Research on the Influence Mechanism of Users' Continuous Use Intention of Augmented Reality Branded Application

Shenglan Yang\textsuperscript{1,a,*}, Yumeng Zhao\textsuperscript{2,b}, Cong Wang\textsuperscript{3,c}

\textsuperscript{1}Business and Tourism School, Sichuan Agricultural University, Chengdu, China
\textsuperscript{2}Business and Tourism School, Sichuan Agricultural University, Chengdu, China
\textsuperscript{3}Business and Tourism School, Sichuan Agricultural University, Chengdu, China

\textsuperscript{a}850307561@qq.com
\textsuperscript{b}1248972002@qq.com
\textsuperscript{c}893744264@qq.com

Abstract

In recent years, with the development of augmented reality technology, the branded app has further derived with augmented reality function focusing on consumer experience, which has been widely preferred by consumers. At the same time, it has also become a new way for brand enterprises to communicate and interact with consumers. However, most augmented reality branded applications are in the primary stage of development and promotion, with a small number of users and low user viscosity. Based on the TAM model, this study introduces two variables of "playfulness" and "spatial existence", and constructs a user's continuous via intention of augmented reality branded applications. The results show that perceived usefulness, perceived ease of use, playfulness and spatial presence have a positive impact on consumer satisfaction, and consumer satisfaction has a positive impact on continuous use intention. This study provides ideas and references for enterprises to further develop and promote augmented reality branded applications and improve the user stickiness of augmented reality branded app.

Keywords—augmented reality branded apps, TAM model, playfulness, consumer satisfaction, continuous use intention

1. INTRODUCTION

In recent years, it has gradually become the norm for enterprises to disseminate information, sell products and provide services through mobile phones, offline physical stores, official websites, e-commerce, and other channels [1]. People's consumption habits are gradually changing from "mainly offline, supplemented by online" to "mainly online, supplemented by offline". Offline stores are more used as a physical display and supplementary experience service store for online sales. With the continuous development of AR technology, some enterprises have applied it to their own branded apps and become a unique technical service to supplement the sense of online experience, which makes it possible for consumers to try and experience physical products without leaving home. For example, L'Oreal launched an app called "modiface" in Chinese in 2014. The application takes the concept of "an interactive mirror". After opening the app, the user's face is quickly positioned and calibrated. Then the users can use the mobile phone as a mirror to try on makeup. By clicking on a single makeup or designing makeup automatically, the user's real-time makeup results will be displayed on the screen. Gucci is one of the first luxury brands to make AR technology. It adds AR function to its application so that users can "try on" sneakers, which is how customers can intuitively see the product in real life through the branded app. IKEA place, an application launched by IKEA, allows users to place virtual furniture in the room and is committed to creating an immersive, realistic, and vivid AR experience for consumers so that consumers can see the real appearance of the product in their own home through the branded application. In short, AR branded application has become mature in continuous development and is accepted and loved by people.

However, the development of new things must be tortuous. Despite the strong growth of application users and considerable opportunities provided by branded applications, many brands are still difficult to maintain...
sustained user usage. At present, the number of users of augmented reality branded applications is small and the viscosity of users is low. With the continuous development and improvement of AR branded app, enhancing users' willingness to continuously use augmented reality branded applications has become a difficult problem that enterprises must overcome. According to the above background, the research raises the following questions: first, what features of augmented reality branded app help to improve the viscosity of users? Second, how to further improve consumers' satisfaction with the AR branded app? Third, how to enhance continuous use intention augmented reality branded applications? This research is designed based on the above problems and is committed to providing ideas and references for the further development of augmented reality branded app.

2. LITERATURE REVIEW

2.1 TAM Model

In the TAM model, external variables will affect the usefulness and ease of use of information technology perceived by users, then on users' intention to use information technology, and finally on users' actual use behavior [2], as shown in Figure 1. The usefulness and ease of use of information technology perceived by users will play an important role in users' decision to accept and use information technology [3]. Perceived usefulness means that users think that using information technology will play a role in improving performance. Perceived ease of use refers to that users think certain information technology is easy to use [2]. The positive relationship between perceived usefulness, ease of use, and continuous use intention has also been verified in empirical research [4, 5]. At present, scholars' research on sustained use intention or use intention has been combined with many classical models, and the TAM model is one of them. TAM model is widely used to predict how and under what circumstances will enterprises or individuals adopt a new technology [6]. The design theme and model innovation also have their own advantages, but there is less attention to the research on the continuous use intention of augmented reality branded app. Therefore, this study attempts to explore the intention of sustainable use from the new subject of augmented reality branded app.

2.2 Playfulness

Playfulness is defined as personal concentration. Individuals are curious about something, interact, and find the interaction pleasant and interesting [7]. It is a multidimensional structure, including focus, curiosity, and enjoyment [8]. Lieberman [9] first proposed the theory of perceived interest. He believes that users will feel happy in the process of interacting with computers. In the past, playfulness focused on consumer adoption behavior: for example, the adoption of a service [10], the adoption of a new sales model [11]. In addition, there are many studies on consumption and purchase behavior [12].

2.3 Spatial Presence

Presence, that is, the feeling existing in space, may be a psychological state related to intermediary and non-intermediary experience. It is defined by some people as a non-mediated perceptual illusion [13, 14]. In a typical AR interface, the interaction between users and media is carried out in three-dimensional space, rather than on a two-dimensional surface in a typical interface and media [15]. Augmented reality interactive technology can combine real content with virtual content, align real objects with virtual objects, connect the real world with the virtual world, and has interactivity and real-time [6]. Augmented reality technology continues to develop in pursuit of a high telepresence user experience. Many branded apps have launched or improved their own AR technology to seek the best user experience. Therefore, the sense of spatial presence has also become one of the important factors affecting consumer satisfaction of AR branded app.

2.4 Customer Satisfaction

Consumer satisfaction is the overall evaluation and judgment of their own experience in using or consuming products or services. It is generated after the perceived product and actual service effects are compared with consumption needs or consumption expectations. If the quality performance is equal to or exceeds the previous expectations, consumers will be satisfied [16]. Consumer satisfaction is a different function, which is the feeling state formed by comparing the service effect actually accepted by consumers with the expected service effect [17]. As a key issue in academic research, consumer satisfaction has been continuously promoted by many scholars for decades. In the existing literature, the concept of consumer satisfaction has covered academic research on many industries and topics, the concept and
model have been very mature, and the literature in this field is also very sufficient. Previous studies are mainly related to consumer purchase [18-20], consumer loyalty, [21, 22] and other keywords are combined. Therefore, this study takes it as an intermediary variable to study the impact of consumer perception on the willingness to continue using the branded apps in the context of omnichannel.

2.5 Continuous Use Intention

Continuous use intention refers to the willingness of users to use information technology in the future and recommend the technology to others [23]. This study defines the willingness to use a branded app continuously as the willingness of consumers to use the branded app in the future and recommend the app to others. Continuous use of the application intends to meet the results of novice shopping AR app users [24]. Li and Fang [25] integrated brand attachment into the Expectation confirmation model. Through the structural equation model test, it is found that consumer satisfaction will have a positive impact on the continuous use intention of branded apps.

3. HYPOTHESES

3.1 Perceived Usefulness and Consumer Satisfaction

Consumers use any technology or products to meet their needs. The virtual reality branded app meets users' needs for online trial furniture. With the help of virtual reality technology, users can try and place products anywhere and at any time. If the product or service can meet the needs of consumers, the perceived usefulness of consumers will help to further promote the generation of consumer satisfaction. Previous studies have shown that perceived usefulness has a positive impact on consumer satisfaction [25, 26]. Therefore, the following hypothesis is proposed:

H1: Perceived usefulness has a positive impact on consumer satisfaction.

3.2 Perceived Ease of Use and Consumer Satisfaction

Easy to use and understand are the prerequisites for users to better adapt to and use an app. If the operation of an app is complex, it is difficult for users to operate it quickly, which will undoubtedly decrease consumers' intention to use it. Especially for the branded app of virtual reality type, it is originally a new supplementary service or supplementary technology with omnichannel background, which is more to create a better consumption experience for consumers. If the augmented reality branded app is easy to use and easy to use, it will undoubtedly promote the creation of a good experience for consumers. Previous studies have also proved that perceived ease of use has a positive impact on consumer satisfaction [25, 26]. Therefore, the following hypothesis is proposed:

H2: Perceived ease of use has a positive impact on consumer satisfaction.

3.3 Playfulness and Consumer Satisfaction

Augmented reality technology connects the real world with the virtual world, making it possible to add virtual objects in three-dimensional space. This interaction between real and virtual is interesting. Since this technology was proposed, augmented reality has been used more and more widely, and the technology is getting better and better, which has been favored and welcomed by more and more people. Branded apps with augmented reality skills are naturally full of fun. In recent years, the consumer response to this kind of branded app is getting better and better. Besides, the acceptance is improving, and the utilization rate is also rising. The interesting augmented reality branded app enriches the content and form of a branded app, surpasses consumers' conventional expectations for the conventional transaction-led branded app, and is conducive to promoting the generation of satisfaction. Therefore, Therefore, the following hypothesis is proposed:

H3: Playfulness has a positive impact on consumer satisfaction.

3.4 Spatial Presence and Consumer Satisfaction

Augmented reality technology uses a variety of means to overlay the computer-generated virtual objects into the real world scene, to enhance the real world. This technology has real-time interaction. In the use of AR branded app, users can realize real-time interaction with real space through mobile phone operation, making consumers feel that "virtual objects on mobile phones seem to be in real life". The sense of space users feel when using the app will undoubtedly increase the fun of users' use experience, which is conducive to consumer satisfaction. Therefore, the following hypothesis is proposed:

H4: Spatial presence has a positive impact on consumer satisfaction.

3.5 Consumer Satisfaction and Continuous Use Intention

When consumers are satisfied with a branded app, it will undoubtedly increase consumers' favor and preference for it. This positive attitude will promote consumers to reuse, continue to use and even share recommendations with relatives and friends. Previous
studies have also confirmed that consumer satisfaction has a positive impact on sustainable use intention [26, 27].

H5: Consumer satisfaction has a positive impact on continuous use intention.

![Conceptual mode](image)

**Figure 2. Conceptual mode**

### 4. METHDLOGY

#### 4.1 Measures

All constructs were measured with multiple items using a 7-point Likert scale, with 1 = strongly disagree and 7 = strongly agree. The content of the questionnaire was modified according to the theme based on previous research, and the opinions of several group researchers who have paid more attention to and experience in branded apps were solicited to modify and improve it. (Table I)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measurements</th>
<th>Loading 1</th>
<th>Loading 2</th>
<th>Loading 3</th>
<th>Reference source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Usefulness (PU)</td>
<td>This app can meet my needs; This app can save my shopping time shopping energy and physical strength; This app can improve our shopping efficiency.</td>
<td>0.855</td>
<td>0.887</td>
<td>0.828</td>
<td>Goersch (2002) [28]</td>
</tr>
<tr>
<td>Perceived Ease of Use (PEU)</td>
<td>I can quickly become familiar with the operation when using this app; This app is easy to use; My interaction with this app is clear and understandable.</td>
<td>0.917</td>
<td>0.918</td>
<td>0.898</td>
<td>Wu and Wu (2015) [29, 30]</td>
</tr>
<tr>
<td>Playfulness (PLA)</td>
<td>The shopping experience just now was very interesting; The shopping experience just now stimulated my desire to explore the app; The shopping experience just now provided me with a space for imagination; I was immersed in the shopping experience just now.</td>
<td>0.830</td>
<td></td>
<td></td>
<td>Lin, H. H., et al. (2020) [8]</td>
</tr>
<tr>
<td>Spatial presence (SP)</td>
<td>It's like trying out furniture in reality; This furniture seems to be part of the real environment; You can imagine the location and image of this furniture in the real environment.</td>
<td>0.831</td>
<td>0.815</td>
<td>0.859</td>
<td>Hilken, T., et al. (2017) [31]</td>
</tr>
<tr>
<td>Consumer Satisfaction (CS)</td>
<td>I think this app meets my expectations; I am very satisfied with this app; I think this app is successful.</td>
<td>0.902</td>
<td>0.886</td>
<td>0.882</td>
<td>Won-jun Lee (2020) [32]</td>
</tr>
</tbody>
</table>
4.2 Participants and Design

In this study, offline experiments were used for data collection, and volunteers were recruited to participate in this experiment for a fee. Participants in the experiment were randomly selected in a university in southwestern China. Considering factors such as download times and user experience evaluation, we selected IKEA Place as the experimental app. To ensure the scientific nature of the experiment, we controlled the subjects, environment, and time of the experiment. A total of 72 effective copies were recovered in this experiment. Among all the interviewees, 33 were males and 39 were females. The ages of the subjects were concentrated in the range of 18-25.

Before the experiment, the experiment staff first explained the experiment rules and precautions to the subjects, and the experiment was started based on the subjects' willingness. The experiment was given a situational task. Firstly, the subjects were asked to download the app and familiarize themselves with the trial, and then assigned a situational task to the subjects: suppose you are the procurement staff of this school. Without considering the cost, please add two items that you think are suitable for this conference room. Lastly, the participants were asked to fill in the questionnaire. After knowing the task, the subjects operated on their own according to the above content.

4.3 Data Analysis

Smart PLS 3.0 [33] was used to evaluate both the measurement model and the structural model because partial least squares (PLS) places minimal restrictions on measurement scales, sample size, and residual distribution [34].

4.4 Measurement Model

The adequacy of the measurement model was assessed for reliability, convergent validity, and discriminant validity. Table II shows that all values were above 0.7, indicating adequate reliability. Table II also shows that all items exhibited a loading greater than 0.7, on their respective constructs. All the AVE (Table III) ranged from 0.656 to 0.830, satisfying both convergent validity conditions.

Discriminant validity was assessed using two criteria. Firstly, the loading of each item on its assigned construct is larger than its loading on any other construct [34]. Secondly, the square root of the AVE of a construct is greater than the correlation between the construct and the other constructs in the model [35]. As shown in Table III, all of these criteria are clearly met.

The test was applied to evaluate the degree of multicollinearity—variance inflation factor (VIF). A regression analysis was conducted using experience co-creation quality as the dependent variable and the others as independent variables. The VIF ranged from 1.634 to 2.886 (Table II), below the recommended threshold of 3.3 [36].

<table>
<thead>
<tr>
<th>Construct</th>
<th>Cronbach's α</th>
<th>Rho_A</th>
<th>CR</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>PU</td>
<td>0.822</td>
<td>0.839</td>
<td>0.892</td>
<td>1.979</td>
</tr>
<tr>
<td>PEU</td>
<td>0.898</td>
<td>0.900</td>
<td>0.936</td>
<td>2.886</td>
</tr>
<tr>
<td>PLA</td>
<td>0.824</td>
<td>0.832</td>
<td>0.884</td>
<td>1.913</td>
</tr>
<tr>
<td>SP</td>
<td>0.784</td>
<td>0.793</td>
<td>0.874</td>
<td>1.634</td>
</tr>
<tr>
<td>CS</td>
<td>0.869</td>
<td>0.873</td>
<td>0.920</td>
<td>2.291</td>
</tr>
<tr>
<td>CUI</td>
<td>0.867</td>
<td>0.868</td>
<td>0.919</td>
<td>2.329</td>
</tr>
</tbody>
</table>
### TABLE III. CORRELATIONS AMONG CONSTRUCTS AND THE SQUARE ROOT OF THE AVE

<table>
<thead>
<tr>
<th></th>
<th>AVE</th>
<th>CS</th>
<th>CUI</th>
<th>PEU</th>
<th>PLA</th>
<th>PU</th>
<th>SP</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS</td>
<td>0.793</td>
<td>0.890</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CUI</td>
<td>0.790</td>
<td>0.818</td>
<td>0.889</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEU</td>
<td>0.830</td>
<td>0.641</td>
<td>0.525</td>
<td>0.911</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLA</td>
<td>0.656</td>
<td>0.808</td>
<td>0.735</td>
<td>0.508</td>
<td>0.810</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU</td>
<td>0.734</td>
<td>0.766</td>
<td>0.720</td>
<td>0.377</td>
<td>0.664</td>
<td>0.857</td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>0.697</td>
<td>0.774</td>
<td>0.660</td>
<td>0.473</td>
<td>0.638</td>
<td>0.708</td>
<td>0.835</td>
</tr>
</tbody>
</table>

#### 4.5 Structural Model

In the PLS analysis, examining the structural paths and the $R^2$ scores of endogenous variables evaluate the explanatory power of a structural model. Figure 4 shows the results of structural path analysis.

![Model test result](image)

**Figure 4. Model test result**

### 5. CONCLUSION AND DISCUSSION

#### 5.1 Conclusion

Through scientific analysis and research, a framework for consumer satisfaction and continuous use intention has been constructed. The results show that perceived usefulness, perceived ease of use, playfulness, and spatial presence all have a positive impact on consumer satisfaction. Consumer satisfaction has a significant positive impact on continuous use intention, which further expands the understanding of the TAM model in the context of augmented reality branded applications. Therefore, the five hypotheses proposed by the study are all supported.

#### 5.2 Significance and Implication

To clarify the influence mechanism of continuous use intention augmented reality branded applications, this research summarizes four factors based on the classic TAM model, combined with the characteristics of augmented reality technology itself and the characteristics of augmented reality branded apps. We studied the influence mechanism of the continuous use intention of consumers.

This research also combines the current practice background to determine the more fashionable research subjects and explores the current issues that enterprises are more concerned about. Through research findings and observations during the experiment, combined with our own ideas and experience, we provide references for the further construction and improvement of augmented reality branded apps in various industries. First, companies should continuously improve the level of AR technology in the development process, impress users with a greater reality, and increase user satisfaction and willingness to continue using it. For example, IKEA has been constantly improving related technologies, from "the effect is more realistic, the picture quality is clearer, and the movement is smoother". Second, in the process of developing related types of branded apps, we should also pay attention to the usefulness of the app itself, focus on the needs of consumers, and strive to meet the needs of consumers. Third, the design should be as concise as possible, with clear columns, and if necessary, with operation navigation to help new users get familiar with and try the app faster, to improve user satisfaction. Fourth,
Most people possess a natural playfulness [1]. Therefore, the design should increase the interest of the application according to the scene, such as adding interesting interface interaction or mini-games.

5.3 Limitations and Future Research

This study has some limitations. First of all, the AR application has only become popular in the Chinese market in recent years. This experiment only includes IKEA, which shows that our research clearly represents the new AR national market. Future research should pay more attention to emerging markets and the experimental apps involved can also be considered from multiple brands and multiple types. Secondly, the research framework only considers some important influencing factors, and many other uncertain factors have not been taken into consideration. Future research may investigate other variables, such as the perception of privacy issues and aesthetic differences in the Chinese or Asian markets, because these aspects may be very different from European and American countries. Third, our sample is limited to college students. Future research should focus on a wider range of consumer groups and collect more reasonable and extensive data for verification.

ACKNOWLEDGMENT

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

REFERENCES


Research on the Influence Mechanism ...