-commerce Platforms Based on Information Accessibility

4. Data Collection and Analysis

4.1 Measurement scale design

The measurement items in this research questionnaire were referenced from mature scales in previous domestic and international studies. The questionnaire comprises two main sections: The first section focuses on the measurement of relevant variables regarding the relationship between information accessibility and satisfaction among deaf consumers. A Likert 5-point scale is employed to measure seven research variables. Scores ranging from 1 to 5 represent responses from "completely disagree" to "completely agree," with respondents assigning scores based on their perceptions. Specifically, accessibility for accessing and shopping refers to the WCAG 2.2 (2023). PDU and PEOU draw from the scales proposed by Davis et al. (1989) [37] and Yen et al. (2010) [38]. Customer satisfaction is measured using scales referenced from Fornell (1992) [39] and Sun & Kim (2013) [40]. Each research variable includes 3-5 measurement items, totaling 27 items. The second section collects basic information about deaf consumers, focusing on demographic details. This includes gender, degree of hearing impairment, age, occupation, monthly income, purchase frequency, and choice of live streaming platforms, encompassing a total of 7 items. The specific details are as shown in Table 1.

Table 1 Variable measurement items and sources.

variable	Encoding.	Measurement Items	References.
Accessible Accessing	AEA1	The important information on the live e-commerce platform is highlighted with vivid colors, or displayed with highlighted text, or accompanied by sign language translation. I can accurately receive the crucial information	WCAG2.2(2023)
	AEA2	The subtitles and annotations for videos and audios on the live e-commerce platform are clear and easy to read. I can quickly obtain accurate information	
	AEA3	The descriptions for product images and charts on the live e-commerce platform are concise and easy to understand. I can comprehend them very easily	
	AEA4	The live e-commerce platform provides visual interactive elements to replace audio prompts for interaction. I can easily operate the platform's user interface and navigation, and quickly find the information and features I need	
Accessible Shopping	AES1	The live e-commerce platform provides visual interactive elements to replace audio prompts for interaction. I can easily operate the platform's user interface and navigation, and quickly find the information and features I need	WCAG2.2(2023)
	AES2	The live e-commerce platform offers an easily accessible real-time chat function. I can conveniently participate in live interactions and communication	
	AES3	The live e-commerce platform provides effective user training and support for usage, which helps me make full use of the platform's shopping functions	
	AES4	The live e-commerce platform offers an intuitive, stable, and user-friendly shopping experience. I can browse and operate the platform more smoothly	
Perceived Usefulness	PDU1	The live-streaming e-commerce platform is useful for my online shopping	Davis et al.(1989) Yen et al. (2010)
	PDU2	The live-streaming e-commerce platform is able to search for a sufficient amount of shopping-related information.	
	PDU3	The live-streaming e-commerce platform has improved the efficiency of my shopping	
	PDU4	The live-streaming e-commerce platform is extremely useful for my shopping or information search	
	PDU5	Live-streaming e-commerce shopping allows me to complete my shopping or find the desired information faster compared to traditional shopping	
Perceived Ease of Use	PEOU1	Learning and mastering the process of live-streaming e-commerce shopping poses no difficulty for me	Davis et al.(1989) Yen et al. (2010)
	PEOU2	I find the operation of live-streaming e-commerce shopping to be simple	
	PEOU3	Operating the live-streaming e-commerce platform skillfully is effortless for me	
	PEOU4	I perceive this live-streaming e-commerce platform to be convenient to use	
	PEOU5	I consider it to be an effortless task to become familiar with the live-streaming e-commerce ordering system	
Product Satisfaction	PTS1	The products purchased through live-streaming e-commerce maintain good performance throughout their lifecycle	Fornell(1992) Sun&Kim(2013)
	PTS2	The quality of products purchased through live-streaming e-commerce meets my expectations	
	PTS3	The performance of products purchased through live-streaming e-commerce meets my needs	
Service Satisfaction	SES1	After placing an order on the live-streaming e-commerce platform, the purchased goods can be delivered quickly	
	SES2	I can quickly and easily obtain the information I need in the live broadcast room	
	SES3	I am satisfied with the after-sales service quality of live-streaming e-commerce	
Process Satisfaction	PSS1	The host in the live broadcast room can respond quickly and provide answers to my questions	
	PSS2	The host has extensive experience with the products in the live broadcast and can guide me in using them correctly	
	PSS3	Live-streaming e-commerce makes me feel like I'm in a real shopping environment, creating a relaxed and enjoyable experience for me	

4.2 Data collection

This study targeted deaf consumers with experience in live commerce purchasing. A survey questionnaire was designed using Questionnaire Star and distributed through online surveys. The survey initially invited friends and family who met the criteria of the target sample to participate. Additional samples were then collected through

recommendations from these initial participants, thus expanding the size of the target sample. To ensure that deaf consumers could comprehend all the survey items, a one-on-one approach was adopted for questionnaire distribution throughout the entire survey process. Research indicates that this "snowball" sampling method can yield sample data with high credibility [41]. Through this approach, a total of 398 survey responses were collected in 10 days. The collected samples underwent examination, and 81 invalid samples were excluded. These exclusions mainly involved samples where the majority of responses were identical, such as consistently selecting "1" or "5," as well as surveys with very short completion times (less than 2 minutes) and mostly similar ratings. In total, 317 valid samples were obtained.

The findings from the survey are presented in Table 2. Regarding gender distribution, male consumers constitute 43.9%, while female consumers make up 56.1%. The primary age demographic of deaf consumers engaging in live e-commerce transactions falls within the bracket of 18 to 25 years, comprising a significant proportion of 77.9%. The severity of hearing impairment is generally high, with levels one and two combined making up 95.3%. Monthly income among deaf consumers is mainly distributed in two intervals: below 3000 yuan and 3001-5000 yuan, accounting for 62.8% and 24.6%, respectively. The most common shopping frequency among deaf consumers on live commerce platforms is once a month or less, constituting 48.0%. The preferred live commerce platforms for deaf consumers are Taobao and Douyin, with a combined usage rate of 87.1%.

Table 2 Demographic information form.

Category	Classification	Number	Percentage
Gender	Male	139	43.9%
	Female	178	56.1%
Age	Under 18 years old	15	4.8%
	18-25 years old	247	77.9%
	26-30 years old	45	14.2%
	31-40 years old	6	1.9%
	41-50 years old	2	0.6%
	51 years and older	2	0.6%
Education	Junior high school and below	3	0.9%
	High school/Technical school	4	1.3%
	College diploma	283	89.3%
	Bachelor's degree	22	6.9%
	Master's degree and above	5	1.6%
Degree of hearing impairment	Level 1	252	79.5%
	Level 2	50	15.8%
	Level 3	9	2.8%
	Level 4	6	1.9%
Monthly income	Below 3000 yuan	199	62.8%
	3001-5000 yuan	78	24.6%
	5001-8000 yuan	33	10.4%
	8001-15000 yuan	5	1.6%
	Above 15001 yuan	2	0.6%
Purchase frequency	Once a month or less	152	48.0%
	2-5 times a month	124	39.1%
	6-10 times a month	28	8.8%
	More than 10 times a month	13	4.1%
Using live commerce platforms	Taobao	152	48.0%
	Douyin (TikTok)	124	39.1%
	Kuaishou	28	8.8%
	Xiaohongshu (RED)	13	4.1%
	Mogujie	0	0.0%
	Pinduoduo	0	0.0%
	JD.com (JD)	0	0.0%
	Others	0	0.0%

4.3 Analysis of construct validity

According to prior research, this study primarily employs Cronbach's α reliability coefficient method for the reliability test, which can be calculated through reliability analysis in the SPSS software. When a Cronbach's alpha reliability coefficient surpasses the threshold of 0.7, it is usually taken as evidence of robust internal consistency and the high trustworthiness of variables within the investigated sample [42]. Construct validity in this study is assessed using the KMO and Bartlett's sphericity test along with factor analysis. The analysis results, as demonstrated in Tables 3, 4, and 5, indicate that the reliability and validity levels of the variables in this survey are relatively high, making them suitable for regression analysis.

Table 3 Reliability and validity testing for AEA and AES.

Factor	item	λ	C	EV	VE	α
AEA	AEA1	.803	.712	2.713	33.916	.855
	AEA2	.835	.775			
	AEA3	.696	.664			
	AEA4	.628	.704			
AES	AES1	.688	.660	3.084	38.552	.880
	AES2	.829	.747			
	AES3	.832	.780			
	AES4	.773	.756			
KMO: .944; Bartlett's Test of Sphericity: $\chi^2=1529.987(p<.001)$, Total variance explained: 72.468						

Table 4 Reliability and validity testing for PDU and PEOU.

Factor	item	λ	C	EV	VE	α
PDU	PDU1	.779	.779	3.897	38.968	.927
	PDU2	.804	.755			
	PDU3	.831	.768			
	PDU4	.842	.839			
	PDU5	.792	.766			
PEOU	PEOU1	.766	.715	3.736	37.365	.915
	PEOU2	.829	.766			
	PEOU3	.803	.768			
	PEOU4	.739	.742			
	PEOU5	.818	.761			
KMO: .932; Bartlett's Test of Sphericity: $\chi^2=2550.412(p<.001)$. Total variance explained: 76.333						

Table 5 Reliability and validity testing for PTS, SES and PSS.

Factor	item	λ	C	EV	VE	α
PTS	PTS1	.691	.809	2.334	25.934	.905
	PTS2	.825	.900			
	PTS3	.695	.858			
SES	SES1	.831	.845	2.455	27.282	.873
	SES2	.711	.789			
	SES3	.657	.819			
PSS	PSS1	.875	.873	2.683	29.811	.880
	PSS2	.790	.829			
	PSS3	.640	.750			
KMO: .929; Bartlett's Test of Sphericity: $\chi^2=2426.933(p<.001)$, Total variance explained: 83.027						

Note: AEA represents Accessible Accessing, AES represents Accessible Shopping, PDU represents Perceived Usefulness, PEOU represents Perceived Ease of Use, PTS represents Product Satisfaction, SES represents Service Satisfaction, PSS represents Process Satisfaction.

4.4 Correlation analysis

This study employs Pearson correlation analysis. The results of Pearson correlation analysis exhibit significance, indicating a relationship when significant and the absence of a relationship when not. The intensity of the association is chiefly gauged through the size of the correlation coefficient: a figure exceeding 0.7 points to an exceedingly tight connection, values ranging from 0.4 to 0.7 denote a substantial link, whereas numbers between 0.2 and 0.4 suggest a moderate bond. Should the correlation coefficient fall below 0.2 yet retain statistical

significance ($p < 0.01$ or $p < 0.05$), it signifies a feeble yet meaningful association[43].Using SPSS 26.0 software, this study conducted correlation analysis on the seven variables, as detailed in Table 6. Except for variables within the same dimension, all other variables show significance, indicating the presence of a correlation. This suggests that the scale is suitable for regression analysis.

Table 6 Variable correlation analysis.

	AEA	AES	PDU	PEOU	PTS	SES	PSS
AEA	1						
AES	.000	1					
PDU	.466**	.332**	1				
PEOU	.415**	.245**	.000	1			
PTS	.443**	.114*	.332**	.280**	1		
SES	.256**	.289**	.434**	.344**	.000	1	
PSS	.285**	.296**	.332**	.336**	.000	.000	1

Note1: ** represents $p < 0.01$, * represents $p < 0.05$.

Note2: AEA represents Accessible Accessing, AES represents Accessible Shopping, PDU represents Perceived Usefulness, PEOU represents Perceived Ease of Use, PTS represents Product Satisfaction, SES represents Service Satisfaction, PSS represents Process Satisfaction.

4.5 Multivariate regression analysis

This study utilizes multiple linear regression to analyze the relationships among various variables. It is generally considered that when $t > 0$ and $p < 0.05$, the positive impact result is established [43]. Based on the aforementioned research hypotheses, this study conducts hypothesis testing through regression analysis. The impact of AEA and AES on PDU is presented in Table 7, the impact on PEOU is shown in Table 8, and the impact of AEA, AES, PDU and PEOU on PTS is displayed in Table 9. The impact on SES is detailed in Table 10, and the impact on PSS is presented in Table 11.

Table 7 Impact of AEA and AES on PDU.

Model		UC		SC	t	Sig(p)
IV	DV	β	S.error	β		
AEA	PDU	.466	.046	.466	10.064	.000
AES		.332	.046	.332	7.184	.000
F=76.448(P<.001), R ² =.327, Adj.R ² =.323						

Table 8 Impact of AEA and AES on PEOU.

Model		UC		SC	t	Sig(p)
IV	DV	β	S.error	β		
AEA	PEOU	.415	.049	.415	8.388	.000
AES		.245	.049	.245	4.965	.000
F=47.506(P<.001), R²=.232, Adj.R²=.227						

Table 9 Impact of AEA, AES, PDU and PEOU on PTS.

Model		UC		SC	t	Sig(p)
IV	DV	β	S.error	β		
AEA	PTS	.286	.068	.286	4.225	.000
AES		.010	.058	.010	.168	.867
PDU		.196	.065	.196	3.001	.003
PEOU		.158	.061	.158	2.596	.010
F=24.301(P<.001), R²=.238, Adj.R²=.228						

Table10 Impact of AEA, AES, PDU and PEOU on SES.

Model		UC		SC	t	Sig(p)
IV	DV	β	S.error	β		
AEA	SES	.131	.064	.131	2.042	.042
AES		.032	.055	.032	.585	.559
PDU		.484	.062	.484	7.859	.000
PEOU		.390	.058	.390	6.762	.000
F=36.688(P<.001). R²=.320. Adj.R²=.311						

Table 11 Impact of AEA, AES, PDU, and PEOU on PSS.

Model		UC		SC	t	Sig(p)
IV	DV	β	S.error	β		
AEA	PSS	.042	.068	.042	.622	.535
AES		.138	.058	.138	.362	.019
PDU		.267	.065	.267	.087	.000
PEOU		.285	.061	.285	.667	.000
F=24.251(P<.001), R²=.237, Adj.R²=.227						

Note1:.000 represents $p < 0.001$.

Note2: AEA represents Accessible Accessing, AES represents Accessible Shopping, PDU represents Perceived Usefulness, PEOU represents Perceived Ease of Use, PTS represents Product Satisfaction, SES represents Service Satisfaction, PSS represents Process Satisfaction.

The results of the regression analysis indicate that, except for the hypotheses that Shopping Ease ($t = 0.168$, $p > 0.05$) positively influences Product Satisfaction, Shopping Ease ($t = 0.585$, $p > 0.05$) positively influences Service Satisfaction, and Access Ease ($t = 0.622$, $p > 0.05$) positively influences Process Satisfaction, the remaining 13 sets of hypotheses are all established.

4.6 Mediation analysis

This paper employs SPSS software to conduct a mediation effect analysis. Through three regression analyses, it compares the absolute values of the beta coefficients and the significance of the p-values between two models to assess the efficacy of the mediating effect, determining whether it is a complete or partial mediation effect. The details are presented in Table 12.

Table 12 Mediation analysis of the PDU and PEOU on AEA, AES and PTS, SES, PSS.

Model	UC		SC	t	Sig(p)	95%confidence space		Effect
	β	S.error	β			lower limit	upper limit	
AEA→PTS	.443	.050	.443	8.837	.000	.345	.542	Partial mediation
AEA→PDU→PTS	.382	.057	.382	6.665	.000	.269	.495	
AES→PTS	.114	.050	.114	2.268	.024	.015	.213	No mediation
AES→PDU→PTS	.070	.054	.070	1.305	.193	-.036	.176	
AEA→SES	.256	.052	.256	4.928	.000	.154	.359	No mediation
AEA→PDU→SES	.105	.057	.105	1.832	.068	-0.008	.218	
AES→SES	.289	.052	.289	5.550	.000	.186	.391	Partial mediation
AES→PDU→SES	.181	.054	.181	3.358	.001	.075	.287	
AEA→PSS	.285	.051	.285	5.532	.000	.183	.386	Partial mediation
AEA→PDU→PSS	.215	.059	.215	3.655	.000	.099	.330	
AES→PSS	.296	.051	.296	5.757	.000	.195	.397	Partial mediation
AES→PDU→PSS	.246	.055	.246	4.469	.000	.138	.355	
AEA→PTS	.443	.050	.443	8.837	.000	.345	.542	Partial mediation
AEA→PEOU→PTS	.407	.055	.407	7.343	.000	.298	.516	
AES→PTS	.114	.050	.114	2.268	.024	.015	.213	No mediation
AES→PEOU→PTS	.092	.052	.092	1.772	.077	-.010	.194	
AEA→SES	.256	.052	.256	4.928	.000	.154	.359	Partial mediation
AEA→PEOU→SES	.167	.056	.167	2.952	.003	.056	.278	
AES→SES	.289	.052	.289	5.550	.000	.186	.391	Partial mediation
AES→PEOU→SES	.236	.053	.236	4.449	.000	.131	.340	
AEA→PSS	.285	.051	.285	5.532	.000	.183	.386	Partial mediation
AEA→PEOU→PSS	.206	.056	.206	3.674	.000	.096	.316	
AES→PSS	.296	.051	.296	5.757	.000	.195	.397	Partial mediation
AES→PEOU→PSS	.250	.053	.250	4.744	.000	.146	.353	

Note1:.000 represents $p < 0.001$.

Note2: AEA represents Accessible Accessing, AES represents Accessible Shopping, PDU represents Perceived Usefulness, PEOU represents Perceived Ease of Use, PTS represents Product Satisfaction, SES represents Service Satisfaction, PSS represents Process Satisfaction.

Through the above analysis, it is found that PDU has no mediating effect on AES and PTS ($p=0.193>0.05$, not significant), PDU has no mediating effect on AEA and SES ($p=0.068>0.05$, not significant), and PEOU has no mediating effect on AES and PTS ($p=0.068>0.05$, not significant). The remaining nine hypotheses are valid, and all of them exhibit partial mediating effects.

4.7 Hypothesis testing results

The results of testing the hypotheses related to the interconnections among AEA, AES, PDU, PEOU, PTS, SES, and PSS, as analyzed through multiple regression and mediation techniques, are summarized in Table 13.

Table 13 Hypothesis testing results.

Hypothesis Number	Hypothesis Relationship	Test Result	
H1	AEA→PTS	Support	Partially Supported
	AEA→SES	Support	
	AEA→PSS	Not Support	
	AES→PTS	Not Support	
	AES→SES	Not Support	
	AES→PSS	Support	
H2	AEA→PDU	Support	Fully Supported
	AES→PDU	Support	
H3	AEA→PEOU	Support	Fully Supported
	AES→PEOU	Support	
H4	PDU→PTS	Support	Fully Supported
	PDU→SES	Support	
	PDU→PSS	Support	
H5	PEOU→PTS	Support	Fully Supported
	PEOU→SES	Support	
	PEOU→PSS	Support	
H6	AEA→PDU→PTS	Support	Partially Supported
	AEA→PDU→SES	Not Support	
	AEA→PDU→PSS	Support	
	AES→PDU→PTS	Not Support	
	AES→PDU→SES	Support	
	AES→PDU→PSS	Support	
H7	AEA→PEOU→PTS	Support	Partially Supported
	AEA→PEOU→SES	Support	
	AEA→PEOU→PSS	Support	
	AES→PEOU→PTS	Not Support	
	AES→PEOU→SES	Support	
	AES→PEOU→PSS	Support	

Note: AEA represents Accessible Accessing, AES represents Accessible Shopping, PDU represents Perceived Usefulness, PEOU represents Perceived Ease of Use, PTS represents Product Satisfaction, SES represents Service Satisfaction, PSS represents Process Satisfaction.

5. Discussion

5.1 Discussion and analysis of satisfaction among deaf consumers on live e-commerce platforms

The above study reveals that both accessibility (represented by AEA and AES) significantly and positively influence the PDU and PEOU. Additionally, PDU and PEOU have a positive and significant impact on PTS, SES and PSS. This indicates that improving accessibility in terms of accessing and shopping contributes to enhancing the usefulness and ease of use of live e-commerce platforms for deaf consumers, ultimately leading to increased satisfaction with products, services, and the shopping process. These findings align with the research results presented by scholars such as Davis (1989) [22], Azizah et al. (2022) [31], and Kurniawan et al.(2021) [36]. Furthermore, PDU and PEOU play a partial mediating role between information accessibility (AEA and AES) and customer satisfaction (PTS, SESand PSS). This suggests that the relationship between information accessibility and satisfaction on live e-commerce platforms may involve the interaction of multiple factors. For

each specific influencing path, live e-commerce platforms should gain a deeper understanding of the roles of PDU and PEOU, and personalized and differentiated accessible design may be an effective way to enhance the satisfaction of deaf consumers. In the conclusion, it was observed that AEA does not affect PSS, and AES does not influence PTS and SES. From the perspective of customer satisfaction, different accessible designs have varying impacts on PTS, SES and PSS. For operators and accessibility designers of live e-commerce platforms, a detailed understanding of the user experience of deaf consumers in different satisfaction aspects is crucial. This knowledge can enable them to improve overall satisfaction more effectively by tailoring accessibility features accordingly.

5.2 Discussion and analysis of information accessibility on live e-commerce platforms

Through the results analysis, it is evident that AEA significantly influences PTS, SES, and AES positively impacts PSS. This underscores the critical role of information accessibility, similar to other e-commerce platforms, in shaping satisfaction for deaf users on live e-commerce platforms. These findings effectively support viewpoints on the importance of information accessibility for people with disabilities on e-commerce platforms put forth by scholars such as Gonçalves et al. (2018) [26], Merritt&Zhao (2020) [27], and Trielsa&Angeline (2023) [28]. The results imply that deaf consumers are satisfied with the inclusive page design and simplified operational processes on live e-commerce platforms. This satisfaction enables them to efficiently and conveniently access product information, leading to purchases that meet their expectations. Deaf consumers can effectively interact and communicate with hosts using the accessibility tools provided by live e-commerce platforms, contributing to a positive shopping experience. However, it is noteworthy that AEA does not significantly influence PSS, and AES does not significantly impact PTS or SES. This prompts contemplation on information accessibility construction. On one hand, its inherent impact might indeed be relatively small. On the other hand, it may also be influenced by other factors, suggesting that certain accessibility designs may not fully meet the personalized needs of deaf consumers, necessitating future improvements. The study further reveals that information accessibility has a positive impact on PDU and PEOU. Enhanced information accessibility enriches the experience of deaf consumers by bolstering their perception of the utility and user-friendliness of live e-commerce platforms, thereby addressing their informational and utilitarian requirements in a more thorough and effective manner. Although the outcomes highlight a robust groundwork in the realm of information accessibility on live e-commerce platforms, it is imperative to maintain vigilant pursuit of innovation, adherence to contemporary standards, and alignment with the evolving expectations of deaf users. This commitment ensures that these platforms consistently deliver an increasingly refined and accommodating user experience tailored to the unique needs of deaf individuals.

6. Conclusion

In summary, this research empirically analyzes the impact relationship between information accessibility on live e-commerce platforms and satisfaction among deaf consumers. The results indicate that information accessibility positively influences PDU and PEOU. Both PDU and PEOU, in turn, have a positive impact on customer satisfaction. The positive impact of information accessibility on customer satisfaction is partially established. Specifically, the positive influence of AEA on PSS and the positive influence of AES on PTS and SES are not established. The mediating effects of PDU and PEOU on the relationship between information accessibility and customer satisfaction are partially established. Notably, PDU does not mediate the relationship between AES and PTS, and it does not mediate the relationship between AEA and SES. Similarly, PEOU does not mediate the relationship between AES and PTS. However, there are partial mediating effects in other cases. The study concludes that information accessibility contributes to strengthening PDU and PEOU among deaf consumers, consequently exerting a positive influence on PTS, SES, and PSS. Information accessibility plays a crucial role in enhancing overall satisfaction for deaf consumers on live e-commerce platforms. The mediating roles of PDU and PEOU in the relationships among information accessibility and customer satisfaction are significant and warrant attention. In conclusion, this research provides valuable insights into the intricate dynamics between information accessibility, perceived usefulness, perceived ease of use, and satisfaction for deaf consumers on live e-commerce platforms. The identified relationships underscore the significance of creating inclusive and user-friendly environments for deaf users in the rapidly evolving landscape of e-commerce.

6.1 Limitations

The limitation of this study lies in not considering the differences among various live e-commerce platforms. Throughout the research process, our sample data primarily consisted of deaf consumers with first-level hearing impairment aged 18-25 in the Yangtze River Delta region of China. This sample might not fully represent the diversity of all deaf consumer groups. To enhance the generalizability of the study, further exploration and refinement are needed in subsequent research endeavors to encompass a broader range of deaf consumer demographics and include variations across different e-commerce live streaming platforms.

6.2 Recommendations for future research

Customer satisfaction plays a crucial role in influencing the sustained development of live e-commerce platforms. Based on the findings of this study regarding the relationship between information accessibility on live e-commerce platforms and the satisfaction of deaf consumers, the following recommendations are proposed:

Firstly, live e-commerce platforms should enhance the perceived usefulness and usability of platform information for deaf consumers to improve their satisfaction. These platforms should continue to refine and enhance accessibility features, presenting information in a format that combines text and images, avoiding complex industry jargon and difficult-to-understand language to ensure information is easily comprehensible and intuitive. Moreover, diverse multimedia content should be provided, such as videos with subtitles and sign language descriptions, as well as presenting audio information in text form, to enhance the perception and usability of content for deaf users. Live e-commerce platforms should adhere to accessibility standards and promptly adopt the latest technological advancements to ensure that the platform aligns with international accessibility standards in both technology and design, thereby enhancing the consumer experience and usability for deaf users. Additionally, platforms can offer real-time online customer support to assist deaf users in understanding how to use platform features. Establishing user feedback channels encourages deaf users to share their experiences and suggest improvements, enabling continuous platform enhancement to meet the practical needs of deaf users, ultimately increasing their participation and satisfaction.

Secondly, the Accessible Accessing of live e-commerce platforms does not have a positive impact on process satisfaction, and the Accessible shopping does not positively influence product satisfaction and service satisfaction. Further in-depth research and improvement are necessary. In terms of enhancing accessible accessing, platforms should strengthen the accessibility design of key steps in the shopping process to ensure that the navigation design in live rooms is easy to understand, and that shopping cart management and the payment process can be completed smoothly and efficiently. Regarding providing an accessible shopping experience, platforms need to gain a deeper understanding of deaf consumers' satisfaction with products and services. This involves specific insights into their expectations regarding the clarity of product information and the timeliness of services. Detailed analysis through user feedback and behavioral data is essential, and adjustments should be made accordingly. The design of accessible shopping should focus more on conveying information about products and services to ensure that deaf users can easily access crucial information. In this process, live e-commerce platforms can provide personalized recommendations and suggestions based on the needs and preferences of deaf users, thereby enhancing their satisfaction with products and services. Therefore, live e-commerce platforms should prioritize accessible design during the shopping process, pay attention to the details of products and services, and continually improve and adjust based on user feedback to enhance overall satisfaction and shopping experience for deaf users on the platform.

Thirdly, for the long-term development of information accessibility construction on live e-commerce platforms, it is suggested that the government establish a dedicated regulatory agency or department responsible for formulating and enforcing relevant standards and regulations regarding information accessibility. These standards and regulations should explicitly include technical specifications and accessibility standards, with strict penalty mechanisms for platforms that do not comply with the standards. Meanwhile, government departments should organize relevant training sessions and seminars to enhance their awareness and understanding of information accessibility. Additionally, the government can provide loans, tax reductions, or other incentives to encourage live e-commerce platforms to increase their investment in information accessibility construction. This

comprehensive approach aims to promote the overall improvement of information accessibility construction levels on live e-commerce platforms. Furthermore, the government and live e-commerce platforms should actively invite deaf users to participate in information accessibility construction efforts. This involvement can include participating in the formulation of accessibility standards, providing feedback based on practical usage experiences, and participating in testing products and services. By actively engaging deaf users in information accessibility construction, including roles in shaping standards and offering input on product and service testing, a more active role can be played by deaf users to ensure that their needs are genuinely met.

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