

RESEARCH ARTICLE

Exploring Consumer Citizenship Behavior by Personification of E-Commerce Virtual Anchors Based on Shopping Value

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ABSTRACT With the rapid development of the e-commerce industry, e-commerce live broadcasting has become a crucial retail outlet for consumers. However, live broadcasting e-commerce faces the “anchor dilemma,” such as the difficulty of finding a suitable live anchor, the collapse of the live anchor, and so on. With the advent of the meta-universe era and the progress of artificial intelligence, e-commerce virtual anchors have become an effective way to solve the “anchor dilemma” in practice. Virtual anchors can carry goods like real people, replacing some real-life e-commerce anchors. Personification is a significant feature of virtual humans. E-commerce virtual anchoring has the ability, the appearance, and the cultural identity of personification. Consumer citizenship behavior is a kind of spontaneous altruistic behavior that improves the overall quality of e-commerce virtual anchor live broadcasts. Through the Stimulus Organism Response (SOR) model, this study explores the personification mechanism of virtual anchors on consumer citizenship behavior in the live broadcast scene of e-commerce. Through empirical research on 343 questionnaires, this study finds that the personification of e-commerce virtual anchors has a positive effect on consumer citizenship behavior and shopping value; and in turn, shopping value has a positive effect on consumer citizenship behavior. This study suggests applying virtual anchors in e-commerce live broadcasting based on the research results.

INDEX TERMS Live broadcast e-commerce, virtual anchor, personification, shopping value, consumer citizenship behavior.

I. INTRODUCTION

With the rapid development of the e-commerce industry, e-commerce live broadcasting has become a significant shopping channel for consumers. The anchor is the primary influencing factor of live e-commerce broadcasts [1]. In reality, the problem of anchoring has become a dilemma that restricts the development of live e-commerce broadcasts. On the one hand, e-commerce anchors, star anchors, and industry opinion leaders frequently have problems such as the collapse of people and “overturning” of goods; on the other hand, merchants who intend to expand sales through live e-commerce are faced with the problem of recruiting

and identifying people when they set up e-commerce live broadcast channels. The e-commerce live broadcast industry is in an “anchor dilemma.”

With the advent of the Metaverse era, artificial intelligence has brought a way to solve the problem of the “anchor dilemma”—virtual anchor live broadcasts. The “anchor dilemma” of the e-commerce live broadcast industry has made the emergence and development of the e-commerce virtual anchor inevitable, and artificial intelligence guarantees the e-commerce virtual anchor will carry on live broadcasts to sell goods. With personified intelligent abilities and a human-like appearance, the e-commerce virtual anchor can show consumers the characteristics of goods and marketing information, attract consumers’ attention, provide consumers with a better shopping experience [2], and replace some real-life

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anchors. In the live broadcast room of an e-commerce virtual anchor, the virtual anchor will be prompted for consumers. In practice, consumers do not exclude the new form of live delivery of e-commerce virtual anchors; they even feel interested in and fond of it. They are willing to take the initiative to make civic behavior conducive to the long-term development of live broadcast rooms. This empirical study reveals the e-commerce virtual anchor personification mechanism on consumer citizenship behavior.

II. THEORETICAL BACKGROUND AND HYPOTHESES

A. CONSUMER CITIZENSHIP BEHAVIOR IN THE E-COMMERCE VIRTUAL ANCHOR BROADCAST ROOM

Gruen established the consumer behavior result model, introducing the concept of “citizenship behavior” into marketing for the first time that defined consumer citizenship behavior as a spontaneous behavior of consumers to improve the quality and value of products or services [3]. Bove held that consumer citizenship behavior belongs to the behavior outside the role of consumers and is a type of altruistic behavior [4]. Yi and Gong developed the consumer citizenship behavior scale using empirical evidence and verified that feedback, publicity, helping others, and tolerant behavior are types of consumer citizenship behavior. In the e-commerce virtual broadcast studio, consumer citizenship behavior refers to the spontaneous behavior of consumers to improve the performance of the e-commerce virtual broadcast studio [5]. The citizenship behavior of consumers in live broadcasts of e-commerce virtual anchors interacts with the virtual anchors of e-commerce, on which the resources go beyond the scope of shopping and benefit the direct broadcast [6]. Consumers’ citizenship behavior benefits the overall promotion of products and services in the e-commerce virtual anchor studio. How to promote consumer citizenship behavior during e-commerce virtual anchor broadcasting is important for sustainable development.

B. STIMULUS ORGANISM RESPONSE MODEL

The Stimulus Organism Response (SOR) model is an important research theory on consumer behavior proposed by Mehrabian and Russell [7]. It is a metatheory in the field of personal behavior research. Woodworth proposed the SOR model in 1918, according to which people respond when stimulated, thus summarizing S-R theory, which is short for the “Stimulus-Response” theory [8]. The SR theoretical model scientifically divides human behavior into stimulation and response. However, it does not consider the psychological activities of people after being stimulated. With the deepening of scholars’ research, environmental psychologists Mehrabian and Russell developed the “Organism” factor in 1974, which is the internal cognitive and emotional reactions in psychology, and put forward the SOR theory. The full name of the S variable is Stimulus Variables, which represents the external environmental stimulus, causing people to change their activities. In marketing research, it often stands for those

characteristics that affect consumer behavior [9]. The full name of the O variable is Organism Variables, which indicates the psychological and cognitive response of the subject in the event of stimulation. The full name of R variable is Response Variables, which represents all kinds of behaviors caused by stimulation. Thus, the SOR model builds on the concept that external stimuli affect people’s psychology and cognition, resulting in behavioral changes.

C. HYPOTHESIS

1) PERSONIFICATION

Personification usually refers to the ability or morphological characteristics of nonhuman objects similar to humans [10]. This characteristic is given by humans [11]. Virtual humans can simulate real human behavior, interact and chat, and convey information to the audience [12], [13]. It can also synthesize personification and emotion [14] to communicate with consumers. Personification can be categorized into interactive, appearance, and cultural personification: interactive personification represents the personification ability of inhuman objects in human–computer interactions, and appearance personification represents the personification of nonhumanized objects. Cultural personification represents the personification of the identity, customs, and thoughts of nonhuman objects [15]. In the virtual anchor scene of e-commerce, cultural personification is the personification of an individual’s identity, character, thoughts, and so on.

In prior research, Cao discovered that artificial intelligence positively influences consumer behavior [16]. With artificial intelligence, virtual anchors can synthesize personification and emotion, and interact with the outside world by simulating human behavior [14]. Through empirical research, Schuetzler confirmed that the personification of artificial intelligence products positively affects users’ interactive behavior [17]. Yang empirically proved that artificial intelligence product personification positively affects consumer sustainable use behavior [18]. Peng proposed that the personification characteristics of AI products help consumers be more willing to engage in civic behavior [6]. According to the dimension of personification in He, personification can be divided into interactive, appearance, and cultural personification [15]. Therefore, this study puts forward the following assumptions:

Some scholars have studied service robots and found that the higher the personification, the more consumers feel safe and reliable [19]. Zhu and Chang pointed out that the higher the degree of personification of service robots, the higher the consumer experience [20]. Therefore, this study puts forward the following assumptions.

H1 personification positively affects consumer citizenship behavior

H2 personification positively affects consumers’ practical shopping value

H3 personification positively affects consumers’ hedonic shopping value

2) SHOPPING VALUE

Shopping is not just about purchasing goods or services; consumers also seek satisfaction and convenience while shopping [21]. Hirschman and Holbrook initially proposed that shopping value is the attainment of a specific function of products or services consumers encounter while shopping, based on previous research on the shopping experience [22]. Babin created a scale for utilitarian and hedonic shopping value and verified that shopping value encompasses both from an empirical perspective [23]. Utilitarian shopping value has two dimensions: efficiency and performance [24]. The utilitarian value dimension reflects the task completion aspect of the shopping experience, while hedonism indicates the ability of the shopping experience to provide happiness and fun [25]. From a consumer experience perspective, Overby and Lee defined hedonic shopping value as a nonfunctional experience with emotional expression [26].

Xiong confirmed that value acquisition positively affects consumer citizenship behavior while shopping in a community of virtual brand consumers [27]. Fu et al. pointed out that harvesting consumer values will positively affect consumers' attitudes and behaviors [28]. The value perceived by consumers in different consumption scenarios positively impacts consumer value cocreation behavior. Consumer shopping value is the value that consumers feel while shopping [29]. Therefore, this study puts forward the following assumptions.

H4 consumer utilitarian shopping value positively affects consumer citizenship behavior

H5 consumers' hedonic shopping value positively affects consumer citizenship behavior

III. RESEARCH MODEL

Based on the above assumptions and the SOR model, this study established a theoretical model of the e-commerce virtual anchor personification mechanism on consumer citizenship behavior, as shown in Fig. 1.

IV. MATERIALS AND METHODS

This study developed the initial questionnaire by first combing through the literature and then conducting pretests and preinvestigations of the initial questionnaire. Then, based on the results of the initial presurvey, the formal questionnaire was developed and distributed, and responses were collected through various channels. At last, through the analysis of the data collected, the hypothesis and theoretical model of this study are verified.

A. QUESTIONNAIRE DESIGN

Based on the theoretical model of the e-commerce virtual anchor personification mechanism on consumer citizenship behavior, this study integrates the items of the previous scholars' maturity scale and collects the basic demographic information. Two screening questions were added to identify the interviewees ("Have you ever seen a live broadcast of e-commerce virtual anchors?" and "Please select 2 for this

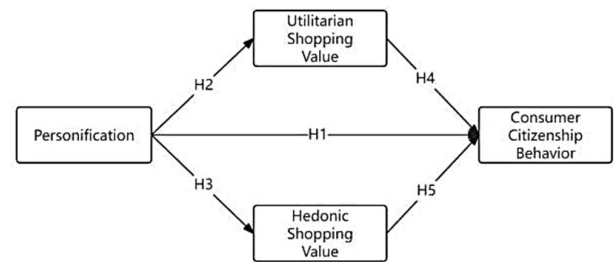


FIGURE 1. Theoretical model of the mechanism of e-commerce virtual anchor personification on consumer citizenship behavior.

topic.”). This study used a 7-point Likert scale for the initial questionnaire design and invited three experts who comprehended the e-commerce virtual anchor and related theoretical concepts to optimize the initial questionnaire items to make the questionnaire easier for the interviewees to understand. This study conducted a presurvey on the initial questionnaire. A total of 200 questionnaires were distributed on the Tencent questionnaire and CREDAMO platform, 100 on each platform, to expand the accessibility of the questionnaire. Among them, the Tencent platform was distributed through WeChat, QQ, and other groups, and the CREDAMO platform adopted the form of recommended samples in the platform database. Of the 200 questionnaires received, excluding the wrong answers to the selection questions, if the interviewees chose “have not seen the TV a virtual anchor live” or “this question, please choose 2.” Otherwise, the questionnaire jumps directly to the end page if the interviewee's option is not 2. This study also eliminated six consecutive questionnaires that chose the same option and did not provide answers. Finally, 169 questionnaires were adopted, and the effective rate was 84.5%. This study mainly uses Cronbach's α coefficient index to evaluate the scale's reliability. The value above 0.70 is high reliability, 0.35–0.70 is acceptable, and less than 0.35 is considered unacceptable. Another indicator of internal consistency is the Corrected Item-Total Correlation (CITC) of item correction. If the indicator exceeds 0.35, it meets the demand and can be retained; however, if its value is less than 0.35, the item must be deleted to ensure that the initial questionnaire meets the reliability requirements [30]. The coefficient of Cronbach's α in the initial scale of this study was more than 0.7. The initial scale was determined as the formal scale through the pretest. The items and sources of the formal scale are shown in Table 1 below.

B. DATA COLLECTION AND MEASUREMENT

In this study, 400 questionnaires were distributed in the Tencent questionnaire and CREDAMO platform. The Tencent questionnaire was distributed through WeChat, QQ, and other groups, and the CREDAMO platform adopted the recommended samples from the platform database. Of the 400 questionnaires received, 57 invalid questionnaires that included the wrong answers to the specific questions, or the six consecutive questionnaires with the same option were

TABLE 1. Items and sources of formal scale.

Variable	Code	Source
Interactive personification	INT1	McLean et al. (2021)[31]
	INT2	Schuetzler (2020)[17]
	INT3	Go et al. (2019)[32]
	INT4	Westerman (2020)[33]
Appearance personification	APP1	Zhou et al. (2021)[34]
	APP2	
	APP3	
Cultural personification	CUL1	Epley (2018)[35]; Aggarwal (2007)[36]
	CUL2	
	CUL3	
	CUL4	
Utilitarian shopping value	UTI1	Babin (1994)[23]; Overby et al. (2006)[26]; Bridges et al. (2007)[37]
	UTI2	
	UTI3	
	UTI4	
Hedonistic shopping value	HED1	Babin (1994)[23]; Overby et al. (2006)[26]; Bridges et al. (2007)[37]
	HED2	
	HED3	
	HED4	
	HED5	
Consumer citizenship behavior	CIT1	Yi et al. (2013)[5]
	CIT2	
	CIT3	
	CIT4	

excluded. Finally, 343 valid questionnaires were collected, with a recovery rate of 85.75%.

C. DATA ANALYSIS

This study used descriptive statistical analysis, reliability and validity analysis, correlation and regression analysis, and structural equation model analysis. Its basic connotation and fitting evaluation index are shown in Table 2.

According to demographic data, 41.69% of men and 58.31% of women took part in the survey, which was consistent with the fact that most of the people who participated in online shopping were women. From the perspective of age, it is mainly concentrated in young adults aged 18-40, accounting for 83.67 %, and middle-aged and elderly people aged 41-60 and above account for 16.32 %. The main academic qualifications were college and undergraduate students, accounting for 72.30%, 6.41% of the people without college education, and 21.28% of the people who had received graduate education. From the occupational point, the majority of employees in private enterprises are 52.48%, followed by 18.66% in state-owned enterprises, 10.50% in students, 9.04% in organs/institutions, 7.29% in foreign-funded enterprises, and 2.04% in freelance. Monthly income is mainly concentrated in the range of 3000-10000 yuan, accounting for 67.63%, 17.78% under 3,000 yuan, and 14.58% above 10,000 yuan. By analyzing demographic data, the sampling aligns with the audience group characteristics in the e-commerce virtual anchor studio.

TABLE 2. Manual statistical information of respondents to the formal questionnaire.

Information	classification	Quantity	%
Gender	Male	143	41.69%
	Female	200	58.31%
Age	18-30	122	35.57%
	31-40	165	48.10%
	41-50	24	7.00%
	51-60	22	6.41%
	Over 60	10	2.92%
	Degree	Junior high school and below	4
high school		18	5.25%
College		120	34.99%
Occupation	Undergraduate course	128	37.32%
	Master of Science or above	73	21.28%
	state-owned enterprise	64	18.66%
	Civil servants	31	9.04%
	private enterprise	180	52.48%
	foreign enterprise	25	7.29%
	Students	36	10.50%
Monthly income (RMB)	Freelance occupation	7	2.04%
	Less than 3000	61	17.78%
	3000-6500	130	37.90%
	6500-10000	102	29.74%
	More than 10000	50	14.58%

V. RESULT

A. RELIABILITY AND VALIDITY

This study used SPSS20.0 and Amos 24.0 software to evaluate the reliability and validity of the measurement model. Cronbach’s α and composite reliability (CR) tests were performed to assess the structural reliability of the measurement model (see Table 2). Cronbach’s α ranged from 0.893 to 0.932, and both tests exceeded the threshold of 0.7. The Average Variance Extraction method (AVE) and the External Factor Load method were used to verify the convergence of the model. The load of each factor was above 0.7 [38], while the Avenue was above 0.5 indicates the high reliability and validity of each item. To test the validity of the discrimination, a multi-factor model and a single-factor model (see Table 4) were established. The fitting indexes are lower than the measurement model, indicating that both models have good discriminant validity.

Further study of the discriminant validity of the model is shown in Table 4.

B. MODEL FITTING

In this paper, Amos24.0 is used to evaluate the fitting index of the model. The results are shown in Table 5 The results show that the data have a good fitting relationship with the measurement model: the chi-square degree of freedom ratio (cmin / df) is 2.340 (< 3.0), the approximate mean square error (RMSEA) is 0.063 (< 0.8), the normed fit index (NFI) is 0.941 (> 0.9), the comparative fit index (CFI) is 0.965 (> 0.9), the incremental fit index (IFI) is 0.965 (> 0.9), and the Tucker-Lewis index (TLI) is 0.960 (> 0.9).

TABLE 3. Measurement model evaluation results.

Item	Mean	Standard Dev.	Standardized Loading	Cronbach's Alpha	CR	AVE
INT1	4.5	0.796	0.796	0.931	0.9352	0.7845
INT2	4.6	1.441	0.794			
INT3	4.54	1.428	0.969			
INT4	4.53	1.414	0.967			
APP1	4.31	1.493	0.849	0.893	0.8925	0.7346
APP2	4.33	1.401	0.848			
APP3	4.61	1.408	0.874			
CUL1	4.59	1.407	0.808	0.9	0.9034	0.7006
CUL2	4.62	1.426	0.81			
CUL3	4.74	1.381	0.877			
CUL4	4.67	1.372	0.851			
UTI1	4.36	1.503	0.797	0.901	0.9034	0.7008
UTI2	4.38	1.452	0.822			
UTI3	4.52	1.406	0.885			
UTI4	4.53	1.426	0.842			
HED1	4.52	1.48	0.853	0.932	0.9331	0.7363
HED2	4.65	1.455	0.878			
HED3	4.63	1.487	0.885			
HED4	4.51	1.434	0.845			
HED5	4.47	1.537	0.828			
CIT1	4.42	1.576	0.877	0.922	0.9221	0.7474
CIT2	4.58	1.559	0.87			
CIT3	4.54	1.468	0.857			
CIT4	4.48	1.49	0.854			

C. HYPOTHESIS TESTING

After the reliability and validity tests, SPSS20.0 software was used to test the proposed hypothesis. The main effects of each path in the model are shown in Figure 2. Through the analysis of Table 6, the following hypothetical conclusions can be obtained: “interactive personification”, “appearance personification”, and “cultural personification” have a “utilitarian shopping value” $\beta = 0.275, p < 0.001; \beta = 0.393, p < 0.001, \beta = 0.332, p < 0.001$ and “hedonic shopping value” $\beta = 0.213, p < 0.001; \beta = 0.488, p < 0.001, \beta = 0.307, p < 0.001$ have a significant positive impact, which verifies the hypothesis of H2 and H3 In addition, “utilitarian shopping value” and “hedonic shopping value” to “consumer citizenship behavior” $\beta = 0.287, p = 0.003 < 0.01; \beta = 0.18, p = 0.008 < 0.01$ has a significant impact, which verifies the hypothesis of H3a and H3b. In addition, the personification of e-commerce anchors to “consumer citizenship behavior” $\beta = 0.16, p < 0.001; \beta = 0.233, p = 0.004 < 0.01, \beta = 0.19, p = 0.007 < 0.01$ has significant positive effects, which verifies the hypothesis of H4 and H5.

D. TEST OF MEDIATING EFFECT AND DIRECT EFFECT

Based on the path analysis, this study constructs a mediation model to examine the “utilitarian shopping value” and “hedonic shopping value”. The Bootstrap method of the SPSS24.0 program plug-in was used to estimate the

TABLE 4. Discrimination validity test results.

	Appearance_p ersonification	Interactive_p ersonification	Cultural_pe rsonification
Appearance_p ersonification	0.7346		
Interactive_pe rsonification	0.128***	0.7845	
Cultural_perso nification	0.126***	0.135***	0.7006
AVE square root	0.857	0.886	0.837

*** represents p value less than 0.001 ; the diagonal is AVE.

TABLE 5. Model fitting test results.

match index	CMIN/DF	RMSEA	NFI	CFI	IFI	TLI
model values	2.34	0.063	0.941	0.965	0.965	0.96

parameters, and a total of 5000 samples were collected. The analysis results are shown in Table 7 as follows:

The results of Table 7 show that the mediating effect value of “interactive personification” → “utilitarian shopping value” → “consumer citizenship behavior” is 0.08, and the corresponding Bias-corrected 95 % confidence interval and Percentile 95 % confidence interval are (0.018,0.0183) and (0.014,0.272), respectively, excluding 0; the mediating effect value of “cultural personification” → “utilitarian shopping value” → “consumer citizenship behavior” is 0.129, and the corresponding Bias-corrected 95 % confidence interval and Percentile 95 % confidence interval are (0.036,0.276) and (0.022,0.255), excluding 0; the mediating effect value of “appearance personification” → “utilitarian shopping value” → “consumer citizenship behavior” is 0.11, and the corresponding Bias-corrected 95 % confidence interval and Percentile 95 % confidence interval are (0.025,0.255) and (0.014,0.23), respectively, excluding 0, indicating that the mediating effect of utilitarian shopping value exists.

The mediating effect value of “interactive personification” → “hedonic shopping value” → “consumer citizenship behavior” is 0.042, and the corresponding Bias-corrected 95 % confidence interval and Percentile 95 % confidence interval are (0.007,0.105) and (0.004,0.096), excluding 0; the mediating effect value of “cultural personification” → “hedonic shopping value” → “consumer citizenship behavior” is 0.095, and the corresponding Bias-corrected 95 % confidence interval and Percentile 95 % confidence interval are (0.027,0.219) and (0.013,0.194), excluding 0; the mediating effect value of “appearance personification” → “hedonic shopping value” → “consumer citizenship behavior” is 0.06, and the corresponding Bias-corrected 95 % confidence interval and Percentile 95 % confidence interval are (0.016,0.149) and (0.005,0.125)

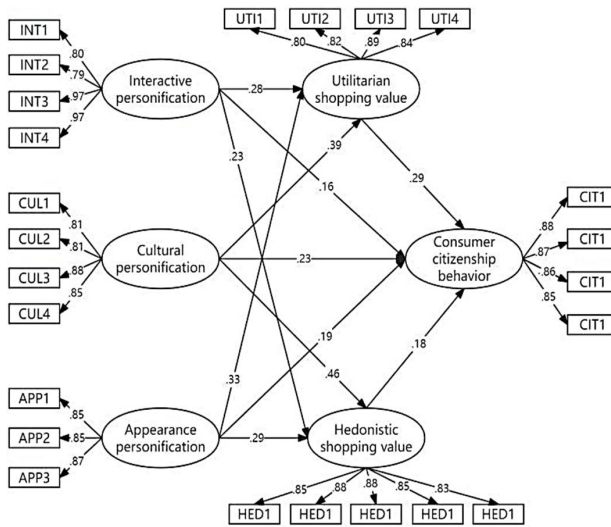


FIGURE 2. Influence mechanism model diagram.

TABLE 6. Path test results.

Path	Non-standardized coefficient α	Standardized coefficient β	S.E.	C.R. (Significant)	P
Interactive personification → Utilitarian shopping value	0.241	0.275	0.059	4.113	***
Cultural personification → Utilitarian shopping value	0.391	0.393	0.094	4.152	***
Appearance personification → Utilitarian shopping value	0.332	0.333	0.093	3.581	***
Interactive personification → Hedonistic shopping value	0.213	0.229	0.062	3.45	***
Cultural personification → Hedonistic shopping value	0.488	0.463	0.103	4.75	***
Appearance personification → Hedonistic shopping value	0.307	0.29	0.098	3.132	0.02
Interactive personification → Consumer citizenship behavior	0.162	0.16	0.049	3.296	***
Cultural personification → Consumer citizenship behavior	0.267	0.233	0.093	2.874	0.04
Appearance personification → Consumer citizenship behavior	0.219	0.19	0.081	2.708	0.07
Utilitarian shopping value → Consumer citizenship behavior	0.331	0.287	0.113	2.93	0.03
Hedonistic shopping value → Consumer citizenship behavior	0.196	0.18	0.074	2.659	0.08

respectively, excluding 0, indicating that the mediating effect of hedonic shopping value exists.

TABLE 7. Non-standardized bootstrap mediating effect and direct effect test.

Path	effect size	SE	Bias-corrected 95%CI		Percentile 95%CI	
			Lower	Upper	Lower	Upper
Interactive personification → Utilitarian shopping value → Consumer citizenship behavior	0.08	0.041	0.018	0.183	0.014	0.172
Cultural personification → Utilitarian shopping value → Consumer citizenship behavior	0.129	0.061	0.036	0.276	0.022	0.255
Appearance personification → Utilitarian shopping value → Consumer citizenship behavior	0.11	0.055	0.025	0.255	0.014	0.23
Interactive personification → Hedonistic shopping value → Consumer citizenship behavior	0.042	0.024	0.007	0.105	0.004	0.096
Cultural personification → Hedonistic shopping value → Consumer citizenship behavior	0.095	0.045	0.027	0.219	0.013	0.194
Appearance personification → Hedonistic shopping value → Consumer citizenship behavior	0.06	0.03	0.016	0.149	0.005	0.125
Interactive personification → Consumer citizenship behavior	0.162	0.072	0.057	0.347	0.052	0.337
Cultural personification → Consumer citizenship behavior	0.267	0.095	0.088	0.467	0.09	0.47
Appearance personification → Consumer citizenship behavior	0.219	0.082	0.059	0.382	0.065	0.388

The effect value of “interactive personification” → “consumer citizenship behavior” is 0.162, and the corresponding Bias-corrected 95 % confidence interval and Percentile 95 % confidence interval are (0.055,0.347) and (0.052,0.337), respectively. The effect value of “cultural personification” → “consumer citizenship behavior” is 0.267, and the corresponding Bias-corrected 95 % confidence interval and Percentile 95 % confidence interval are (0.088,0.467) and (0.09,0.47), respectively. The effect value of “appearance personification” → “consumer citizenship behavior” is 0.219, and the corresponding Bias-corrected 95 % confidence interval and Percentile 95 % confidence interval are (0.059,0.382) and (0.065,0.388), respectively,

which do not contain 0, indicating that the direct effects of “interactive personification” → “consumer citizenship behavior”, “cultural personification” → “consumer citizenship behavior”, “appearance personification” → “consumer citizenship behavior” exist. The corresponding hypotheses H1 are verified.

VI. DISCUSSION AND CONCLUSION

Based on SOR theory, this study explores the influence mechanism of the personification of e-commerce virtual anchors on consumer citizenship behavior. By collecting consumer data through questionnaires, the hypothesis of this study is confirmed.

First of all, the personification of e-commerce virtual anchors positively impacts consumer citizenship behavior. The interactive, cultural, and appearance personification of e-commerce virtual anchors positively impacts consumer citizenship behavior. The interaction between virtual humans and humans is more interactive than that between humans and ordinary graphics and text [39]. This means that improving the personification of e-commerce virtual anchors is conducive to promoting consumer citizenship behavior between live broadcasts.

Secondly, consumer shopping value positively impacts consumer value co-creation behavior. Among them, consumer utilitarian shopping value and hedonic shopping value have a positive impact on consumer citizenship behavior. Consumers obtain utilitarian shopping value or hedonic shopping value, representing consumers’ convenience, money, or happiness in the consumption process. In the live broadcasts of an e-commerce virtual anchor, consumers are happy when they save money and have time to complete shopping or watch the live broadcast. This allows consumers to go beyond simple shopping goals and be willing to engage in civic behaviors such as feedback, publicity, help, and tolerance for the live studio to improve.

Finally, consumer shopping value plays an intermediary role in the relationship between e-commerce virtual anchor personification and consumer citizenship behavior. With the rapid development of e-commerce live streaming, an increasing number of consumers tend to engage in civic behaviors such as giving feedback on their subjective feelings about products or services [40]. The personification of e-commerce virtual anchors brings consumers a better, faster, and happier shopping experience, encouraging consumers to be more willing to conduct citizenship behavior. The consumer’s shopping experience should be an important goal of the operation.

A. THEORETICAL AND PRACTICAL SIGNIFICANCE

This study constructs a theoretical model of the effect of e-commerce virtual anchor personification on consumer citizenship behavior through the SOR model and explains its mechanism using 343 questionnaires. This study found that in the application scenarios of e-commerce virtual anchors,

the personification of virtual human technology can be divided into interactive, appearance, and cultural personification. The personification of e-commerce virtual anchors is conducive to consumers’ acquisition of shopping value in accepting e-commerce virtual anchor services and promotes consumers’ citizenship behavior.

In practice, the development of e-commerce live broadcasts presents a new trend of cross-border integration. The integration of e-commerce live broadcast and virtual human technology has produced the application scenario of an e-commerce virtual anchor. E-commerce virtual anchors can live online 24 hours a day, provide intelligent services to consumers, enhance the consumer shopping experience, and bring more imagination and traffic to the brand [41]. This study finds that the personification of e-commerce virtual anchors positively impacts consumer citizenship behavior. For e-commerce live broadcast operators, it is feasible to purchase virtual anchors as the main type of live delivery, and they can consider purchasing highly personified e-commerce virtual anchors to replace some real anchors. It is more suitable for brand e-commerce live broadcasts, and the work of head real anchors is difficult to replace by e-commerce virtual anchors. E-commerce virtual anchor developers should develop e-commerce virtual anchor technology with a high degree of personification. Among them, cultural personification needs special attention, that is, when customizing and developing e-commerce virtual anchors for customers, they should focus on the identity, personification, and knowledge corpus of e-commerce virtual anchors. It should be combined with customer-brand products. If an e-commerce live broadcast business of maternal and child products needs to customize an e-commerce virtual anchor, it can be considered to define its image as a senior baby care expert or a trusted mother.

B. LIMITATIONS AND FUTURE DIRECTIONS

With the development of metaverse technology, artificial intelligence has profoundly changed how people work, play, and live, and it has also brought great convenience [42]. In the past, people participated in the meta-universe in various ways, and the e-commerce virtual anchor, as an emerging model, increased people’s participation in the meta-universe [43]. The meta-universe enriches people’s digital life. People can interact and communicate in various ways in the meta-universe, and human–computer interaction is one of the main ways [44]. The research team will continue to focus on e-commerce virtual anchors. First of all, the e-commerce virtual anchor is in the ascendant in the field of live broadcasting and mainly appears in the Chinese market. This study mainly distributes questionnaires to Chinese consumers. After the e-commerce virtual anchor has become popular worldwide, the research team will continue global research in this field. Second, with the progress of multi-modal machine learning technology, this study will collect live video of live delivery

of e-commerce virtual anchors, and analyze related issues in this field through second-hand big data. Finally, this study focuses on virtual TV anchors driven by artificial intelligence technology. In practice, there are e-commerce virtual anchors driven by dynamic capture technology. The interaction of this type of e-commerce virtual anchors is mainly realized by real people wearing dynamic capture equipment. This type of e-commerce virtual anchor is not involved in this study. This type of e-commerce virtual anchor driven by dynamic capture can be compared and studied in future research.

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