Proceeding Paper

Applying the Unified Theory of Acceptance and Use of Technology Model on the Behavior of Home Buyers Using Housing Apps [†]

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Abstract: It is convenient to have advances in science and technology so that people obtain information without going out. We explore the intention of the use of housing apps based on the unified theory of acceptance and the use of technology. A total of 365 questionnaires were collected with 8 incomplete answers discarded. The snowball sampling method was used for confirmatory factor analysis and SEM structural equation model analysis. The research results show the following. (1) Housing app users can quickly obtain knowledge and information about houses, and it is more convenient. (2) Both effort expectancy and social influence have a direct and positive effect on behavior intention when using the housing app. (3) There is no significant impact after adding moderator variables of gender, age, and income in Unified Theory of Acceptance and Use of Technology, (UTAUT). It is convenient and helpful to use the housing app. Therefore, the use of the housing app will be an indispensable trend.

Keywords: real estate; UTAUT; housing app

1. Introduction

In the past, the traditional real estate industry always relied on real estate agents taking customers to see their dream houses. Now, with the assistance of technology, many people read an overview at the "online house inspection", and then make an appointment with the real estate agents or the landlord to see the houses. At present, a housing app function has been combined with the GPS satellite positioning function to find out the route planning between the user's location and the object. After the outbreak of COVID-19 in 2019, the frequency of using apps and official website information tools by business personnel have increased by 20−30% [1]. Therefore, the impacts and factors of using housing apps are valuable topics for research.

This study is based on the unified theory of acceptance and use of technology (UTAUT) to revise and propose a more complete model and explain the users' behavior in using new technology information. According to the research from Chen [2] and Ke [3], the moderator variables of gender, age, and income are added in this research. Therefore, the intention of use and user behavior of real estate transaction platforms is researched, too. According to the research motivation, the three research objectives of this study are (1) to explore the behavior of housing app users by UTAUT; (2) to verify housing app users' use behavior by adding moderator variables; and (3) to compare two research models to verify the housing app users fit.

Through a literature review and analysis, two research models are used to explore the behavior of housing app users, including research model 1 to verify the behavior of housing

app users without adding moderating variables and research model 2 to verify the behavior of housing app users with moderating variables. The frameworks of this study include six dimensions of UTAUT: performance expectancy, effort expectancy, social influence, facilitating condition, behavior intention, and user behavior, and the three moderating variables of gender, age, and income.

2. Data Analysis

The snowball sampling method was used in this research, and the research objects were the users who have downloaded the housing apps or have used the housing apps to search for houses. Google online questionnaires were issued to Line groups and major social platforms. The questionnaire survey was performed as a pre-test and a formal survey. The formal questionnaire test period was from 1 April 2021 to 1 May 2021. A total of 365 questionnaires were distributed with 8 incomplete questionnaires, and the effective response rate was 98%.

The research tool is based on the UTAUT proposed by Venkatesh et al. [4] and refers to the Chinese scales translated by Kao [5] from Venkatesh et al. [4] and Chiang [6]. Referring to Ke [3], the items of this questionnaire were revised according to the purposes of this study. This research defined user behavior as the frequency of using housing apps to search for ideal objects every day. The questionnaire was divided into two parts. The first part was to know the influencing factors and intentions of housing app users' use behavior, including performance expectancy, effort expectancy, social influence, facilitating conditions, and intention of use. The second part was to know the personal background variables, including gender, age, and income. A 7-point Likert scale was used in this research, with 7-points scales for an agreement include 1 "strongly disagree" to 7 "strongly agree".

Smart PLS 2.0 was used to analyze the paths of model 1, UTAUT without moderator variables, and model 2, UTAUT with moderator variables. The results and the fits of the two models were compared. Model 1 is UTAUT without moderator variables, and the results of the relationship estimates for each potential variable are shown in Table 1. The significance test of each path takes a t-value > 1.96 as the critical value, which indicates whether the relationship between the variables reaches significant levels. Table 1 shows that all the paths are significant. The estimated effect of performance expectancy on behavioral intentions is −0.059, which is not significant. The estimated effect of effort expectancy on behavioral intention is 0.158, which reaches a significant level, a *p*-value < 0.05. The estimated effect of social influence on behavioral intention is 0.417, which reaches a significant level, a *p*-value < 0.05. The estimated effect of facilitating conditions on user behavior is 0.342, which reaches a significant level, a *p*-value < 0.05. The estimated effect of behavior intention on user behavior is 0.845, which reaches a significant level, a *p*-value < 0.05.

Table 1. Path coefficient of dimensions of model 1.

Variable Paths	Standardization Coefficient	SE	t Value	*p* Value
Performance expectancy→Behavior intention	−0.059	0.039	1.511	0.132
Effort expectancy→Behavior intention	0.158	0.058	2.734 *	0.007
Social influence→Behavior intention	0.417	0.07	5.997 *	0.000
Facilitating conditions→Use behavior	0.342	0.056	6.158 *	0.000
Behavior intention→Use behavior	0.845	0.021	41.047 *	0.000

* *p* < 0.05.

According to the results in Table 2, the path of research model 1 affects the relationships. Effort expectancy and social influence have a direct and positive effect on behavior intention. The coefficient values are 0.158 and 0.417. Effort expectancy, social influence, and behavior intention have an indirect and positive effect on user behavior. The coefficient values are 0.133, 0.352, and 0.845. Facilitating conditions have a direct and positive effect on user behavior. The coefficient value is 0.342. According to the results, H1-2, the effort expectancy of housing APP users have significant effect on behavior intention, H1-3, the

social influence of housing APP users have significant effect on behavior intention, H1-4, the facilitating conditions of housing APP users have significant effect on use behavior, and H1-5, the behavioral intention of housing APP users have significant effect on use behavior, are supported. Effort expectancy, social influence, and facilitating condition have positive impacts on behavioral intention, which indicating that with the prevalence of the Internet, information acquisition methods have diversified. The promotion of mass media, Internet media and related industries can increase the number of buyers. The behavioral intention of using housing APP means that App users believe that they can obtain effective housing information from the APP on their smartphones, and improve the users' in finding housing. The path model diagram is shown in Figure 1.

Table 2. Direct and indirect influence between various dimensions of model 1.

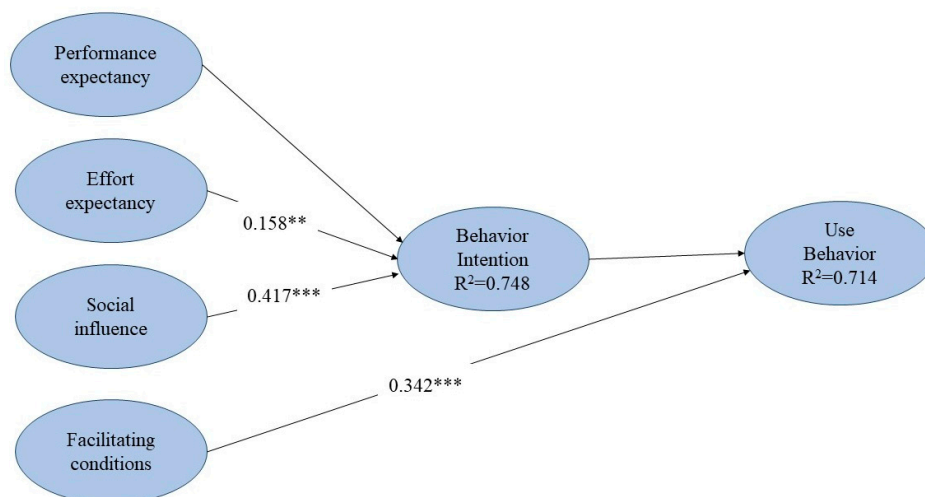| Dimensions | Behavior Intention | | Use Behavior | | |
	Directly	Indirectly	Directly	Indirectly	Total Effect
Performance expectancy					
Effort expectancy	0.158			0.133	0.133
Social influence	0.417			0.352	0.352
Facilitating conditions			0.342		0.342
Behavior intention				0.845	0.845
R^2	0.748		0.714		

Figure 1. Path diagram of model 1. Note: ** t > 2.58, *p* < 0.01; *** t > 3.29, *p* < 0.001.

PLS-SEM uses GOF value as an indicator of overall model fit. Cronbach's α measures the internal consistency and stability of the dimension, and R^2 represents the explained variation of the model's internal factors. According to the results of Table 3, the GOF of the model in this study is 0.422, which means the model fits well in the model. Cronbach's α is above 0.8, which has good reliability and R^2 of behavioral intention and use behavior are, respectively, 0.748 and 0.714, which means that the model has middle and high explanatory power.

Model 2 shows the results of the UTAUT with moderator variables (Table 4). In the significance test of each path, a t-value > 1.96 is regarded as the critical value, which indicates whether the relationships between the variables reach significant levels. Table 4 shows that social influence affects behavior intention and behavior intention affects user behavior significantly. The estimated effect of social influence on behavior intention is 0.821, the estimated effect of facilitating conditions on user behavior is 0.214, and the estimated effect of behavior intention on user behavior is 0.661 at a significant level, a *p*-value < 0.05.

Table 3. Goodness-of-fit of model 1.

	Average Variance Extracted, AVE	Composite Reliability	R^2	Cronbach's Alpha	Redundancy	Good of Fitness, GOF
Performance expectancy	0.630	0.931		0.914		
Effort expectancy	0.604	0.924		0.906		
Social influence	0.700	0.933		0.914		
Facilitating conditions	0.818	0.931		0.889		0.422
Behavior intention	0.831	0.936	0.748	0.898	0.172	
Use behavior	0.794	0.920	0.714	0.870	0.564	
Performance expectancy	0.630	0.931		0.914		
Effort expectancy	0.604	0.924		0.906		

Table 4. Path coefficient of dimensions of model 2.

Variable Paths	Standardization Coefficient	SE	T Value	*p* Value
Performance expectancy→Behavior intention	−0.931	0.203	0.458	0.648
Effort expectancy→Behavior intention	−0.170	0.284	0.596	0.551
Social influence→Behavior intention	0.821	0.233	3.524 *	0.000
Facilitating conditions→Use behavior	0.214	0.114	1.879	0.061
Behavior intention→Use behavior	0.661	0.060	11.082 *	0.000

* $p < 0.5$.

The results of the moderator estimates of each moderator variable in model 2 are shown in Table 5. The significance test of each path takes a t-value > 1.96 as the critical value, which indicates whether the relationships between the variables reach a significant level.

Table 5. Path coefficient of moderator variables of model 2.

Moderating Variables	Moderating Paths	Standardization Coefficient	SE	t Value	*p* Value
Gender	Performance expectancy→Behavior intention	0.257	0.287	0.898	0.370
	Effort expectancy→Behavior intention	0.305	0.426	0.716	0.474
	Social influence→Behavior intention	0.053	0.287	0.184	0.854
Age	Performance expectancy→Behavior intention	−0.250	0.319	0.780	0.436
	Effort expectancy→Behavior intention	0.608	0.361	1.683	0.093
	Social influence→Behavior intention	−0.260	0.302	0.860	0.391
	Facilitating conditions→Use behavior	0.148	0.175	0.846	0.398
Income	Effort expectancy→Behavior intention	0.407	0.343	1.188	0.236
	Social influence→Behavior intention	−0.321	0.280	1.146	0.253
	Facilitating conditions→Use behavior	−0.183	0.156	1.177	0.240

According to the results in Table 6, the paths of research model 1 directly and indirectly affect the relationships with moderator variables. Social influence has a direct and positive effect on behavior intention with a coefficient value of 0.821. Social influence has an indirect and positive effect on user behavior with a coefficient value of 0.543. Behavior intention has a direct and positive effect on user behavior with a coefficient value of 0.661. According to the results of hypothesis 2, only H2-3 and H2-5 are supported. The path model diagram is shown in Figure 2.

Table 6. Direct and indirect influence between various dimensions of model 2.

Dimensions	Behavior Intention		Use Behavior		Total Effect
	Direct	Indirect	Direct	Indirect	
Performance expectancy					
Effort expectancy					
Social influence	0.821			0.543	0.543
Facilitating conditions					
Behavior intention			0.661		
R²	0.714		0.735		
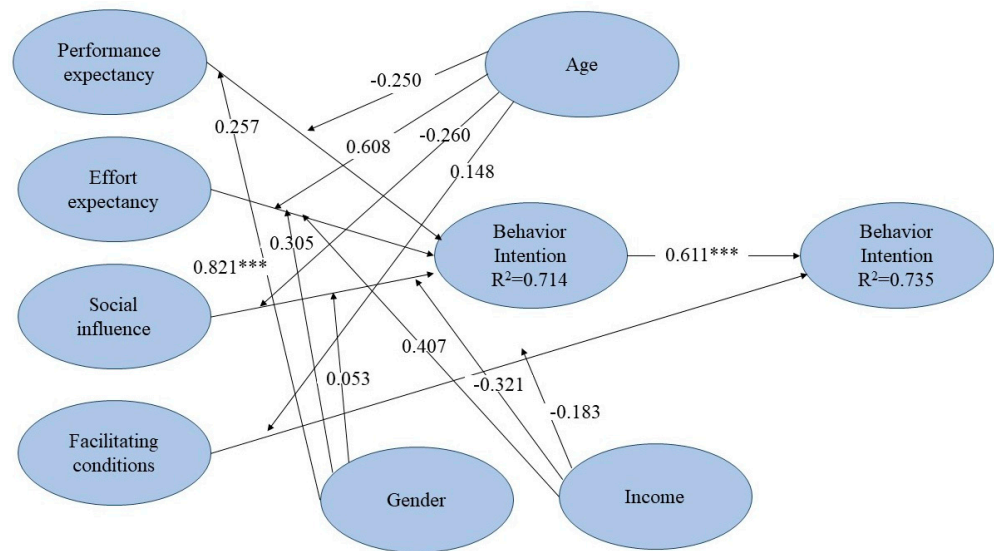
Figure 2. Path diagram of model 2. Note: *** t > 3.29, $p < 0.001$.

According to Table 7, the GOF is 0.420, which presents the model fits well in this study. Cronbach's α is above 0.8, which has good reliability and R^2 of behavioral intention and use behavior are, respectively, 0.714 and 0.735, which means that the model has middle and high explanatory power.

Table 7. Path diagram of model 2.

Dimensions	AVE	Composite Reliability	R²	Cronbach's α	Redundancy	GOF
Performance expectancy	0.629	0.931		0.914		
Effort expectancy	0.605	0.924		0.906		
Social influence	0.699	0.933		0.914		0.420
Facilitating conditions	0.818	0.931		0.889		
Behavior intention	0.831	0.936	0.714	0.898	−0.231	
Use behavior	0.794	0.920	0.735	0.870	−0.014	

3. Discussion

3.1. Verifying Research Hypotheses

3.1.1. H1: Housing App Users Have a Significant Effect on UTAUT

According to Table VIII, the research model 1, H1-2, H1-3, H1-4, and H1-5 are established, which is consistent with the research from Chen [2]. Performance expectancy, effort expectancy, social influence, and facilitating conditions have a significant positive impact on behavior intention, indicating that with the prevalence of the Internet, the methods of acquiring information have become more diversified. It promotes through the media and online media in related industries to increase the behavior intention of buyers to use

the housing apps. It also presents that app users think they can obtain effective housing information from the apps and find a house. In model 1, performance expectancy has no significant impact on behavior intention. It is speculated that although housing app users think the app is easy to use, they do not completely trust all the information in the app because the users still need to confirm the house condition and judge the house before buying it or not.

3.1.2. H2: Housing APP User Moderator Variables Have a Significant Moderating Effect on UTAUT

According to Table 8, in model 2, H2-3, and H2-5 are supported. However, in the moderator path, gender, age, and income do not meet the significant level, which is consistent with the result of Chang [7] and Weng and Huang [8]. Currently, not only do men want to buy a house and use the searching tools to find houses but women can make money independently. Therefore, the results have no significant effect by gender. When age and income variables are not significant factors, it is inferred that younger users may want to see houses through the housing app, but they are less likely to buy a house because of budget. Relatively, older people use housing apps less than young people, and some of them still use a traditional way to see houses.

Table 8. Comparison of the fit of research models.

Indicators	Research Model 1	Research Model 2
GOF value	0.422	0.420
Behavior intention R^2	0.748	0.682
Use behavior R^2	0.714	0.763

3.1.3. Comparison of the Fit of Research Models

According to the analysis results of models 1 and 2, the results and details are as follows.

According to the results in Table VIII, the GOF value of model 1 with external variables is higher, and the R2 of research model 1 is higher. According to Wetzels et al. [9], a GOF value around 0.1 represents a weak model fit, a GOF value greater than 0.25 represents a moderate model fit, and a GOF value greater than 0.36 represents a good model fit. R2 is a measure of the explanatory power of the dependent variables in the model. Hair and Sarstedt [10] pointed out that R2 was divided into weak, moderate, and high explanatory power at 0.25, 0.50, and 0.75. According to the results in Table VIII, the GOF values of the two research models are 0.420 and 0.422 and the R2 is between 0.682 and 0.763, which indicates that both models have a good model fit and a moderate to a high level of explanatory power.

4. Conclusions and Suggestions

4.1. Conclusions

4.1.1. Validation of UTAUT without Moderator Variables

According to the results of model 1, "behavioral intention" has significant explanatory power, affects user behavior, and also increases the user's loyalty, because the users of housing apps can save time and obtain effective housing information without spending too much effort. In recent years, app platforms have brought convenience and dependence to people. Therefore, the use of housing apps has an impact on users.

4.1.2. Validation of UTAUT with Moderator Variables

According to the results of model 2, housing apps are undoubtedly one of the indispensable social tools for young users. However, their income is not equivalent to older people, so the rate of using housing apps for the younger group is not higher than that for older people. Because of gender equality, the concept of males being in charge of housing

no longer exists. Both men and women can freely want to buy a house and see a house. Women may also be the head of the family and choose to buy a house. Power is no longer a matter of one-sided choice.

4.1.3. Suggestions

(a) The research results show that users can obtain housing information on the housing apps, which means that the apps have practical value. Therefore, we suggest that app users are more likely to know accurate information about houses through an app that is constantly updated. In addition, the successive launch of apps specially made for housing transaction information are tools that the public can consider using, which also saves the time and energy of looking for houses.

(b) The public generally likes to watch short videos on the Internet, with YouTube becoming a popular platform in recent years. Most of the information included in the housing apps is text and pictures. Although there are photos for users to observe the condition of the houses, it is suggested that real estate agents use small video clips to introduce various housing conditions and introduce a personal grid so that the public can better understand the actual situation and users do not feel that the process is monotonous and instead has a sense of fun.

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