

Influencing Factors and Models of the Millennial Generation's Willingness to Use Smart TV

Yuxin Qin *

School of Literature and Journalism, Guangdong Ocean University, Guangdong, China

* Corresponding Author Email: 1461856765@qq.com

Abstract. With young people becoming the main purchase force in the smart TV industry, their user experience of smart TV is highly valued. However, the use rate and preference of the youth for TV are low at present. What is the reason for their pessimistic willingness to use TV? Focusing on the influencing factors of the millennial generation's willingness to use a smart TV, this paper theoretically based on the technology acceptance model (TAM) and advertisement avoidance model introduces the free mindset, constructs the model, and puts forward research hypotheses, so as to analyze this phenomenon from the perspectives of communication, behavioral science, and social psychology. It is shown that perceived usefulness, perceived ease of use, perceived goal impediment, and perceived advertising clutter are important independent variables that affect millennial willingness to use the smart TV. Consistent with previous research conclusions, perceived usefulness still acts as a key intermediary variable in the TAM model. In addition, the study also found that the free mindset has a significantly positive impact on the willingness to use, but there is no moderating effect in this model.

Keywords: Technology Acceptance Model; Advertisement Avoidance Model; Willingness to Use; Free Mindset; Millennial Generation; Smart TV.

1. Introduction

Under the new technical conditions, the connotation and extension of TV are constantly expanding with the changing ecology of TV programs, including massive content, rich applications, and wireless connection... In recent years, the brighter smart TVs have entered thousands of households and their development promotes a new production mode of content. For example, users can be charged at the corresponding three levels of startup, system, and content. However, many consumers find that in addition to the increasing VIP projects, various recharge rules, and cumbersome operation functions, abundant commercial advertisements determine the content sharing as well as the smooth and convenient use, ultimately affecting the choice of TV viewers.

According to statistics, the all-channeled retail volume of China's color TV market in 2022 was 36.34 million, down 5.2% year-on-year. Meanwhile, the average daily startup rate of TV sets has dropped to less than 30%. [1] Although there are some mobile terminals such as smartphones and tablet computers competing against the smart TV, the worse TV-watching experience and various operations lead to consumer dissatisfaction, which are also key influencing factors. Even young people playing on the Internet on weekdays will feel uncomfortable when they come into contact with complicated smart TVs. Nowadays, the generation who grew up with TV has turned on TV less and less frequently, and the time of watching TV is getting shorter. The smart TV industry, which tries to make young people potential users and the main force of future purchases, has ushered in a cold winter under the saturated market.

In this trend, a vital question to be answered is, how can smart TV retain and attract more young users with a better experience in the multi-screen era? Namely, what factors affect their willingness to use smart TV? Based on the above problems, this study takes the young audience of the smart TV as the research object from the user-centered perspective. Premised on the integrating technology acceptance model and advertisement avoidance model, this paper explores the influencing factors of their willingness to use the smart TV.

2. Literature Review

2.1 Research on TV Audience Behavior from a Communication Perspective

1. Research on Traditional TV Audiences

In the field of communication, with the rise of limited effect theory, the effect of media communication is considered to be limited. Academia pays more attention to how the audience uses mass media as well as the individual and psychological influence in this process, thus the research on audience needs represented by “use and satisfaction” has become the focus.

As for foreign research, Perse et al. (1993) discussed how to improve people’s satisfaction with TV viewing from the perspective of new TV technology. [2] Abrams (2010) explores the needs of Asian Americans for entertainment, boredom mitigation, and identity recognition through watching TV from the perspective of cross-cultural communication. [3] In Chinese research, Ren Tianfeng (2007) analyzed the audience needs for TV dramas in entertainment, fashion, emotion, cognition, and self-realization. [4] In addition, the influencing factors of the early traditional TV audience research in domestic and foreign academia include the power structure and autonomy of the viewing field (Zhang & Li, 2003), [5] the specific media use patterns produced by different genders (Mares, 2006), [6] etc.

To sum up, the research on traditional TV audience at home and abroad before 2010 are abundant, mainly analyzing the factors affecting TV watching from the demographic characteristics such as gender, age, etc., which reflects the limited initiative and strong functionalism of the audience in the traditional viewing context. But the impact of audience perception and TV-watching experience is less analyzed.

2. Research on TV Audience in the Era of Media Convergence

Since Nicholas Negroponte and Ithiel De Sola Pool put forward and developed this concept, “media convergence” has become synonymous with the development of multi-functional integration of various media in the network era. [7] Accordingly, the emerging technologies based on the Internet have changed the rules of information dissemination and the ecological pattern of media, and TV audience viewing has also changed from passive to active. In Chinese research, Jiang Yi (2008) believed that the characteristics of Internet TV are mainly reflected in the convenience of information acquisition, the individuation of information service, and the interactivity of information dissemination. On this basis, the viewing behavior and psychological characteristics of Internet TV audiences are analyzed. [8] With the development of intelligent media, Liu Yang (2016) who has made conceptual differences between traditional TV, Internet TV, and smart TV concluded that smart TV has software and hardware to achieve an intelligent operating system compared with traditional one. [9]

As for the influencing factors of smart TV, foreign scholars (Liou et al., 2015) pointed out that network problems such as interruption or delay will affect consumers’ willingness to use the TV. [10] A study conducted by Park et al. (2016) in South Korea shows that poor-quality network and complex control interface lead to a low willingness to use a smart TV. [11] In addition, active TV viewers often use technology to better participate in the viewing (Nee & Dozier, 2016). [12] Domestic scholars (Guan, Mo, Peng, 2018; Liu, 2021) interpreted the problems, current situation, and path of elderly-oriented smart TV from the psychological and physiological perspectives of the elderly based on reality. [13] [14]

To sum up, studies at home and abroad have shown that TV viewing behavior in the era of media integration that features interactivity, mobility, and companionship. Its research mainly focuses on the audiences’ perceptual experience to explore the impact on TV viewing, such as perceptual interests, perceptual barriers, perceptual interaction, etc. In the local context, the academia mainly pays attention to middle-aged and old people who are mainstream TV users in China, but lacks research on the young users who are technological innovators and early adopters.

2.2 Research on the Influencing Factors of Younger Generation's TV Use

Growing up accompanied by new media technologies such as computers, video games, music players, and mobile phones, people aged between 18 and 29 are called the “young millennial generation” and “digital natives”. [15] Exploring the relationship between young people and TV media technology in the era of media convergence, Deng Xiaoxuan (2012) analyzed the important factors affecting college students' use of Internet TV from three aspects, including perceived characteristics, perceived popularity, and perceived needs. [16] Moreover, Yu Jingjing (2013) focused on the TV 2.0 era and found that perceived ease of use, perceived usefulness, and perceived entertainment have a significant impact on female college students' Internet TV viewing behavior. [17] According to foreign studies, the empirical research on the Z generation's acceptance of Social TV found that perceived ease of use and perceived usefulness act as critical intermediary variables. [18]

In addition, based on the characteristics of TV as one of the most effective marketing communication tools, academia has investigated the attitudes of the millennial generation towards TV advertisements. Compared with digital advertising channels, traditional advertising channels (such as traditional TV advertising) are more trusted by millennials (Marketing Sherpa, 2016). [19] On the one hand, although millennials spend more time on digital media and social media, they are still open to traditional advertising and have more doubts about digital advertising, believing that they are “irrelevant, excessive, and intrusive”. On the other hand, emerging smart TV advertising can effectively track users' viewing effects through big data. For example, a study holds that Generation Z is proactive, advertising thus should stimulate viewers' emotions to increase their participation in TV. [20]

2.3 Literature Review

After the collection of research, it is found that the domestic and foreign studies on the influencing factors of TV viewing have been relatively complete. Different disciplines' horizons, models, and theories are used by scholars, which lays a theoretical foundation for the in-depth study of this paper, broadening the academic horizon. But generally speaking, the research on the influencing factors of TV viewing mainly focuses on the channel program arrangement, program type, program quality, and demography, lacking research on users' technology adoption. The types of TV concerned mainly concentrate on Internet TV in the era of video-network convergence. Thus, there is less research on the influencing factors of smart TV in the era of intelligent media. The focus of respondents in this research is more on the elderly, less paid to the younger users who are the early adopters of technology, and the main force of future TV audiences.

In terms of research methods, early domestic scholars used more qualitative methods and made descriptive or summary analyses on the current situation of smart TV use behavior, thus the conclusions were subjective. Foreign scholars have made scientific measurements on the use of smart TV in different groups of people and situations through various dimensional measurements earlier. Therefore, it is vital to design and use a scientific model measurement scale to study the influencing factors of smart TV use willingness.

2.4 Theoretical Model Review of This Study

1. Technology Acceptance Model

Audience Activity is a key concept in any media research because it determines the media participation of the research object (Bondad Brown et al., 2012). [21] Lee et al. (2013) defined audience activities with the following words. (a) utility or people's perceived usefulness of media use; (b) intentionality, that is, people's motivation to use the media; (c) selectivity, that is, people's interests affect their media use; (d) imperviousness that refers to an unwillingness to change views or ways of acting. [22] The variables of the technology acceptance model can reflect the above dimensions. Therefore, combined with the above literature, this study mainly takes the technology acceptance model to study the influencing factors of smart TV.

User acceptance of technology has been a wide concern in previous studies, and the theoretical framework for analyzing individual acceptance of technology is different. Specifically speaking, the technology acceptance model was first established by Davis (1989) based on the rational behavior theory. [23] Besides, the key determinants are set as perceived usefulness and perceived ease of use, which makes each variable more concise, flexible, and universal. Therefore, it is considered to have a strong impact on users' technology acceptance, [24] which is widely used in personal technology acceptance behavior in various types of information systems, supported by a large number of empirical studies. [25]

From the perspective of media technology, the use of smart TV is essentially related to the acceptance and use of new technologies. Therefore, this study believes that the TAM model, one of the most commonly used theoretical models in worldwide media user research, can provide a theoretical basis for use behavior technically.

2. Avoidance Model

Advertisement avoidance refers to all behaviors of media users to reduce advertisement reception to varying degrees. [26] In the domestic research, Yang Wenxia and Su Yong (1995) took the lead in discussing the avoidance phenomenon of TV advertisements. [27] With the advent of the Internet, the form of advertising communication and the situation of advertising reception is changing. The object of research on advertising avoidance has transformed from traditional media advertising to traditional Internet advertising, and then to mobile advertising. The research focuses on the response of advertising avoidance has developed from behavior and cognitive avoidance to the triple dimensions based on cognition, emotion, and behavior.[28] [29] Some foreign scholars have confirmed that perceived goal impediment, perceived advertising clutter, and past negative experience have significant effects on advertising cognition, emotion, and behavioral avoidance. In addition, they built and verified the Internet advertising avoidance model (Cho & Cheon, 2004). [30] Therefore, it is of great significance to study users' perception of smart TV advertisements by using the advertisement avoidance model.

With the development trend that young users are the main buyers of smart TV in the future, this study aims at the gap between current research and the media characteristics of smart TV. Furthermore, a regulatory intermediary model is developed based on the technology acceptance model and advertisement avoidance model, introducing regulatory variables, so as to better focus on the influencing factors of millennial use of smart TV from the perspective of user perception.

3. Research Hypothesis and Model Construction

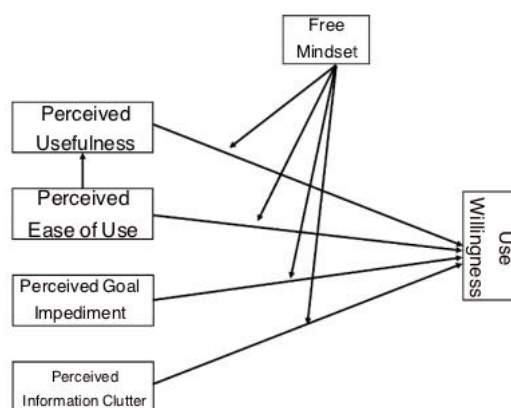


Fig 1. Construction of Research Model

3.1 Independent Variables

1. Perceived Usefulness and Perceived Ease of Use

From the perspective of perceived usefulness, the new generation of information technology can make the scene and immersive content experience in richer content categories. Besides, presentation

methods can better match the needs of the audience, greatly enhancing the audience's perception of the smart TV's usefulness, which may make users have a more positive attitude towards smart TV. However, from the perspective of perceived ease of use, the dazzling interface, numerous functions, and delayed waiting for switching on and off enable more young people to feel the unfriendly experience of human-computer interaction, which may leave a negative attitude towards smart TV. Based on this speculation, the author puts forward the following assumptions.

H1: Users' perceived usefulness has a significantly positive impact on their willingness to use a smart TV.

H2: Users' perceived ease of use has a significantly positive impact on their willingness to use a smart TV.

H3: User's perceived usefulness mediates between perceived ease of use and willingness to use.

2. Perceived Goal Impediment and Perceived Advertising Clutter

Perceived goal impediment is a variable in the advertisement avoidance model. Users often have a strong goal orientation when using the Internet. When advertisements interrupt their task process, disturb their web browsing, distract visitors' attention, and interfere with their search for needed information, they will cause advertisement avoidance (Cho & Cheon, 2004). Perceived advertising clutter, another variable in the advertising avoidance model, includes the degree of advertising overdose, user annoyance, and advertising exclusivity. When users start smart TV, they often have specific goals and motives. The startup advertisements will undoubtedly interrupt their search for program information and interfere with the realization of their goals. Thus, users' perceived goal impediment may have a negative impact on the use of a smart TV. In addition, there are window advertisements for video playing, patch advertisements, etc., as well as various types of bundled advertisements overwhelming the audience, which may also affect the audience's sense of experience and participation in a smart TV. In this regard, the author puts forward the following assumptions.

H4: Users' perceived goal impediment has significantly negative effects on their willingness to use a smart TV.

H5: Users' perceived advertising clutter has significantly negative effects on their willingness to use a smart TV.

3.2 Dependent Variables

In the TAM model, Behavioral Intention (BI) is defined as the degree of willingness of an individual to use a specific technology. [31] Combined with the situation of this study, it is defined as the willingness to use, which refers to the frequency, possibility, and degree of use that users expect or continue to use smart TV at present and in the future under certain conditions. Thus, this study takes the willingness to use as the final result variable, studying the mechanism between other variables and willingness to use.

3.3 Regulatory Variables: Free Mindset

People with a free mindset believe that certain goods should be made available to everyone for free, which is often cited as one of the reasons why people are reluctant to pay for online goods (Dou, 2004). [32] Before the advent of smart TV, according to the development of TV technology, China's TV charging policy has been adjusted from free of charge, to payment, and charge with further refinement. [33] In this process, the audience was trained to have the right to consume these goods free of charge and was disgusted with the losses caused by pricing the goods provided free of charge before. (Kahneman & Tversky, 1979; [34] Shampanier et al., 2007; [35] Goyanes et al., 2020) [36]

With the advent of digital payment, smart TV providers have rarely provided free goods. Every pre-installed video platform implies a charging trap with increasingly distinct classification of paid VIP services. VIP payment for smart TV is a typical online payment, whose payment mode will affect users' experience. Based on this, the author speculates that users' free mindset also impacts their willingness to use, putting forward the following assumptions.

H6: Free mindset plays a moderating role in the influence of independent variables on dependent variables.

4. Research Design

4.1 Scale Definition

Considering the validity of the variables, the scales refer to the existing research results. Based on the existing research and its themes, the author finally formed a formal survey scale (as seen in Table 1).

Table 1. Source of Measurement Scale

Variable	Number of Tested Variables	References
Perceived Usefulness (PU)	6	Davis (1989)
Perceived Ease of Use (PEOU)	8	Davis (1989)
Perceived Goal Impediment (PGI)	4	Cho & Cheon (2004)
Perceived Advertisement Clutter (PAC)	4	Cho & Cheon (2004)
Free Mindset (FM)	3	Dou (2004)
Use Intention (UI)	3	Davis (1989)

4.2 Sample Collection and Statistics

SPSS25 was used to statistically analyze basic descriptive sample distribution. (As seen in Table 2). In short, the valid samples of this survey are mainly young users aged 18-29 with high education and middle income. Their situation roughly meets the basic requirements of this survey for millennial smart TV audiences.

Table 2. Basic Information of Survey Samples

Basic Situation of Surveyed Samples (N=337)		Number of Samples	Percentage
Gender	Male	91	27
	Female	246	73
Educational Background	Educated by High Schools or Below	8	2.4
	Educated by Junior Colleges	283	84
	Bachelor's degree	28	8.3
	Master's degree or Above	14	4.2
Career	Enterprises' Employees	6	1.8
	Students	15	4.5
	Institutional Agencies' Employees	283	84
	Freelancers or Others	33	9.8
Monthly Income	Students Without Formal Incomes	245	72.7
	RMB 3000 or Below	15	4.5
	RMB 3000 - 5000	21	6.2
	RMB 5001 - 10000	32	9.5
	RMB 10001 - 15000	14	4.2
	RMB 15001 - 20000	3	0.9
	RMB 20001 - 30000	1	0.3
	RMB 30000 or Above	6	1.8

The viewing situation of smart TV in the survey sample is shown in Table 3. In the basic description and statistical analysis of user behavior, it is found that (1) As for the weekly use frequency of smart TV, "less than once a week on average" accounts for the highest proportion, reaching 47.8%, followed by "3-6 times a week on average" accounting for 24.4%, while users who choose "once a day on average" account for the lowest proportion, indicating that the millennial use frequency of smart TV is low. Thus, improving millennial use experience of smart TV is imperative, proving the necessity of this research again. (2) In the paid survey, nearly half of the users have

purchased paid services for smart TV, accounting for 46.1%, of which 92.7% are below 500 yuan and less than 10% are above 500 yuan, indicating that users prefer rational and low-priced paid services.

Table 3. Viewing Situation of Smart TV's Survey Sample

Viewing Situation of Smart TV (N=337)		Number of Samples	Percentage
Weekly Use Frequency of Smart TV	Once Per Day on Average	40	11.2
	3-6 Times Per Week on Average	87	24.4
	Weekly Once on Average	59	16.6
	Weekly Less Than Once on Average	170	47.8
Preference for Program Types	Traditional TV Programs	111	45.7
	Internet Programs	245	68.8
Whether Paid for Smart TV	Yes	154	45.7
	No	183	54.3
Yearly Money on Average Paid for VIP of Smart TV(N=154)	Less Than RMB 300	129	78.7
	RMB 300 - 500	23	14
	RMB 500 - 1000	7	4.3
	RMB 1000 - 2000	3	1.8
	More Than RMB 2000	2	1.2

5. Data Analysis

5.1 Reliability and Validity Test

In this study, SPSS25 was used to analyze the reliability and validity of the scale. As shown in Table 4, the Cronbach' salpha coefficients of the six main variables in this study are all greater than 0.7. Usually, Cronbach α coefficient greater than 0.7 reaches a significant level ($P < 0.05$), indicating that the factor has good reliability, which means that the data obtained through this questionnaire survey can reflect the young people's perception and experience of smart TV reliably. As for the validity analysis, $KMO = 0.770 > 0.7$ with significance < 0.05 , indicating good validity.

Table 4. Reliability and Validity of Factors

Dimension	Number of Samples	Alpha	Average Value (N=337)
Perceived Usefulness	6	0.89	3.70
Perceived Ease of Use	8	0.90	4.07
Perceived Goal Impediment	4	0.88	2.19
Perceived Information Clutter	4	0.87	1.96
Free Mindset	3	0.85	3.92
Use Willingness	4	0.89	3.62
Scale Entirety	28	0.75	
Effectiveness	Number of KMO Sampling Appropriateness		0.77
	Bartlett Sphericity Test	Approximate χ^2	349.033
		Degree of Freedom	15

5.2 Difference Comparison of Demographic Variables

Then, the independent sample test of SPSS25 is used to test the differences in perceived usefulness, perceived ease of use, perceived goal impediment, perceived advertising clutter, and free mindset of different gender users. The significance $P > 0, 05$ in the Levin variance test, as shown in Table 5, and the significance P values of each dimension (double tails) are all > 0.05 , indicating that there is no significant difference between different genders in each variable, which proves that gender isn't needed to be used as a control variable in future analysis.

Table 5. Independent Sample T Test of Gender Difference

	Female	T	Sig. (Double Stern)
Perceived Usefulness	3.65±0.87	1.617	0.107
Perceived Ease of Use	4.11±0.69	-1.656	0.099
Perceived Goal Impediment	2.21±0.79	-0.052	0.581
Perceived Information Clutter	1.96±0.74	-0.093	0.926
Free Mindset	3.90±0.81	0.548	0.584
Use Willingness	3.6±1.1	0.457	0.648

Using one-way ANOVA to test the difference of free mindsets among users in different income ranges, as shown in Table 6, it is found that the significance $P > 0.05$, indicating that there is no significant difference in free mindset among different income groups.

Table 6. One-way Variance Test of Income Difference

Free Mindset	Students Without Formal Incomes	Less Than RMB 3000	RMB 3000 - 5000	RMB 5001 - 10000	RMB 10001 - 15000	RMB 15001 - 20000	RMB 20000 - 30000	More Than RMB 30000	F	Significance
	3.92±0.83	4.11±0.69	3.78±0.71	3.85±0.86	4.00±0.94	3.33±0.88	4.33±0.00	3.95±0.80	0.51	0.831

5.3 Hypothesis and Model Testing

Table 7. Correlation Analysis

	Perceived Usefulness	Perceived Ease of Use	Perceived Goal Impediment	Perceived Information Clutter	Free Mindset	Use Willingness
Perceived Usefulness	1					
Perceived Ease of Use	.124*	1				
Perceived Goal Impediment	-.231**	-.237**	1			
Perceived Information Clutter	-.305**	-.242**	.189**	1		
Free Mindset	.240**	.300**	-.266**	-.258**	1	
Use Willingness	.376**	.434**	-.450**	-.419**	.385**	1

*. Correlation is significant at 0.05 level (double stern)
 **. Correlation is significant at 0.01 level (double stern)

In this study, the correlation analysis of six core variables was carried out. As shown in Table 7, there is a significant correlation between the two variables ($p < 0.01$). The independent variables “perceived usefulness”, “perceived ease of use”, and “free mindset” are significantly positively correlated with the dependent variable “willingness to use”. However, the independent variables “perceived goal impediment” and “perceived advertising clutter” are negatively correlated with this dependent variable.

5.4 Analysis of Influencing Factors

In this study, the linear regression analysis was carried out by SPSS25, and the conclusions are shown in Table 8.

1. $R = 0.444 > 0.3$, which means that the fitting degree of this linear regression model is good. $VIF < 5$ means that there is no multicollinearity between two independent variables. If $F=52.842$ and $P < 0.001$, the regression equation is significant. P values between two variables are less than 0.05, among which perceived usefulness ($BETA=0.223 > 0$), perceived ease of use ($BETA=0.364 > 0$), and free mindset ($BETA=0.175 > 0$) all greatly and positively affect willingness to use. Perceived goal

impediment ($BETA = -0.357 < 0$) and perceived advertising clutter ($BETA = -0.306 > 0$) both negatively affected willingness to use.

Finally, the regression equation between variables is as follows. Willingness to Use = $2.012 + \text{Perceived Usefulness} * 0.023 + \text{Perceived Ease of Use} * 0.364 + \text{Perceived Goal Impediment} * -0.357 + \text{Perceived Advertising Clutter} * -0.306 + \text{Free Mindset} * 0.175$.

Table 8. Analysis of Influencing Factors

Module	Coefficients Not Standardized		Standardized Coefficients	t	Significance	VIF
	B	Standardized Error	Beta			
(Constant)	2.012	0.457		3.524	0.000	
Perceived Usefulness	0.223	0.054	0.183	4.139	0.000	1.165
Perceived Ease of Use	0.364	0.063	0.254	5.752	0.000	1.162
Perceived Goal Impediment	-0.357	0.058	-0.271	-6.167	0.000	1.146
Perceived Information Clutter	-0.306	0.063	-0.215	-4.818	0.000	1.187
Free Mindset	0.175	0.057	0.137	3.048	0.000	1.209
R ²					0.444	
F					52.842	
P					0.000	
Dependent Variables: Use Willingness						

5.5 Test of Mediating Effect and Regulating Effect

Using SPSS25 software, the author first regresses “perceived ease of use” (independent variable) to “perceived usefulness” (intermediary variable), which is then regressed from two models, including the regression of “perceived ease of use” (independent variable) to “willingness to use” (dependent variable) as well as the regression of “perceived ease of use” (independent variable) and “perceived usefulness” (intermediary variable) to “willingness to use” (dependent variable).

As shown in Table 9, as for the regression of “perceived usefulness → willingness to use” in the model, $P < 0.05$, then $X \rightarrow Y$ passes the significance level test with the correlation between two variables. It is necessary to compare the regression coefficient B2 of “perceived ease of use” in model 2 with the regression coefficient B1 of “perceived ease of use” in model 1 at this time. Since $0.563 < 0.621$, it is proven that the mediating effect of “perceived usefulness” is significant and partial.

Table 9. Mediating Effect Test of Perceived Usefulness

Module		Coefficients Not Standardized		Standardized Coefficients	t	Significance
		B	Standardized Error	Beta		
1	(Constants)	1.091	0.291		3.747	0
	Perceived Ease of Use	0.621	0.07	0.434	8.819	0
2	(Constants)	-0.148	0.324		-0.456	0.649
	Perceived Ease of Use	0.563	0.066	0.394	8.495	0
	Perceived Usefulness	0.399	0.057	0.327	7.054	0
a. Dependent Variables: Use Willingness						

Through the SPSS 25 extension program PROCESS, this paper analyzes the mediating effect of a free mindset. In Model 15, the independent variable = perceived ease of use, the mediator variable = perceived usefulness, the moderator variable = free mindset, and the dependent variable = willingness to use. According to the results in Table 10, the P value of interactivity Int is > 0.05 , which indicates that the moderator “free mindset” has no significant moderating effect on the relationship between the independent variable “perceived ease of use” and the mediator variable “perceived usefulness”.

Then, continuing to use Model 1 to test in turn, the author set the independent variables as “perceived goal impediment” and “perceived advertising clutter”, the regulatory variable as “free mindset”, and the dependent variable as “willingness to use”. According to the results in Table 10, the P values of interactive Int are all > 0.05 , indicating that the regulatory variable “free mindset” does not have a significant moderating effect in the relationship between independent variables “perceived goal impediment” and “perceived advertising clutter”.

Table 10. Test of Regulatory Effect of Free Mindset

Model 15						
	coeff	se	t	p	LLCI	ULCI
constant	3.639	.051	71.583	.000	3.539	3.739
X1	.341	.062	5.505	.000	.219	.463
M	.377	.064	5.909	.000	.251	.502
Int_1	-.111	.066	-1.685	.093	-.241	.019
Model 1						
	coeff	se	t	p	LLCI	ULCI
constant	4.399	.687	6.405	.000	3.048	5.750
X3	-.946	.256	-3.696	.000	-1.449	-.442
M	.067	.173	.385	.700	-.274	.408
Int_1	.123	.067	1.824	.069	-.010	.255
Model 1						
	coeff	se	t	p	LLCI	ULCI
constant	2.981	.640	4.655	.000	1.721	4.240
X4	-.432	.267	-1.615	.107	-.958	.094
M	.409	.161	2.535	.012	.091	.726
Int_1	-.015	.070	-.213	.832	-.153	.123

6. Research Findings

6.1 Significant Positive Impact of Perceived Usefulness and Perceived Ease of Use

H1 and H2 that millennial willingness to use smart TV is significantly positively affected by perceived usefulness and perceived ease of use has been demonstrated. Meanwhile, so has H3 that perceived usefulness has a partial mediating effect between perceived ease of use and willingness to use. These results are consistent with previous studies on the TAM model. The average values of perceived usefulness and perceived ease of use are close to 3.7 and 4.0, indicating that respondents have a strong perception of the usefulness and ease of use of smart TV. In this regard, the author makes a reasonable explanation as follows. Digital survival has already become the normal life of young millennials aged 18 to 29. As digital natives, they have mastered technology and social media as a platform for social connection, personalized service, and instant satisfaction (Moreno et al., 2017; [37] Singal, 2017) [38]. Importance has been attached to their autonomy in controlling the environment and they are good at using technology to cultivate a sense of control (Mangold & Smith, 2012) [39], which refers to their skillful use of high-tech products to extend their strength and make full use of technology to serve themselves, thus greatly improving the usefulness and ease of use of technology.

6.2 Significant Negative Effects of Perceived Goal Impediment and Perceived Advertising Clutter

According to the research, H4 and H5 that millennial users' perceived goal impediment to smart TV advertisements and perceived advertising clutter negatively affect their willingness to use smart TV have been verified. This finding is consistent with previous advertising research. However, the data after the questionnaire options are assigned show that the average values of "perceived goal impediment" and "perceived advertising clutter" are 2.19 and 2.0 respectively. In other words, millennial users show that the impact of perceived goal impediment and perceived advertising clutter for smart TV advertisements is not great during the investigation.

This reflects that millennial online users feel disturbed by smart TV advertisements and show passive adaptability to them. On the one hand, social media allows its users to control advertisement avoidance (Chi, 2011) [40] or choose advertisement content, method, and time (Kelly et al., 2010; [41] Malthouse et al., 2013) [42]. However, in the advertising context of smart TV, users must be forced to watch startup advertisements or rigid commercial implantation before watching TV programs, and cannot skip and block them. Therefore, the regression results show that the intrusive, exclusive, messy advertisements, goal impediments, and other factors brought by smart TV advertisements negatively affect users' willingness to use smart TV to a large extent. On the other

hand, millennial generations immersed for a long time in the Internet advertising mode have formed a high level of advertising adaptation. [43]

6.3 Significant Positive Impact and Regulation of the Free Mindset

According to the empirical results of the research hypothesis, it can be concluded that a significant positive correlation exists between “free mindset” and “use willingness”. As Dou puts it, “The free mindset is a strong tendency rooted in decades of free access to non-material goods.” In the early development of the Internet, using the free charge to grab users’ attention, a scarce resource, has become a marketing weapon. During this period, the public is delighted to enter the free Internet world from the paid traditional media. Moreover, this free mindset has been strengthened in the Internet world, which even formed the free dependence of the major netizens. People have expanded the imagination of the Internet as a democratic and open means of information dissemination. Besides, the artificially constructed concept of “free and shared Internet spirit” has forcibly transformed digital products and services into a nearly typical public product.

For the other half of the survey objects with the high free mindset in this study, this study explains the reasons as follows. First, smart TV and traditional TV are two products. However, based on the audience’s strong belief in the free mindset, everyone believes that they can access the content on the Internet anytime and anywhere without paying (Dou, 2004). Secondly, at present, smart TV users in China need to pay basic cable TV fees, broadband fees, and some paid movies at the request of copyright owners, which may be regarded as a public product with compulsory financing, so consumers become unwilling to pay for online content. Thirdly, consumers believe that under the invasion of advertising financing media, they have already paid for products with limited attention, and content providers should sell this service to advertisers instead of the audience (Niemandetal., 2019).[44] Just as a study on millennial Facebook advertisements, it is shown that they are participating in an implicit social contract, that is, they hope to receive advertisements from Facebook in exchange for free accounts (Milne and Gordon, 1993). [45]

7. Conclusion

Exploring the willingness and influencing factors of the millennial generation to use smart TV in the Chinese context, this study focuses on users’ perception of smart TV technology and its advertising effect, and further deepens their understanding of the millennial experience in using a smart TV. To a certain extent, it demonstrates the applicability of the integrated technology acceptance model and advertising avoidance model in the field of smart home appliances, which finds out the influence mechanism between factors and fills the gap of different user groups at home and abroad to accept smart TV. In addition, by introducing the variable of a free mindset, it breaks away from the technical worship of “technical magic bullet theory” for the technology acceptance model to a certain extent. Researching user participation from a deeper social and psychological level reveals the social relationship between audience and media innovatively to some extent. In the future, concerning how to optimize the experience of young audiences using smart TV, the author puts forward the following strategies. First, smart TV needs to play its unique competitiveness to meet the diversified and personalized needs of users. Second, the quality of advertisements should be improved, rather than the number of advertisements. Besides, the audience’s viewing experience of OTT advertisements should be optimized. Thirdly, the young audience’s awareness of payment should be cultivated, so as to improve the payment grading selection and meet users’ differentiated needs with various free mindsets. Fourth, industry norms should be strengthened not only for commercial realization, but also for providing users with audio and video experience.

At present, there are some limitations in research design and theoretical framework. First of all, the data of this study are collected cross-sectionally, while with the rapid development of technology, participants’ willingness to use smart TV may have changed. In the future, longitudinal research methods such as observation and interview can be combined to reveal users’ complex psychological

motivations and social factors. Secondly, future research can expand the research objects and further deepen the understanding of the free mindset. For example, the research of older users can be included.

References

- [1] All View Cloud. (2023). 2022 Annual Report of Color TV Market in China. Retrieved from 9 May, https://mp.weixin.qq.com/s/qhLSX_uEfUZA1bSmO6O3NQ.
- [2] Perse, E. M. & Ferguson, D. A. (1993). The impact of the newer television technologies on television satisfaction. *Journalism Quarterly*, 70(4):843-853.
- [3] Abrams, J. R. (2010). Asian American television activity: Is it related to out-group vitality?. *International Journal of Intercultural Relations*, 34(6):541-550.
- [4] Ren, T. F. (2007). The research on demand factors influencing the audience's watching behavior. Shanghai: Master Dissertation of Donghua University.
- [5] Zhang, T. D. & Li, D. (2003). The viewing behavior and the viewing mode of Beijingsee. *Social Sciences of Beijing*, (02), 137-142.
- [6] Mares, M. L. & Iv, E. H. W. (2006). In search of the older audience: Adult age differences in television viewing. *Journal of Broad casting & Electronic Media*, 50(04), 595-614.
- [7] Pool, I. D. S. (1983). *Technologies of freedom*. Cambridge:Belknap Press.
- [8] Jiang, Y. (2008). Research on the Chinese network TV audience interactions. Nanjing: Master of Nanjing Normal University.
- [9] Liu, Y. (2016). TV transformation and upgrading: Big screen ecology--Based on the Smart TV User Behavior and Media Ecology Theory. *TV Research*, 317(04), 1130-1140.
- [10] Liou, D. K., Hsu, L. C. & Chih, W. H. (2015). Understanding broadband TV users' continuance intention to use. *Industrial Management & Data Systems*.
- [11] Park, J. H. & Kim, M. K. (2016). Factors influencing the low usage of smart TV services by the terminal buyer sin Korea. *Telematics & Informatics*, 33(4), 1130-1140.
- [12] Horning, M. A. (2017). Interacting with news: Exploring the effects of modality and perceived responsiveness and control on news source credibility and enjoyment among the second screen viewers science direct. *Computers in Human Behavior*, (73), 273-283.
- [13] Guan, C. L., Mo, L. Y. & Peng, R. (2018). Research and optimization of smart TV interaction based on physical and mental characteristics of the elderly. *Public Communication of Science & Technology*, 10(24), 194-196+135.
- [14] Liu, W. (2021). Nursing the old: Problems, current situation and path of smart TV suitable for the old. *West China Broadcasting TV*, 42(11), 21-23.
- [15] Prensky, M. (2001). Digitalnatives and digitalimmigrants I. *Onthehorizon*, 9(5), 1-6.
- [16] Deng, X. X. (2012). Investigation and analysis of network TV use influence factors based on Xi'an college students. *Southeast Communication*, 92(04), 89-91.
- [17] Yu, J. J. (2013). The network television viewing behavior and impact study on female college students in TV 2.0 age. Chongqing: Master Dissertation of Southwest University.
- [18] Swidan, A., Al-Shalabi, H., Jwaifell, M. et al. (2013). The intensity and the factors affecting the use of social network sites among the students of Jordanian Universities. *International Journal of Computer Science Issues*, 10(1), 492-498.
- [19] Marketing Sherpa. (2016). Customers at is faction research study: data from 2,400 customers reveals how far companies must got to please (oralienate) customers.
- [20] Ivan, L., Nika, G., Cruz, P., Trisha, C. B., Luzaran, J. R., Antonio, E. & Etrata. (2022). Gen Z and TV: An analysis of traditional advertising medium and perception. *Millennium Journal of Humanities and Social Sciences*, 50-67.
- [21] Bondad-Brown, B. A., Rice, R. E. & Pearce, K. E. (2012). Influences on TV viewing and online user-shared video use: Demographics, generations, contextual age, media use, motivations, and audience activity. *Journal of Broadcasting & Electronic Media*, 56(4),471-493.

- [22] Lee, T. K. & Taylor, L. D. (2013). The motives for and consequences of viewing television medical dramas. *Health Communication*, 29(1),13–22.
- [23] Davis, F. (1989). Perceived usefulness, perceived ease of use and user acceptance of information technology. *MISQuarte*, 13(3), 319-341.
- [24] Wu, X. Y. & Jiao, Y. B. (2008). A study of factors affecting customers' adoption of Internet banking. *Nankai Business Review*, 11(06), 18-27.
- [25] Kuang, W. B., Lv, C. C. & Zhang, H. Y. (2020). The STIP model of new media research. *Journal of Renmin University of China*, 34(04), 125-134.
- [26] Speck, P. S., Elliott, M. T. (1997). Predictors of advertising avoidance in print and broadcast medial. *Journal of Advertising*, 2613, 61-76.
- [27] Yang, W. X. & Su, Y. (1995). Analysis of Zapping in advertisements--Avoiding advertisements. *Journal of Intelligence*, (4), 51-52.
- [28] Kaatz, R. B. (1986). Media Connections in a changing consumer environment. *Journal of Advertising Research*, 26(2), RC3-RC7.
- [29] Kitchen, P. J. (1986). Zipping, zapping and nipping. *International Journal of Advertising*, 5(2), 343-352.
- [30] Cho, C. H. & Cheon, H. J. (2004). Why do people avoid advertising on the Internet. *Journal of Advertising*, 33(4), 89-97.
- [31] Davis, F. (1989). Perceived usefulness,perceived ease of use and user acceptance of information technology. *MISQuarte*,13(3), 319-341.
- [32] Dou, W. (2004). Will Internet users pay for online content? *Journal of Advertising Research*, 44(4), 349-359.
- [33] Chen, Q. W. (2012). Charges of cable digital television service and related policies performance appraisal: A case study of Guangdong province. Guangzhou: Master Dissertation of South China University of Technology.
- [34] Kahneman, D. & Tversky, A. (1979). On the interpretation of intuitive probability: A reply to Jona than Cohen. *Cognition*, 7(4), 409–411.
- [35] Shampanier, K., Mazar, N. & Ariely, D. (2007). Zeroasa special price: The true value of free products. *Marketing Science*, 26(6), 742–757.
- [36] Goyanes, M., Demeter, M. & Grado, L. (2020). The culture of free: Construct explication and democratic ramifications for readers willingness to pay for publican fairs news. *Journalism*, 23(1), 207–223.
- [37] Moreno, F. M., Lafuente, J. G., Carre, F. A. & Moreno, S. M. (2017). The characterization of the millennial and their buying behavior. *International Journal of Marketing Studies*, 9(5), 135–44.
- [38] Singal, J. (2017). Snapchat? No, thanks. I'm an old millennial. CNN. Retrieved from May 1 <https://www.cnn.com/217/05/01/health/young-old-millennial-partner/index.html>.
- [39] Mangold, W. G. & Smith, K. T. (2012). Selling to millennial with online reviews. *Business Horizons*, 55(2), 141–53.
- [40] Chi, H. H. (2011). Interactive digital advertising vs.virtual brand community: Exploratory study of user motivation and social media marketing responses in Taiwan. *Journal of Interactive Advertising*, 12(1), 44–61.
- [41] Kelly, L., Kerr, G. & Drennan, J. (2010). Avoidance of advertising in social net working sites: The teenage perspective. *Journal of Interactive Advertising*, 10(2), 16–27.
- [42] Malthouse, E. C., Haenlein, M., Skiera, B., Wege, E. & Zhang, M. (2013). Managing customer relationships in the social media era:Introducing the social CRM house. *Journal of Interactive Marketing*, 27(4), 270–280.
- [43] Hu, Z. M., Cheng, Y. & Cui, H. Y. (2016). What converts online content consumers from free to free: perspective from mental inertia based on value-added experience. *Management Review*, 28(11), 116-128.
- [44] Niemand, T., Mai, R. & Kraus, S. (2019). The zero-price effect in freemium business models: The moderating effects of free mentality and price-quality inference. *Psychology & Marketing*, 36(8), 773–790.
- [45] Milne, G. R. & Gordon, M. E. (1993). Direct mail privacy-effectiveness trade-offs within an implied social contract framework. *Journal of Public Policy & Marketing*, 12(2), 206-15.