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Research on User Focus Model of APP Dynamic Effect in Interface Design

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Abstract:

In the era of the experience economy, users are no longer satisfied with the technology and functions of mobile applications, and friendly mobile APPs are more user-friendly. Based on Material Design's interactive animation theory, this research studies the user's focus and immersion in APP use by expanding the three dimensions of TAM, and compares the impact of different interactive animations on users' focus and immersion in different applications, so as to obtain The theoretical assumption model of user focus and immersion in motion design is proposed to supplement the extended research of TAM model theory in interaction design. Finally, the hypothesis theoretical model of this paper is tested. Provide a certain reference for the design of the interface APP dynamic effect.

1. Introduction

With the arrival of the 5g era, interactive animation is bound to make breakthrough progress in-app the application field, so as to provide users with a more real, efficient, interesting, convenient, and fast experience.

Dynamic effect design brings users a comfortable user experience, but user experience, in turn, optimizes the design of interactive dynamic effect, making interactive dynamic effect design more intimate. As people spend more and more time using mobile phones, the immersive experience that mobile phones bring to users through apps is gradually becoming different. The sense of immersion brought by the app to users is multifaceted. From the design perspective, the sense of immersion in the process of APP use is the user's high-level experience and penetrates all aspects of the design.

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2. The Importance of Interactive Animation Design in Interface Design

The research shows that adding appropriate animation effects to the interactive interface design of software products can significantly improve the friendliness of products. Interactive animation not only makes the operation interface more gorgeous but also makes the operation more interesting. More importantly, it can make the operation a process, increase the operator's understanding of the operation, and make the operation more recognizable. The animation in the interface design will reduce the work efficiency of the product to a certain extent.

Take the music friend app as an example, the entire app interface uses sketches for creation, and icons, logos, and illustrations use AI to draw vector diagrams to prepare for the later expansion. Principle and after effect are selected for dynamic effect and production. The final packaging is designed and produced by Photoshop.

The cheerful rhythm of the landing page can be fascinating, just like the window of a clothing store. Of course, a good "window" can be fascinating. Using simple graphical thinking to deal with illustrations can make the landing page screen not messy and orderly, and then cooperate The theme color of music friends is associated with the interface to enhance the unity.

Banner uses a three-dimensional representation of cards and projection. Smooth page-turning brings a good visual experience. The homepage is presented as a waterfall page, continuing the homepage representation of traditional music apps. The capsule advertisement selects interesting illustrations. Dynamic effect design brings users a comfortable user experience, but the user experience, in turn, optimizes the design of interactive dynamic effect, making the interactive dynamic effect design more intimate, as shown in Figure 1.

Figure 1. Screenshots of "music friend app".

3. Build a Focus Model in App Dynamic Design

Technology acceptance model, TAM is considered to be one of the most influential and commonly used information control system theories. Tam is used to describe an individual's acceptance of information. The fields involved in Tam continue to develop with the persistent efforts of a large number of researchers. However, in the field of interaction design, there is still little research that extends to app. Based on the previous theories, this paper carries out the research on user focus immersion in app dynamic design, and uses Likert scale and experimental data to verify the hypothetical

relationship model between dynamic design and focus immersion, as well as user satisfaction.

3.1. The impact of dynamic design on perceived usefulness and ease of use

Dynamic effect design is the design of dynamic effect. The effect of all movements on the user interface can be regarded as the intersection of interface design and animation design. According to the influence of interactive design development on animation, this paper divides the dynamic design into ordinary dynamic design and dynamic design based on material design. In the field of interface design, Baecker RM and small are the first to propose that different animations can have different effects on the user interface.

The research suggests that animation makes use of the human experience of how objects move in the real world, creating perceptual continuity for users. Apply subtle animation to interface design to make changes on the screen clear [2]. This research proposes for the first time that applying animation motion rules to the user interface can improve users' perceived ease of use.

3.2. The influence of dynamic design on perceived enjoyment

In recent years, scholars moon and Kim have used the perceived enjoyment of intrinsic motivation factors in the concept of flow to expand Tam, indicating that enjoyment is an important factor to motivate users to use the system. Designers should consider internal and external incentives in user interface design to help improve usability[1].

Scholars Bruce h Thomas and Paul Calder proposed that the technology borrowed from comics and computer animation can enhance the experience of computer interaction, and proved by experiments that the rational application of "hedonic" components can make the interface smoother and more pleasant to use [2].

3.3. Effects of perceived usefulness and ease of use on focusing force

Researchers proposed a reality-based interactive framework, including four themes: (1) natural physical reflection; (2) Body awareness and skills; (3) Environmental awareness and skills; (4) Social awareness and skills. Through the positive impact of dynamic design on perceived usefulness and ease of use, users can achieve immersion.

Interaction design not only focuses on how to make users more easily identify products and operate products but also on how to make users obtain emotional pleasure and satisfaction. This demand for emotion is the result of users' pursuit of experience [3]. From the perspective of interaction design, ou Xifan and Tan Hao put forward the interaction design based on the premise of being useful, easy to use, and want to use, which helps users get a better emotional experience, that is, focus and immersion [4].

3.4. The effect of perceived enjoyment on focusing force

The most widely used theory of concentration immersion is in games. In the process of experiencing the game, people also feel and enjoy the most. Koufaris applied mobility theory to study online consumers' purchasing behavior and asserted that mobility experience consists of perceived enjoyment, concentration, and perceived control [5]

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3.5. The impact of on focusing force on user satisfaction

When users are completely immersed in an app or a certain occurrence process, they will have the feeling of forgetting time, so as to improve user satisfaction. Researchers have proposed that the focusing force will affect users' satisfaction, thus determining the sustainability of their use of mobile Internet services [6].

3.6. Theoretical assumptions

Based on the dynamic design of material design, the enhanced TAM model is used to study the impact of dynamic design on focus immersion, and a theoretical hypothesis model is established in Figure 2.
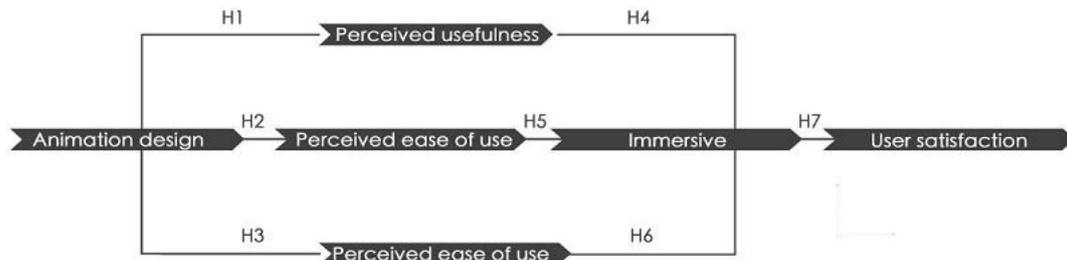

Figure 2. *Hypothesis theory model.*

4. Measure of Concept

The measure studied in this paper is a research measure proposed by relevant scholars, which is modified and summarized in combination with the research field and investigation of this paper.

4.1. Perceived usefulness

Perceived usefulness refers to the subjective belief that users can improve work efficiency when using a specific system. According to the research measurement of perceived usefulness proposed by relevant scholars, combined with this paper, the measurement is carried out through four aspects, as shown in Figure 3.

Item of perceived usefulness measure
This animation helps me improve my efficiency
This animation effect makes the task that the user wants to complete easier to complete
This animation effect helps users improve work efficiency

Figure 3. *Measure of perceived usefulness*

4.2. Perceived ease of use

Perceived ease of use means that users think it can save them trouble when using a specific system. The higher the perceived ease of use, the more positive the user's attitude toward us. At the same time, the higher the perceived ease of use of users, the greater the perceived usefulness [7]. According to the measurement of perceived ease of use proposed by relevant scholars, combined with this paper, the measurement is carried out from four aspects, Figure 4.

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Perceived ease of use measurement item
Animation makes learning easier
The dynamic effect is easier to use
Animation effects enable users to familiarize themselves with functions in the least amount of time

Figure 4. Measure of perceived ease of use

4.3. Perceived enjoyment

Perceived enjoyment refers to the feeling that users feel happy or interesting when using a particular system. In in-game applications, users will have a very obvious sense of enjoyment. In-app, the most important thing is to make users feel enjoyable through the process of interaction. According to the measurement questions of the research on perceived enjoyment by Lavie Talia and Stravinsky Noam, combined with this paper, the measurement is carried out from four aspects, as shown in Figure 5.

Perceived enjoyment measures the item
Make the user feel very happy during use
Users are happy to use this service
The use process feels very boring

Figure 5. Measure of perceived enjoyment.

4.4. Focusing force

The measurement of focus immersion requires people to judge their own emotions. When a user uses a certain system, he fully exerts his skills and loses a sense of space and time. When the balance between the skill level and the challenge level reaches the highest value, an immersion effect will occur, which is usually called the "the Forget me" state. The state of "forgetfulness" is most likely to occur when a person performs a task or activity wholeheartedly for an inner purpose. And the person must be in an active state, and the immersion state is most likely to occur.

According to Hamilton Mitchell, Kaltcheva Velitchka D, and Rohm Andrew J, the measurement questions of concentration and immersion, combined with this paper, are measured from four aspects, Figure 6.

Focus on immersion items
Mind-wandering during use
Immerse in interaction
Time flies

Figure 6. Measure of concentration immersion.

4.5. User satisfaction

The measurement of concentration immersion requires people to judge their own emotions. When users use a specific system, they give full play to their skills and lose the sense of space and time. When the skill level and challenge level reach the balance of the highest value, they will have an immersion effect, which is usually called "selflessness". When a person wholeheartedly performs a task or activity for his

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internal purpose, he is most likely to have a "selfless" state. Moreover, this person must be in a positive state to be most likely to be immersed [15].

According to the measurement question of focus immersion proposed by Hamilton Mitchell, kaltcheva velitchka D, and Rohm Andrew J, combined with this paper, the measurement is carried out from four aspects, as shown in Figure 7.

User satisfaction measurement items
No difficulty in interaction
The interactive mode meets the user's needs
Willing to use this product

Figure 7. Measure of concentration immersion.

5. Experimental Verification of Focusing Force Model

5.1. Experimental process

In the first part, according to the previous theoretical model and research measures, a questionnaire is developed.

In the second part, a small number of people were surveyed, and the sentences, semantics, and experimental materials of the questionnaire were modified in a small range.

The third part is to distribute the questionnaire on a large scale and sort out and analyze the later data. This paper mainly uses the Internet questionnaire star to conduct a questionnaire survey. There are 32 questions in the questionnaire. 1~8 questions are about the basic situation of the subjects. The following questions are set according to the Likert scale. If you disagree, you will get 1 point. If you agree, you will get 5 points. Before answering, the subjects will watch the design of two different interactive dynamic effects. Some people will answer questions about the 01 dynamic effect, and some people will answer questions about the 02 dynamic effect.

One hundred and sixty-nine questionnaires were finally recovered. Twelve questionnaires that were selected to answer the same question and had a short answer time were excluded as invalid questionnaires. The remaining 157 questionnaires met the conditions of this study, with a total recovery rate of 92%.

5.2. experiment purpose

In this experiment, a questionnaire survey is used to verify the correlation between h1-h3 dynamic effect design and perceived usefulness, perceived ease of use and perceived enjoyment, h4-h6 perceived usefulness, ease of use, enjoyment and focused immersion, and H7 focused immersion and user satisfaction based on the theoretical hypothesis model through correlation analysis and regression analysis, so as to verify the theoretical hypothesis model.

5.3. Experimental materials

This experimental material follows the dynamic design principle of material design and selects the dynamic design of the information module in the common information preview in the app field as the experimental content.

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The first set of materials is a comparison of dynamic design with uniform motion and slight elastic motion. The second set of materials is the dynamic effect design comparison of linear motion and curve motion. There are obvious differences between the two groups of materials, which is consistent with this study and suitable for use as experimental materials.

5.4. Analysis of experimental data

5.4.1. Basic information analysis

The basic information of gender, age, and work status in the questionnaire collected in this study were statistically analyzed. See Figure 7 for specific statistical data.
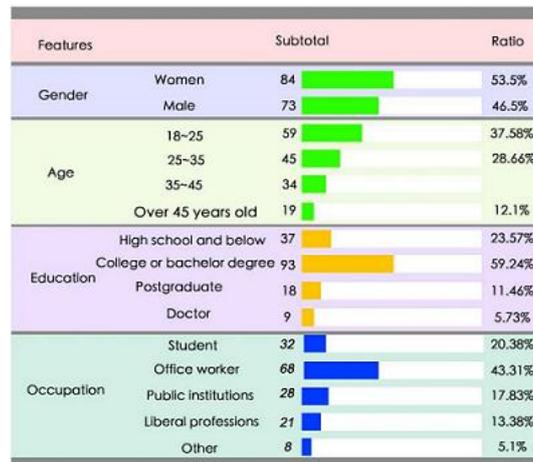
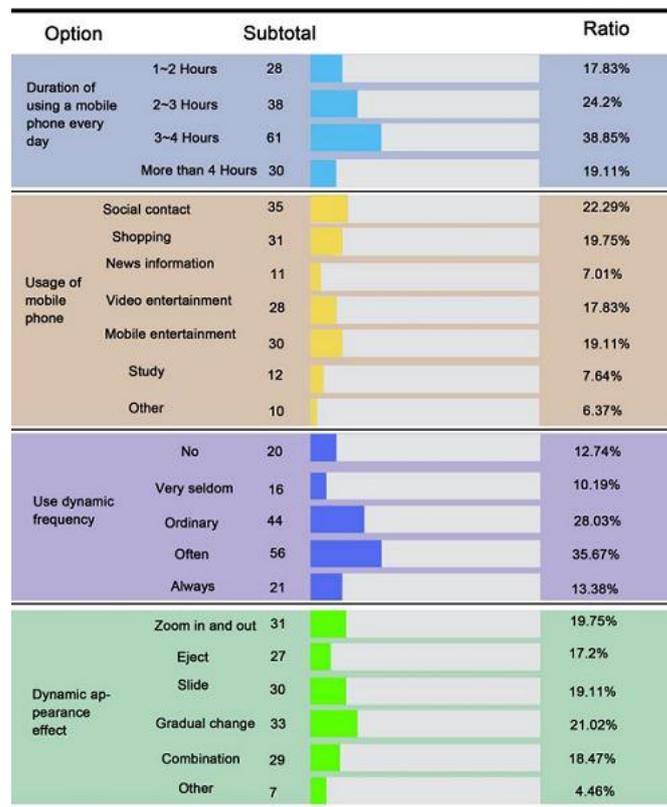

Figure 7. *Statistics of population characteristics.*

Figure 8. *Users' use of APP.*

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The male-to-female ratio of the survey respondents was about 46:53, and the two were even. The survey groups were concentrated among young people and highly educated people. The occupational distribution is dominated by office workers, but there are also students and freelancers. Office workers account for 61.1%, students account for 20.3%, and freelancers account for 13.38%. Figure8.

The following points can be drawn from the comprehensive analysis, Figure 9.

		Average value	Standard deviation	Error average
Interactive animation	Useful	11.8081	0.26109	2.59779
Normal effect	Useful	10.8793	0.35987	2.74071
Interactive animation	Convenient to use	11.4141	0.23593	2.34743
Normal effect	Convenient to use	10.0172	0.17303	1.31778
Interactive animation	Enjoy	11.9798	0.22056	2.19452
Normal effect	Enjoy	10..3448	0.23790	1.81177

Figure 9. Statistics of general and interactive dynamic design for expanding independent TAM samples.

The proportion of men and women in the survey object is about 46:53, and the two are in the same state. The survey group is concentrated on young people and highly educated people. The occupational distribution is dominated by class workers above grade, but also students and freelancers. Office workers account for 61.1%, students account for 20.3%, and freelancers account for 13.38%, (Figure 7).

1) The following points can be drawn from the comprehensive analysis of the Figure 8.

2) Users are very dependent on mobile phones. As can be seen from the first part of Figure 8, most users use their mobile phones for about 4 hours every day. 38.85% of the users use mobile phones for 3~4 hours a day, while 19.11% of the users use mobile phones for more than 4 hours a day.

3) Mobile Internet and app have gradually replaced traditional phones, TVs, and game consoles. It can be seen from the second part of Figure 7 that most users use apps for social communication, shopping, entertainment, etc. social communication accounts for 22.29%, shopping accounts for 19.75%, and mobile entertainment accounts for 36%. These are the main purposes of users using mobile phones.

4) The frequency of interactive animation in apps is also increasing. As can be seen from the third part of Figure 7, 35.67% of the subjects said that interactive animation often appeared in the app, and 28.03% of the subjects thought that the frequency of interactive animation was average.

5) According to the statistics in the fourth part of Figure 7, we can see that the frequency of all simple interactive animations is the same, indicating that simple dynamic effects occur more frequently in the design of the app. The main effects are sideslip (accounting for 19.11%), gradient (accounting for 21.02%), zoom in, and zoom out (accounting for 19.75%).

5.4.2. The impact of interactive dynamic effect design in APP on expanding Tam

The statistics of common dynamic effect and interactive dynamic effect design for expanding Tam independent samples are shown in Figure 9. The average score of perceived usefulness under interactive dynamic effect conditions is 11.80, and the

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standard deviation is 2.59; The average score of perceived ease of use is 11.41, and the standard deviation is 2.34; the average score of perceived enjoyment is 11.97, and the standard deviation is 2.19; The average score of perceived usefulness was 10.87 and the standard deviation was 2.74; The average score of perceived ease of use is 10.01, and the standard deviation is 1.31. The average score of perceived enjoyment is 10.34, and the standard deviation is 1.81. The independent sample t-test method is used for further analysis, and the results are shown in Figure 10. The results showed that there was the greatest difference in perceived enjoyment between interactive and general motor effects (t=4.795, p<0.00); The second was perceived ease of use (t=4.161, p<0.00); The difference in perceived usefulness was the smallest (t=2.119, p<0.05).

			T-test for equality of mean values			95% Confidence interval	
	T	Freedom	Significance P	Mean difference	Standard error difference	Lower limit	Upper limit
Perceived usefulness	2.119	155	0.036	0.92877	0.43840	0.06277	1.79477
Perceived ease of use	4.161	155	0.000	1.39690	0.33574	0.73368	2.06012
Perceived enjoyment	4.795	155	0.000	1.63497	0.34097	0.96142	2.30852

Figure 10. *Test of general dynamic effect and interactive animation for expanding independent TAM samples.*

5.4.3. The impact of interactive motion design in APP on perceived usefulness

Establish a regression equation. The results are shown in Figure 11, which is divided into the analysis of the variance table and coefficient table. First look at the ANOVA table, R^2 Is 0.025. R^2 That is, the square value of R represents the explanation degree of the independent variable to the dependent variable and represents the explanation degree of the regression equation to the dependent variable. This shows that the degree of explanation of interaction effect on perceived usefulness reaches 2.5%. Secondly, look at the significance p-value. If $p<0.05$, it means that at least one independent variable can effectively predict the dependent variable. As shown in Figure 10, $p<0.05$ indicates that interactive animation can effectively predict perceived usefulness. Finally, look at the coefficient table, which is the significant influence result of independent variables. It mainly depends on the significance value. If $p<0.05$, it indicates that the independent variable has a significant impact on the dependent variable. $P<0.05$ in the table indicates that interaction has a significant positive impact on perceived usefulness. Therefore, suppose H1 is true.

5.4.4. Impact of APP interaction design on perceived ease of use

H2 linear regression analysis is shown in Figure 11. The regression equation is established with perceived ease of use as the dependent variable and interactive dynamic effect as the independent variable. Results as explained in 3.4.3, the R of interaction effect on perceived ease of use ^{2} Up to 10.8%, $P<0.05$. From the above data analysis, it can be seen that the interaction dynamic effect positively affects the perceived ease of use, so hypothesis H2 is valid.

5.4.5 Impact of APP interaction design on perceived enjoyment

See Figure 11 for H3 linear regression analysis. The regression equation is established with perceived enjoyment as the dependent variable and interactive dynamic effect as the independent variable. Results as explained in 3.4.3, the R of interaction effect on perceived ease of use ^{2}= 14.3%, $P<0.05$. From the above data

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analysis, it can be seen that the interactive dynamic effect positively affects the perceived enjoyment, so H3 is assumed to be true.
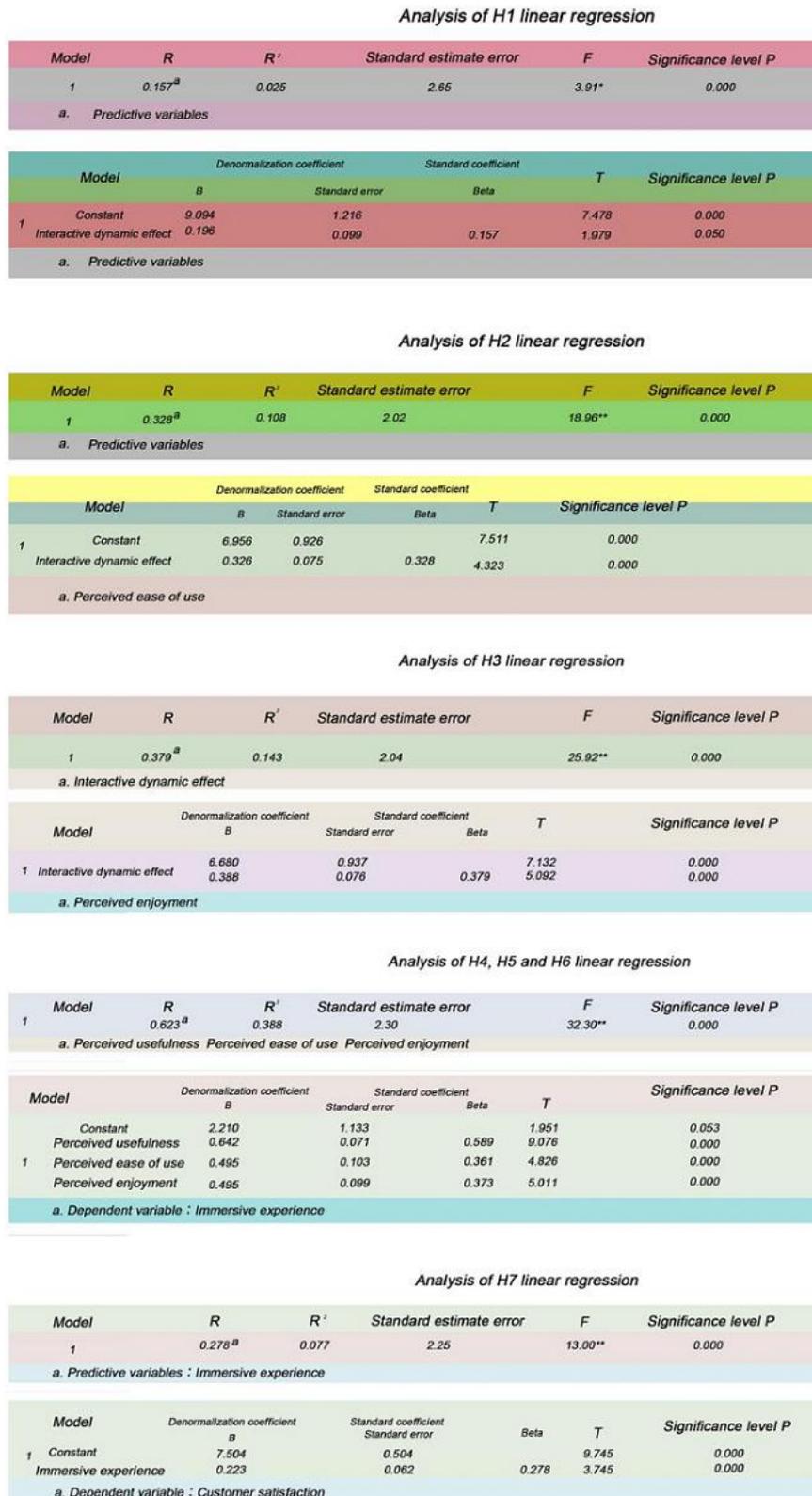
Analysis of H1 linear regression

Model	R	R^2	Standard estimate error	F	Significance level P
1	0.157^a	0.025	2.65	3.91*	0.000
a. Predictive variables					

Model	Denormalization coefficient		Standard coefficient	T	Significance level P
	B	Standard error	Beta		
1 Constant	9.094	1.216		7.478	0.000
Interactive dynamic effect	0.196	0.099	0.157	1.979	0.050
a. Predictive variables					

Analysis of H2 linear regression

Model	R	R^2	Standard estimate error	F	Significance level P
1	0.328^a	0.108	2.02	18.96**	0.000
a. Predictive variables					

Model	Denormalization coefficient		Standard coefficient	T	Significance level P
	B	Standard error	Beta		
1 Constant	6.956	0.926		7.511	0.000
Interactive dynamic effect	0.326	0.075	0.328	4.323	0.000
a. Perceived ease of use					

Analysis of H3 linear regression

Model	R	R^2	Standard estimate error	F	Significance level P
1	0.379^a	0.143	2.04	25.92**	0.000
a. Interactive dynamic effect					

Model	Denormalization coefficient		Standard coefficient	T	Significance level P
	B	Standard error	Beta		
1 Interactive dynamic effect	6.680	0.937		7.132	0.000
	0.388	0.076	0.379	5.092	0.000
a. Perceived enjoyment					

Analysis of H4, H5 and H6 linear regression

Model	R	R^2	Standard estimate error	F	Significance level P
1	0.623^a	0.388	2.30	32.30**	0.000
a. Perceived usefulness Perceived ease of use Perceived enjoyment					

Model	Denormalization coefficient		Standard coefficient	T	Significance level P
	B	Standard error	Beta		
Constant	2.210	1.133		1.951	0.053
Perceived usefulness	0.642	0.071	0.589	9.076	0.000
1 Perceived ease of use	0.495	0.103	0.361	4.826	0.000
Perceived enjoyment	0.495	0.099	0.373	5.011	0.000
a. Dependent variable : Immersive experience					

Analysis of H7 linear regression

Model	R	R^2	Standard estimate error	F	Significance level P
1	0.278^a	0.077	2.25	13.00**	0.000
a. Predictive variables : Immersive experience					

Model	Denormalization coefficient		Standard coefficient		T	Significance level P
	B		Standard error	Beta		
1 Constant	7.504		0.504		9.745	0.000
Immersive experience	0.223		0.062	0.278	3.745	0.000
a. Dependent variable : Customer satisfaction						

Figure 11. Test of general dynamic effect and interactive animation for expanding independent TAM sample.

5.4.6. Effect of APP perceived usefulness, ease of use and enjoyment on focus immersion

See Figure 11 for H4, H5, and H6 linear regression analysis. The regression equation is established with focus immersion as the dependent variable and perceived usefulness, perceived ease of use, and perceived enjoyment as the independent variables. Result $R^2 = 38.8\%$, and the P values in the analysis of the variance table and coefficient table are <0.05, indicating that the three can effectively predict the degree of focus immersion. From the above data analysis, we can find that perceived usefulness, perceived ease of use, and perceived enjoyment performance have a positive impact on focus immersion. Therefore, H4, H5, and H6 are assumed to be true.

5.4.7. See Figure 11 for H7 linear regression analysis of the impact of APP focus immersion on user satisfaction, with user satisfaction as the dependent variable

The regression equation was established with the concentration immersion as the independent variable.

The results are shown in Figure 11, $R^2 = 0.077$, $P < 0.05$ in the analysis of the variance table and coefficient table, indicating that focus immersion has a positive impact on user satisfaction. Therefore, H7 is assumed to be true.

5.4.8. Correlation analysis of focus immersion model

Correlation analysis is a statistical analysis method for the correlation between two or more variables, which is used to measure whether there is a close relationship and correlation between variables. Correlation analysis is not a strict dependent relationship. Compared with regression analysis, the status of variables in correlation analysis is equal, and there is no causal relationship. In regression analysis, there is a difference between independent variables and dependent variables, which is a certain relationship. Before correlation analysis is generally used for regression analysis, the coefficient commonly used to measure correlation analysis is Pearson correlation, that is, R-value. R> 0 means the positive correlation between variables, and r<0 means the negative correlation between variables. It can be seen from the table that the interaction dynamic effect and perceived usefulness, perceived ease of use, and perceived.

The correlation coefficient values of knowledge enjoyment were all greater than 0, and p<0.05, indicating that there was a significant positive correlation between interaction effect and perceived usefulness, perceived ease of use, and perceived enjoyment.
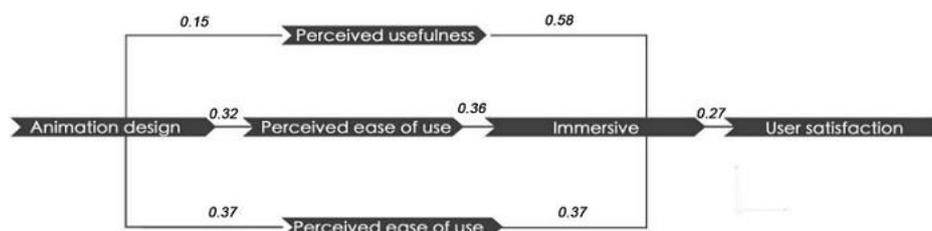

Figure 12. Test of general dynamic effect and interactive animation for expanding independent TAM samples.

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6. Conclusions

Through the analysis of the questionnaire by SPSS, it is verified that h1-h7 in the hypothetical model are all valid. It is confirmed that H1 dynamic design has a positive impact on perceived usefulness, H2 dynamic design has a positive impact on perceived ease of use, H3 dynamic design has a positive impact on perceived enjoyment, H4, H5, H6 perceived usefulness, ease of use and enjoyment have a positive impact on focus immersion, and H7 focus immersion has a positive impact on user satisfaction. Finally, it is concluded that under certain conditions, the dynamic effect of the design based on the principle of the hypothetical theoretical model constructed in this paper can improve users' concentration and relaxation. Dynamic effect design can directly affect the concentration and immersion of users, but the premise is to study and accurately grasp the application scope of dynamic effect design.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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