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THE INFLUENCE OF USER EXPERIENCE ON CONSUMPTION INTENTION: A STUDY OF SMART HOME APPLIANCES IN CHINA

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ABSTRACT

Smart appliances will become the direction of home development in future. However, smart appliances still have some problems in user experience. This study determines the dimensions of the smart appliances scale from two fields of industrial design and marketing management, divides them into five dimensions: sensory experience, performance experience, interactive experience, emotional experience, and associative experience, and discusses the relationship between these five dimensions and user consumption intention. At the same time, it studies gender differences in the relationship between the five dimensions of user experience and consumption intention. The data was collected through a questionnaire from 378 Chinese smart home appliance consumers. Using SPSS and the AMOS-SEM method to analyze the data, the results show that user sensory experience, performance experience, interactive experience, emotional experience, and associative experience have a significant positive influence on the consumption intention of smart appliances. It is further found that there are no gender differences between user experience and consumption intention. This study also proposes four strategies for marketing smart home appliances in China.

Contribution/Originality: This study contributes to the existing literature by investigating the influence of user experience of smart appliances on consumption intention, in terms of industrial design and marketing management. The user experience uniquely comprised sensory, performance, interactive, emotional, and associative experience, a pioneering attempt in this domain.

1. INTRODUCTION

Smart home appliances arise from the "Internet of Things" (IoT) , which has improved consumer satisfaction, energy efficiency, personalization, and advanced big data analytics (Aheleroff et al., 2020). It has a lot of promise for real-time data collecting, giving useful information, and predictive maintenance at a cheap cost, while also opening up a new frontier of a data-driven method for adding value (Trappey, Trappey, Govindarajan, Chuang, & Sun, 2017). Smart appliances make the home fashionable, comfortable, and safe (Balta-Ozkan, Amerighi, & Boteler, 2014; Mashal, Shuhaiber, & Daoud, 2020; Park, Kim, Kim, & Kwon, 2018; Schill, Godefroit-Winkel, Diallo, & Barbarossa, 2019). Nowadays, with the continuous improvement of quality of life, people have higher and higher requirements for the functions and user experience of smart appliances (Zhang, Ren, & Wang, 2019). However, China's smart home appliance market is still in its early stages of development. The standardization system has not been completely established, which leads to many experience problems such as complex operation, vague meaning, and lack of interaction (Yang & Zhang, 2021). In addition, the development of smart home appliances still faces

significant challenges in terms of security, homogeneity, and operation interface (Lv, 2020). These challenges may also affect consumer consumption intention. The satisfaction of users' senses, emotions, and values is directly related to whether smart appliances can enter the family and integrate into life (Yang & Zhang, 2021).

Currently, the research on smart appliances mainly focuses on industrial design. Some scholars have studied the security of smart appliances, such as hacker attacks, out-of-control, information leakage (Tenkanen, Kallio, & Poikolainen, 2018; Woolf, 2016). Some scholars have studied how to design products and improve functions to improve the user experience (Singh, Singh, Nandi, & Nandi, 2019; Zhang et al., 2019). However, there is still a lack of relevant literature on whether the user experience of smart appliances can improve customers' consumption intention and enterprise sales. There is less research on the influencing factors of smart appliance consumption intention and how to improve the user experience and increase consumption intention. In addition, there are differences in cognition, psychology, and behavior between men and women, which lead to different consumption psychology and behavior between them (Aufderhaar, Schrepp, & Thomaschewski, 2019).

There are few studies on the gender difference between user experience and consumption intention of smart home appliances. Therefore, this study takes Chinese smart appliance consumers as the research object, divides the smart appliance user experience into five aspects: sensory experience, performance experience, interactive experience, emotional experience, and associative experience, and discusses the relationship between user experiences and consumption intention of smart appliances. At the same time, it further studies the gender difference in the relationship between smart appliance user experience and consumption intention. The research is of particular significance for formulating marketing strategies for consumers, improving the user experience of smart appliances, changing Chinese consumers' willingness to consume smart appliances, and realizing the development of energy conservation, emission reduction, and artificial intelligence.

2. LITERATURE REVIEW AND RESEARCH HYPOTHESES

2.1. User Experience of Smart Appliances

While talking of the user experience, it is believed that a great user experience must first address customers' demands without bothering or boring them. Second, the products should be simple and stylish so that people may enjoy them. Furthermore, it should be capable of surprising users (Norman, Miller, & Henderson, 1995). With the continuous expansion of user experience in content and architecture, the meaning of user experience is also expanding. However, there is no consensus on the actual definition, specific content, and user experience evaluation methods (Scapin, Senach, Trousse, & Pallot, 2012).

Law, Roto, Hassenzahl, Vermeeren, and Kort (2009) pointed out that user experience has the characteristics of dynamics, environmental dependence, and subjectivity. These characteristics and the multi-disciplinary intersection of user experience research lead to inconsistent user experience definitions. The current research on user experience of smart appliances mainly exists in product design and experience marketing (Han, Ren, & Zhang, 2016). In product design, user experience emphasizes the interaction between people and products. Therefore, the research on the dimension of user experience pays more attention to users' manipulation, impression perception, and interaction.

Mittal, Ratchford, and Prabhakar (1990) believed that users' perception of products includes "function" and "sense," which correspond to utility experience and sensory experience, respectively. Liu (2018) stated that the user experience of emotional smart appliances can be divided into controllable experience, usability experience, and interactive experience. Zhang et al. (2019) divided the user experience of smart appliances into three parts: sensory experience, operability experience, and emotional experience. However, in the field of experience marketing, user experience emphasizes subjective thinking about personal perception, emotion, and knowledge (Schmitt, 1999). It is the comprehensive perception of users' behavior, feeling, and emotion when using products or services and reflects users' subjective inner activities (Daniel, 2000).

The dimension division method of Schmitt (1999) was widely used in marketing circles to divide user experience into sensory experience, emotional experience, thinking experience, action experience, and association experience. Therefore, referring to the dimension division of intelligent product user experience by Han et al. (2016), this paper focuses on the user experience research from two fields of industrial design and marketing management. It divides the user experience of smart appliances into sensory experience, performance experience, emotional experience, interactive experience, and associative experience. Among them, sensory experience, performance experience, and interactive experience are called direct experience; Emotional experience and associative experience are called derivative experience.

2.2. Consumption Intention of Smart Appliances

Park et al. (2018) investigated smart homes services and found that perceived compatibility, connectivity, control, system reliability, and enjoyment of smart home services are positively correlated with users' intention to use smart home services. In contrast, perceived cost is negatively correlated with users' intention to use smart home services. This research is the first step to explore the adoption process of smart homes in potential research fields in future. Schill et al. (2019) included environmental factors into the research scope to influence smart home consumption intention. The results show that altruism and ecological variables can promote smart home consumption intention, and environmental concern and perceived usefulness positively impact consumers' choice to buy a smart home. Mashal et al. (2020) investigated and studied the influencing factors of Jordanian residents' acceptance of smart home services. The study found that consumers' attitudes towards smart home services were significantly influenced by user awareness, trust, perceived enjoyment, personalization, perceived usefulness, and perceived ease of use, which affected their willingness to use together with social influence.

2.3. Relationship Between User Experience and Consumption Intention of Smart Appliances

Chen (2012) found that users with pleasant emotional experiences have stronger consumption intention than satisfied users when studying users' emotional experiences. User experience can also positively affect users' online reputation by arousing emotional pleasure and affecting users' communication intention (Huang, Ali, & Liao, 2017). Qu (2016) studied the relationship among user experience, perceived personal benefits, and willingness to continue using a relational virtual community based on the SOR model. The results show that user experience positively affected users' perceived unique benefits and then affected users' willingness to continue using. Watulingas and Permana (2020) studied the relationship between user interface, user experience, digital marketing, and user consumption intention in industrial design and found that user experience significantly positively impacts consumption intention.

Based on the above research contents, this paper puts forward the following research hypotheses:

H1: There is a positive correlation between user experience and consumption intention of smart home appliance consumers in China.

H2: Consumers' sensory experience significantly and positively affects the consumption intention of smart home appliance consumers in China.

H3: Consumers' performance experience significantly and positively affects the consumption intention of smart home appliance consumers in China.

H4: Consumers' emotional experience significantly and positively affects the consumption intention of smart home appliance consumers in China.

H5: Consumers' interactive experience significantly and positively affects the consumption intention of smart home appliance consumers in China.

H6: Consumers' association experience significantly and positively affects consumption intention of smart home appliance consumers in China.

2.4. Gender Differences in User Experience and Consumption Intention

User experience is a complex and subjective psychological perception (Preece et al., 1994). Users of different genders have different perceptions of the user experience of websites or general interactive products. Different information processing strategies may lead to potential differences in the perception of user experience between men and women (Aufderhaar et al., 2019). Generally, women process information more comprehensively, while men use more selective processing strategies (Meyers-Levy, 1986). Men's perception of visual design quality is higher than women's. The visual complexity of men is higher than that of women (Hsiu-Feng, 2014). Other studies have shown that women are more critical about websites' aesthetics or visual design than men (Cyr & Bonanni, 2005). Simon (2000) research shows that men are generally more satisfied with the information displayed on websites than women.

Therefore, we investigated gender differences in the relationship between user experience and consumption intention and put forward the following assumptions.

H7: Significant gender differences exist in consumers' user experience and consumption intention of smart home appliance consumers in China.

H8: Significant gender differences exist in consumers' sensory experience and consumption intention of smart home appliance consumers in China.

H9: Significant gender differences exist in consumers' performance experience and consumption intention of smart home appliance consumers in China.

H10: Significant gender differences exist in consumers' emotional experience and consumption intention of smart home appliance consumers in China.

H11: Significant gender differences exist in consumers' interactive experience and consumption intention of smart home appliance consumers in China.

H12: Significant gender differences exist in consumers' association experience and consumption intention of smart home appliance consumers in China.

3. RESEARCH METHOD

3.1. Research Framework

This study constructed a research model based on the previous literature review and theoretical data. Figure 1 presents this model as the theoretical framework of the current study.
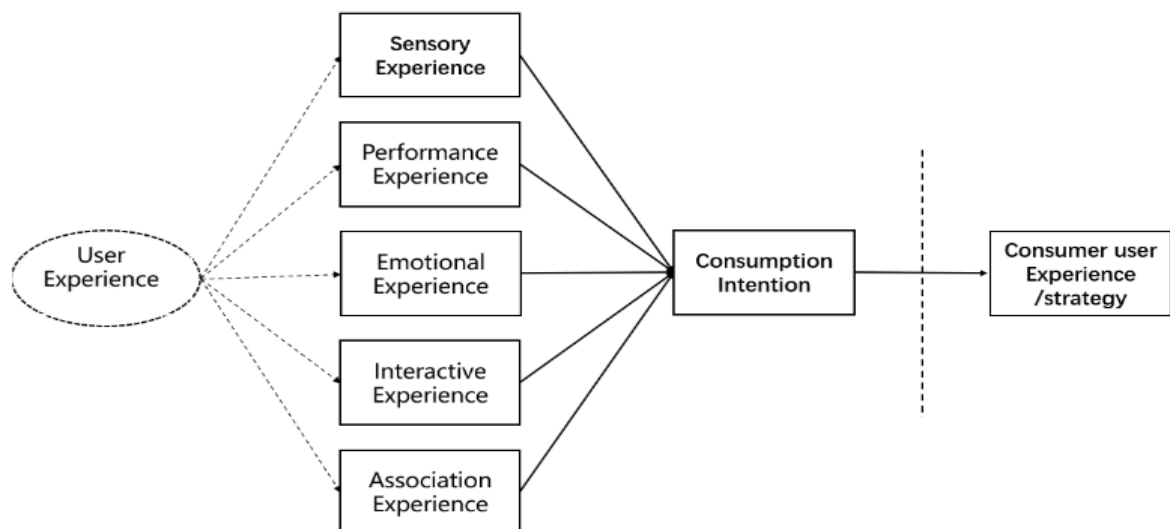

Figure 1. Framework of the study.

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3.2. Questionnaire Design

The surveyed questionnaire mainly comprised three parts. The first part dealt with the basic information about the respondents, including gender, age, level of education, income, and occupation. The second part mainly measured consumers' user experience of smart appliances through 19 items. These measurement items of user experience of smart appliances included sensory experience (4 items), performance experience (4 items), emotional experience（3 items）, interactive experience (4 items), and association experience (4 items), were adapted from Schmitt (1999) and Han et al. (2016). The third part mainly measured the consumption intention of smart appliances. Referring to the scale of Liang (2016) and Rahim, Sulaiman, Chin, Baharun, and Muharam (2016), this study set consumption intention to four aspects: initial consumption intention, repeat consumption intention, recommendation intention, and willingness to pay a higher cost. It contained a total of four items. All items used Likert's 5-level scoring method, ranging from 1 to 5. The higher the score, the more agreeable were the items. The following are examples of each dimension:

1. Sensory experience: I think the operation interface of smart home appliance system is very beautiful and exquisite.
2. Performance experience: I think the function of smart home appliance software system is very powerful.
3. Emotional experience: I think using smart home appliances can always bring me a relaxed and happy emotional atmosphere.
4. Interactive experience: I think the operation of smart home appliances is very simple and easy to start.
5. Association experience: I think I belong to the same family group as other users who use the same home smart appliances.
6. Consumption intention: The next time I buy home appliances; I will consider purchasing smart appliances again.

Table 1. Profile of the respondents. (N=378)

Variables	Characteristics	N=378	%
Gender	Male	163	43.1
	Female	215	56.9
Age	18- 20 years	31	8.2
	21-30 years	159	42.1
	31-40 years	106	28.0
	41-50 years	59	15.6
	51 years or older	23	6.1
Level of education	Below high school	18	4.8
	High school / technical secondary school	28	7.4
	Undergraduate / Higher Vocational Training	252	66.7
	Master	72	19.0
	Doctor	8	2.1
Income(month/RMB)	Up to 5000	93	24.6
	5001-10000	151	39.9
	10001-20000	83	22.0
	20001-30000	26	6.9
	30000 or more	25	6.6
Occupation	Government and public institution staff	75	19.8
	Enterprise employees	148	39.2
	Individual business	60	15.8
	Students	55	14.6
	others	40	10.6
Total		378	100.0

4. EMPIRICAL ANALYSIS

4.1. Demographic Profile of Respondents

Table 1 shows the characteristics of respondents of the study. Male respondents make up 43.1%, and female respondents make up 56.9%. The respondents were from the following five age groups: 8.2% were up to 20 years of age; 42.1% were 21-30years of age;28% were in the 31-40-year age group; 15.6% were aged from 41to 50 years; 6.1% were 51 or more. According to their level of education, 4.8% of respondents were below high school; 7.8% were high school or technical secondary school; 66.7% of respondents stated that they had undergraduate or higher vocational training degree;19% had a master's degree; the rest 2.1% of respondents hold doctor degree. In terms of their income, about 24.6% of respondents had a monthly income of less than 5000 RMBs; 39.9% had a monthly income from 5001 to 10000 RMBs; 22% of respondents had a monthly income from 10001-20000 RMBs; 6.9% earn 20001to 30000 RMBs a month, and the remaining 6.6% of respondents had a monthly income more than 30000 RMBs. In terms of their occupation,19.8% of respondents were government and public institution staff; 39.2% were enterprise employees; 15.9% were Individual business;14.6% were students, and 10.6% of respondents were in other occupations.

4.2. Data Collection and Analysis

An Internet survey company was hired to conduct a structured self-administered questionnaire (https://www.wjx.cn/, in December 2021). This study adopted the method of random sampling, and the participants came from all over the country. The qualification criteria of participants included over 18-year age and should have more than two years of experience in using smart home appliances. To ensure that participants knew enough about smart appliances, they were asked some basic questions before the formal test. All respondents entirely voluntarily participated in the study, and they were allowed to stop answering questions at any time. A total of 385 questionnaires were collected in this study, of which seven were invalid, and the remaining 378 were valid, with an effective rate of 98.2%. Roster, Rogers, Albaum, and Klein (2004) and Liu et al. (2010) stated that the internet questionnaire is a low-cost and efficient survey method, which more and more researchers adopt. The representativeness of internet survey data is comparable to the sampling probability of the general population. In this study, AMOS-SEM (23) was used to test hypotheses 2 to 6, hypothesis 1 was tested using Pearson correlation analysis, and the independent sample T-test was used to test hypotheses 7 to 11.

4.3. Measurement Model Assessment

In this study, the measurement model was evaluated by convergent validity and discriminant validity. Convergence reliability included factor loading, average variance extracted (AVE), and composite reliability (CR).

Table 2 shows all variables of CR and AVE were in the range of 0.839 to 0.91and 0.556 to 0.728, respectively. The factor loading of each item is greater than the cut-off value of 0.7. Similarly, we found that the variables examined exceeded the Heterotrait-Monotrait Ratio of Correlations (HTMT) requirement of value less than 0.9. In addition, the Cronbach's α coefficient for variables of sensory experience, performance experience, emotional experience, interactive experience, association experience, and consumption intention is respectively 0.838, 0.852, 0.886, 0.910,0.905, and 0.839. According to Hair, Ringle, and Sarstedt (2011) the measurement model meets the academic standards in terms of reliability, convergent validity, and discriminant validity.

4.4. Structural Model Assessment

This study adopted structural equation modeling (SEM) to test the theoretical model, and the overall structural model mode (X2/df=2.963; RMR=0.063; RMSEA=0.072; CFI=0.940; TLI=0.929; IFI=0.940; NFI=0.913) reached the standard proposed by Escobar-Rodríguez and Bonsón-Fernández (2017) indicating that

the structural model reached an ideal level. Figure 2 shows the measurement results of the structural equation model.

Table 2. Reliability and validity analysis of variables.

Variables	Item	Loading	CR	AVE	Cronbach's Alpha
Sensory Experience	SE4	0.721	0.842	0.574	0.838
	SE3	0.729			
	SE2	0.856			
	SE1	0.714			
Performance Experience	PE3	0.798	0.853	0.659	0.852
	PE2	0.845			
	PE1	0.791			
Emotional Experience	EE3	0.878	0.889	0.728	0.886
	EE2	0.854			
	EE1	0.827			
Interactive Experience	IE4	0.846	0.91	0.717	0.910
	IE3	0.86			
	IE2	0.839			
	IE1	0.841			
Association Experience	AE4	0.868	0.907	0.708	0.905
	AE3	0.843			
	AE2	0.846			
	AE1	0.808			
Consumption Intention	CI1	0.781	0.839	0.556	0.839
	CI2	0.734			
	CI3	0.713			
	CI4	0.78			

Note: SE: sensory experience; PE: performance experience; EE: emotional experience.
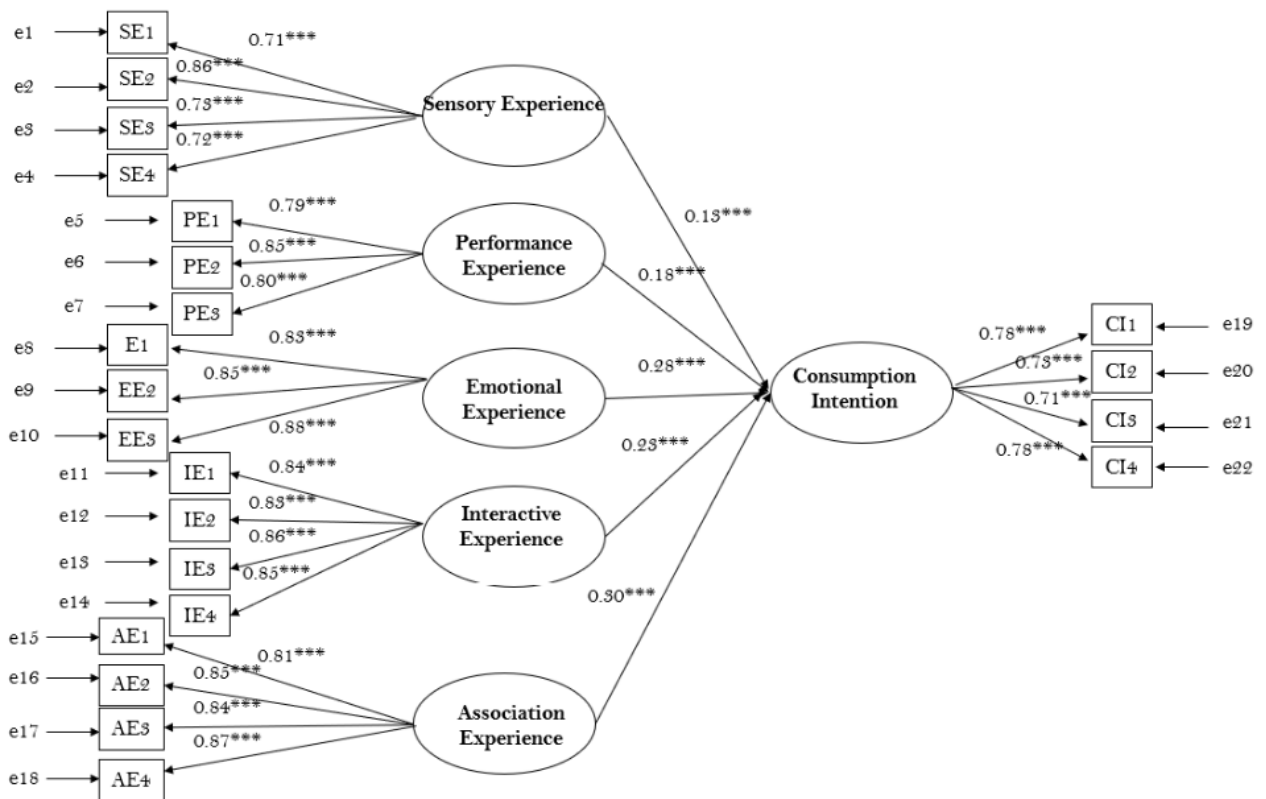IE: interactive experience; AE: association experience; CI: consumption intention.

Figure 2. The results of the structural equation model.

Note: ***<0.001.
SE: sensory experience; PE: performance experience; EE: emotional experience.
IE: interactive experience; AE: association experience; CI: consumption intention.

4.5. Research Hypothesis Testing

Hypothesis 1 was tested by analyzing the Pearson correlation coefficient between user experience and consumption intention. The results in Table 3 show that there is a significant positive correlation between the two variables and their dimensions, and the correlation coefficients are distributed between 0.511 to 0.806 with $p < 0.01$ (1% level of significance). The interactive experience has the highest correlation coefficient with consumption intention (0.806**), the second is the association experience (0.798**), followed by the emotional experience (0.795**), the performance experience (0.703**), and the sensory experience (0.635**).

Table 3. Pearson correlation analysis of user experience and consumption intention.

Variables	SE	PE	EE	IE	AE	CI
SE	1					
PE	0.511**	1				
EE	0.571**	0.644**	1			
IE	0.557**	0.650**	0.744**	1		
AE	0.534**	0.599**	0.731**	0.748**	1	
CI	0.635**	0.703**	0.795**	0.806**	0.798**	1

Note: **$p < 0.01$ (1% level of significance).
SE: sensory experience; PE: performance experience; EE: emotional experience.
IE: interactive experience; AE: association experience; CI: consumption intention.

Hypotheses 2 to 6 were tested by investigating the direct path coefficient between the five dimensions of user experience and consumption intention. The findings in Table 4 show that the five dimensions of user experience: sensory experience, performance experience, emotional experience, interactive experience, and associative experience significantly and positively affect consumption intention of smart home appliance consumers in China. In other words, all hypotheses 2-6 proposed in this study are found valid.

Table 4. Direct path for the structural model (N= 378).

Hypothesis	Path	Estimate	SE.	CR.	Result
H1	User experience → Consumption intention	-	-	-	Accepted
H2	Sensory experience → Consumption intention	0.134***	0.045	3.33	Accepted
H3	Performance experience → Consumption intention	0.183***	0.039	3.695	Accepted
H4	Emotional experience → Consumption intention	0.275***	0.047	4.051	Accepted
H5	Interactive experience → Consumption intention	0.228***	0.053	3.354	Accepted
H6	Association experience → Consumption intention	0.296***	0.047	4.721	Accepted

Note: ***$p < 0.01$.
X2/df =2.963; RMR=0.063; RMSEA=0.072; CFI=0.940; TLI=0.929; IFI=0.940; NFI=0.913.

Hypothesis 7-12 were tested by analyzing the independent sample t-test between the five dimensions of user experience and consumption intention according to gender. As shown in Table 5, there is no significant gender difference between user experience and consumption intention. In addition, the average score of male and female consumers of consumption intention and association experience to smart home appliances is equal. The male consumers' interactive experience mean scores are higher than that of female consumers. On the contrary, female consumers' mean score of other dimensions is higher than that of male consumers. It is concluded that all hypotheses 7-12 are invalid from the above data.

Table 5. T-test statistics of user experience and consumption intention differences according to gender.

Dimension	Male		Female		t	p
	Mean	SD	Mean	SD		
User experience	3.48	0.91	3.51	0.96	-0.314	0.754
Sensory experience	3.15	0.96	3.33	0.93	1.846	0.066
Performance experience	3.41	1.13	3.46	1.13	0.364	0.716
Emotional experience	3.58	1.12	3.60	1.11	0.143	0.886
Interactive experience	3.64	1.11	3.55	1.20	0.129	0.443
Association experience	3.59	1.14	3.59	1.15	-0.057	0.955
Consumption intention	3.62	0.90	3.62	0.92	-0.038	0.970

Note: Male=163; Female=215.

5. CONCLUSION AND RECOMMENDATIONS

The current research found that the user experience of smart appliances positively impacts users' consumption intention. Studies conducted by Deng, Turner, Gehling, and Prince (2010); Yu (2019) support our findings. Users' consumption intention of smart appliances is significantly and positively influenced by sensory experience, performance experience, emotional experience, interactive experience, and associate experience. Many research conclusions are consistent with the hypothesis testing results of this study. Du and Fan (2007) found that an excellent sensory experience can promote customer consumption through customer research. The survey of Hua (2010); Cheng and Liu (2013) and Yuan (2020) revealed that performance experience is an essential factor affecting customers' consumption intention through empirical research, and the former has a significant positive impact on the latter. In studies like Xu, Zhao, and Wang (2009); Wu, Chang, and Pan (2014); Lai (2019); Yuan (2020), it was found that user emotional experience had a significant positive impact on consumers' consumption intention. Consumers showed pleasure or interest in products, which promoted consumers' consumption intention.

Ning (2019) got the same results that the interaction between consumers and products generated corresponding pleasure or interest, which promoted consumers' consumption intention or consumption behavior. Consumers paid attention to associate experience when purchasing products, and it significantly and positively impacted consumers' consumption behavior (Cui & Qu, 2020). At the same time, it was also found that the associate experience of smart appliances had the greatest positive impact on consumption intention, Cui and Qu (2020) obtained the results consistent with these findings. Then followed by emotional experience, interactive experience, and performance experience, and sensory experience, which had the most negligible effect on consumption intention. However, Lai (2019) found that emotional experience greatly impacted consumption intention.

According to the data analysis, there are no significant gender differences in consumers' user experience and consumption intention of smart home appliance consumers in China. In addition, significant gender differences do not exist in sensory experience, performance experience, emotional experience, interactive experience and associative experience. This is consistent with Kristina, Martin, and Jörg (2019), who found similar results that there were no substantial differences in men's and women's perceptions of the user experience.

The growth of smart appliances is an unavoidable trend that is not only consistent with societal development needs, but also with China's intelligent development policy. This study proposes four strategies to better boost the development of China's smart home appliance market.

- The design of smart home appliances should be beautiful, capable to improve and optimize the efficiency of product operation, and avoid problems such as system crashes during the experience process. Based on a reliable system experience, the design also needs to simplify the user's operation process in the product experience and, at the same time, provide users with solutions in diverse scenarios (Yang & Zhang, 2021).
- The core of user experience is the user himself. The user experience of smart home appliances should therefore involve the basic functional practicability and the user's psychological experience, caring about the user's self-feeling, paying attention to the use effect of the product, and even the service effect.
- User experience requirements change due to specific usage scenarios. Correspondingly, product design needs

to focus on user preferences and segmentation needs. This will make the overall service process system more complete, as well as provide consumers a sense of surprise while using smart home appliances, which is critical for user experience.

- Marketing has become more intelligent. Consumers' user experience is not only about whether they can get personalized customization, but also whether merchants can use intelligent marketing methods to accurately target customers and push copywriting, so as to grasp the psychology of consumers (Wang & Zhang, 2020). Therefore, it is essential to pay attention to market information feedback, and continuously improve and perfect smart home appliances. Through intelligent marketing methods, merchants can truly reconcile and propose new products or services based on the actual needs of users and the personalized trends of consumers in the consumption process.

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