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EXPLORING THE FACTORS INFLUENCING CONSUMER'S ATTITUDE TOWARD USING AND USE INTENTION OF VIRTUAL REALITY GAMES

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Abstract

Mobile games have already turned into a new favorite leisure activity of modern people with the gradual popularization of smart mobile device technology. The development of mobile games has gradually proved to be a new business opportunity for game companies. Virtual reality (VR) game has become the trend of the game industry thanks to the accelerated development of artificial intelligence. Mobile games using virtual reality technology have also become a new marketing trend, so understanding consumers' using expectations of VR will be conductive to improvement of the development and profitability of the games. Therefore, this research adopts the technology acceptance model (TAM) as the theoretical foundation to explore the influence of perceived usefulness, perceived ease of use, perceived playfulness, and immersive experience on attitude toward using and use intention of VR games. With consumers who have played VR games as the research object, the data analysis results of 210 valid questionnaires show that the hypotheses of this research are supported. This research provides a future development strategy and an integral marketing direction of virtual reality games through the analysis results, and provides the reference for the subsequent researchers of virtual reality games.

Key words: Virtual Reality Game, Technology Acceptance Model, Immersive Experience, Attitude Toward Using, Use intention

Introduction

With the increasing popularity of smart devices and mobile computing technology, it has become a mobile lifestyle for consumers to have a smart phone for whether shopping or passing time through online games at any time and everywhere. As the technology of virtual reality (VR) gradually matures, it is also widely used in different fields, such as education training, flight operation simulation, remote medical treatment, and computer games, etc. (Flavián et al., 2019). In recent years, the development of VR technology has gradually turned into a global concern and market opportunity. Users do not need to go out to face the crowds, and can experience the completely new real feelings and experiences brought by various VR products at home (Cowan & Ketron, 2019).

VR games use virtualization as a reality to imagine fantasy into reality. The images of the virtual world can present a picture like the real world, making users feel as if they are immersed in the environment (Rubio-Tamayo et al., 2017). With lively and interactive games, consumers have also begun to pursue content levels that can be immersed in reality, and through simulated screens and related interactions in virtual reality, users can also experience the new real feeling and the joy of playing games brought by VR at home (Cant et al., 2019).

VR adopts 3D drawing technology or depiction to create a virtual environment, provide users with sensory experience related to vision, hearing, etc. The images of virtual world can present images like the real world to make users feel as if they are experiencing it personally. In view of this, more and more manufacturers have launched immersive virtual games combined with knowledge learning design (Eiris, et al., 2020). The games have simple and easy to operate interface, providing users with an immersion experience, and a unique interaction in VR, challenging and interesting plots, yet not boring. Users can walk around in the virtual world as if they were in the real world, thus they will be more willing to accept it (Servotte et al., 2020).

Based on the above, this study uses the technology acceptance model (TAM) to explore the effects of perceived usefulness, perceived ease of use, perceived playfulness and immersion experience on attitude toward using and use intention of VR games in order to understand the factors that affect users' use of VR games, and provide reference and suggestions for future development for the dealers in the VR game market and follow-up researchers. The process of this study process includes introduction, collection and arrangement of relevant literature, establishment of research framework and hypothesis, questionnaire design and survey, statistical methods

for data analysis and verification results, conclusion and suggestions.

Literature Review

Virtual Reality Games

With the popularity of smart phones, mobile devices, mobile computing, and the continuous advancement of VR technology, technology giants have invested in the VR market, which has promoted the booming game market. The craze in 2016 raised by the Pokemon Go is not only because of breakthroughs in technologies such as virtual reality, subverting online games, the technology of combining real scenes with virtual information, and VR effects, allowing players to experience games outdoors, which has swept the world (Flavián, et al., 2019). VR is a high-tech simulation system generated by computer technology, which combines animation, image, sound and related peripheral equipment (Cant, et al., 2019). However, many people are not optimistic about VR. Most of the reasons are that the price of the devices is too high, there is not enough content, the market scale is not obvious, it is even hard to get rid of the dizziness after a long-term using as well as the wire, which damage the game experience and convenience (Cowan & Ketron, 2019).

A virtual reality ecosystem can be divided into three parts: content, platform and equipment. Subsequent services and sales channels must also be comprehensively considered to build a complete VR ecosystem. Sheridan (2000) believes that there are three big indispensable elements in VR virtual reality. (1) Imagination: VR is a virtual environment created by using 3D drawing technology or depiction. Scene design, sound effects and vibration can make users have real feelings, imagine themselves in the middle of this virtual environment. You can interact with the virtual scene only through mental imagination. Mental association connects the simulated virtual world and the real world, and can also achieve the effect of simulation. (2) Interactivity: create a virtual environment to provide users with the experience concerning vision, hearing, touch reception and other senses. When the computer receives the user's actions, VR can provide instant interactive response to make the virtual scene interactive, and VR peripheral equipment can be used to make the interaction closer to the real world. (3) Immersion: in VR, appropriate response shall be given according to human senses, among which the tactile sensation needs to be matched with sight and hearing. When a person sees the object falling with the sight and should catch it with hands, then the tactile feedback effect will appear. In the virtual situation, external interference must be prevented. Once the user is disturbed, it is easy to lose interest. A sense of mystery and freshness must be created to stimulate the user's desire to explore. It makes it easier for users to merge into the virtual environment. The effect of VR is also achieved if the real and virtual environment cannot be distinguished by users (Eiris, et al., 2020).

Grau (2007) considers that VR is not a completely new phenomenon.

From the perspective of traditional art, it can be find that many hallucinations come from the creation of paintings. VR has already played an important role in the historical relationship between human beings and images. Human beings extend the media as a tool of perception in order to maximize the senses. It can be explained by the application of VR: that means the audience can change their perception and view themselves from different biological, gender and cultural backgrounds. Various applications of VR related technologies will continue to amplify in the future (Servotte et al., 2020).

At present, most VR applications on the market mainly focus on game development. As one of the many situation simulation games, Summer Lesson: Hikari Miyamoto is a Play Station game developed using VR technology (Bandai Namco Entertainment, 2020). In the game, the player is the tutor of Miyamoto who is struggled for study. Through a week of interaction with the student, the player will play the game in a 360-degree space, immersing in the atmosphere of the work. The players can choose various options by nodding and shaking the head or staring at the eyes to experience a warm or tense situation. The players will also see the girl in front of them gradually opening her mind and experience the feelings and multiple scenarios brought by VR. Another well-known adventure survival game was launched in 2017, Resident Evil 7: Biohazard (Capcom, 2020). This game changes the traditional third-person angle in its previous series and for the first time uses the first-person perspective with VR technology. The protagonist of this story received an email from his wife who has been missing for 3 years, and went to an abandoned house which has been deserted for many years to find his wife. The game is more immersive in scenes, more shocking and terrifying in senses, more realistic in 3D sound, providing the payers a more exciting and playable gaming experience.

However, a perfect VR game experience must provide visual, auditory, interactive, and other sensory simulation elements in order to achieve the effect of VR. The more “fake” the virtual environment is, users are more likely to “believe in the truth”. The better the VR effect, the better the “immersion experience” it provides. With the realistic three-dimensional and spatial sense, coupled with the clear sound source and earphone with the sense of surround, users will feel as if they are really in the virtual environment no matter what they see or hear (BENEVO, 2017). When VR introduces the above interactive design, users can not only see the virtual image and hear the virtual surround sound in the VR environment. They can rotate their eyes and heads to follow objects and walk or dodge in the virtual environment. But in addition, it will bring more intense “immersion experience” if it can further provide tactile and olfactory stimulation. Therefore, the combination of the virtual scenes with real-world objects will make the product more humanized, interacted, and playful to meet the actual needs of customers.

Technology Acceptance Model

Davis (1989) proposed a technology acceptance model (TAM), which mainly originated from the theory of reasoned action proposed by Fishbein and Ajzen (1975). The reasoned action theory is a causal model to explain and preresponds of individual's attitude to an object or situation (Taylor & Todd, 1995). The social pressure that an individual feels when taking a particular action.

The TAM claims that perceived usefulness and perceived ease of use will affect the attitude of using technology, and then affect the specific behaviour.
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dict individual behaviour from four aspects: belief, attitude, intention, and behaviour. The emotion or attitude toward a particular behaviour will result in a particular behaviour through the

ctive norms have been excluded, since they have theoretical uncertainty and psychological measurement difficulties. Thus, the two main factors that affect attitude are perceived usefulness and perceived ease of use (Davis, 1989). The framework of the TAM is shown in Figure 1.

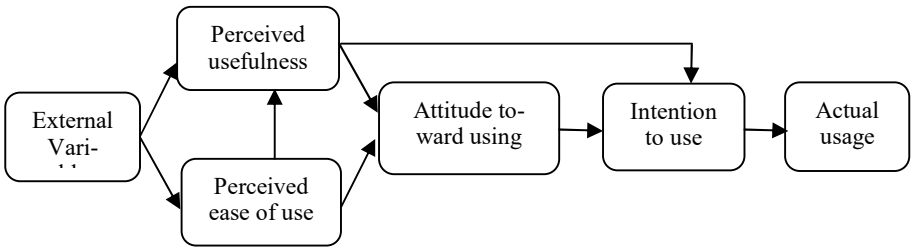

Figure 1. The framework of the technology acceptance model

Perceived usefulness refers to the subjective chance that users of a system in an organizational environment will improve work performance, shorten working hours, and the higher the positive attitude towards the system. Perceived ease of use refers to the ease with which a particular information system operates and the higher the perceived ease of use, the higher the positive attitude toward the system. Attitude toward using refers to the user's positive or negative feelings or evaluation feelings about performing an act (Venkatesh & Davis (2000) and the higher the influence of perceived usefulness and perceived ease of use, the more positive the attitude toward the system. Intention to use refers to the willingness of users of an information system to determine their willingness to continue using a particular system, and to the extent that they are affected by their attitude and perceived usefulness. The actual behaviour is mainly affected by the intention to use and the higher the willingness to use, the higher the probability of the actual behaviour (Taylor & Todd, 1995).

Immersion Experience

Psychologist Csikszentmihalyi (1975) defines immersion as an experience when people are fully focused on an activity with a sense of enjoyment and satisfaction. Csikszentmihalyi mentioned that immersion means that after entering an activity, the consciousness is concentrated in a small range, while other unrelated consciousness and thinking are filtered, only responding to specific goals and clear feedback, and raising a sense of control on the environment. This kind of focusing behaviour will make people forget the passage of time and then achieve the state of total selflessness that means they will enter the state of immersion. Privette and Bundrick (1987) believed that immersion experience is spontaneous enjoyment experience, similar to peak experience and peak performance. It has the same enjoyment as peak experience and the same behaviour as peak performance. Immersion experience in itself does not represent optimal pleasure or performance; it may include one or both.

Ghani and Deshpande (1994) proposed that the main characteristics of immersion are that the user will fully concentrate during the activity and lead out enjoyment from it. The effect of immersion experience will make users pay more attention to the process than the result. Webster et al. (1992) believe that immersion is basically a subjective experience of human-computer interaction, with the characteristics of game and exploration. At the same time of human-computer interaction, the user feels a sense of pleasure and involvement, while higher game traits can get more positive emotions and satisfaction, and trigger personal further exploration.

Research Methods

This study uses the technology acceptance model as the theoretical framework to explore the effects of the perceived usefulness, perceived ease of use, perceived playfulness, and immersive experience on attitude toward using and use intention of VR games. In this study, data were collected by both online and physical questionnaires. The study framework is shown in Figure 2.

Research Hypothesis

Pan et al. (2012) believe that users can enhance leisure and entertainment when playing VR games, and they can get relaxation, joy, fun, and inner satisfaction. In other words, the increased casual feeling or satisfaction of the user when using the perceived usefulness of the VR game, and when the user can quickly achieve the casual effect when using the VR game, it has a positive impact on the attitude towards using (Hsu & Lu, 2004). In a research of using action games in wireless network environment, Ha et al. (2007) found that perceived ease of use had a positive effect on perceived playfulness, attitude and perceived usefulness. It has a positive impact on the attitude towards using when users think it is easy to operate and use VR games. According to Moon and Kim (2001), perceived playfulness is a very important aspect, which will affect the user's attitude and intention to use VR games.

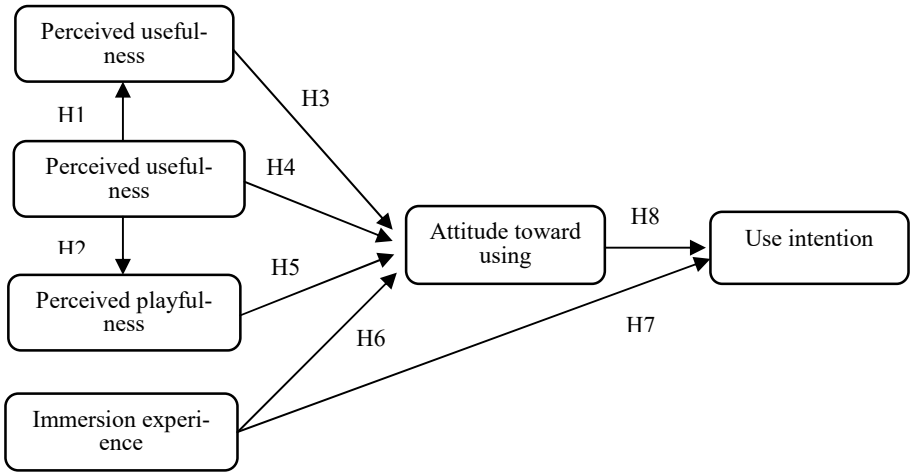

Figure 2. The study framework

Teo et al. (1999) believe that perceived playfulness refers to the extent of fun to which users think they can enjoy when playing VR games. When users think that the process is fun, users will hold a more positive attitude. Based on the review of literature, this study proposes the following hypotheses:

H1: Perceived ease of use has a positive impact on perceived usefulness of VR game.
H2: Perceived ease of use has a positive impact on perceived playfulness of VR games.
H3: Perceived usefulness has a positive impact on attitude toward using of VR games.
H4: Perceived ease of use has a positive impact on attitude toward using of VR games.
H5: Perceived playfulness has a positive impact on attitude toward using of VR games.

Webster et al. (1992) proposed that immersive experience can make users full of cognitive curiosity in the process of playing games, and surround them by various novel stimuli. Choi and Kim (2004) found that players will continue to play online games if they have immersion experience. Players will have a sense of achievement because they feel immersed, so they will want to experience this feeling again, and they will continue to play games in order to pursue this feeling of immersion. Players will be absorbed in the game in order to achieve the goal of the game task. When the user is completely focused on an activity with a sense of enjoyment and satisfaction, the behavior of concentration will make people forget the passing of time and then reach the state of complete selflessness to enter the immersive experience (Csikszentmihalyi, 1975). Players will take a positive attitude towards VR games when they think using

them is good and they will feel it's a good leisure activity. Therefore, the user's positive or negative feelings or evaluation feelings when using VR games will affect the user's intention to use it continuously. Users' intention to continue using VR games is affected by the attitude and perceived usefulness. Thus, users will actively play VR and recommend it to others in the future. Based on the review of literature, this study proposes the following hypotheses:

H6: Immersion experience has a positive impact on attitude toward using of VR games.
H7: Immersion experience has a positive impact on use intention of VR games.
H8: Attitude toward using has a positive impact on use intention of VR games.

Research Design

The purpose of this study is to explore whether the intention to use virtual reality games affects each other based on the technology acceptance model. Variables and operational definitions in this study are shown in Table 1. The study objects are young users who have played virtual reality games. By issuing online and physical questionnaires, respondents are asked to fill in the most suitable choices according to their own feelings.

Table 1. The study variables and operational definitions

Variable	Operational definition	Source
Perceived usefulness (PU)	The extent to which the use of VR games help the player to complete the task, purpose, or entertainment	Davis (1989); Pan et al.(2002); Venkatesh & Davis (2000)
Perceived ease of use (PEU)	The easy extent of VR games for players.	Davis (1989); Venkatesh & Davis (2000)
Perceived playfulness (PP)	The degree to which players think they are amused, interested, joyful and curious when using VR games.	Moon & Kim (2001); Teo et al. (1999)
Immersion experience (IE)	The degree to which players are focused when using VR games.	Webster et al. (1992); Ghani & Deshpande (1994)
Attitude toward using (AU)	The degree of positive and negative feelings of players when playing VR games.	Fishbein & Ajzen (1975); Taylor & Todd(1995)
Use intention (UI)	Players' willingness to use VR games and recommend to others.	Davis (1989); Taylor & Todd(1995)

A total of 50 samples were pretested in order to modify the problems found in reliability and validity analysis. The questionnaire design of this research is mainly divided into six parts. The Likert five-point scale is used to measure the questionnaire, and ranging from 'strongly disagree' to 'strongly agree', with 1 to 5 points respectively. Statistical software SPSS was used for data analysis to explore whether the hypothesis of establishing the relationship between constructs is valid. The measures used in this study include descriptive statistical

analysis, reliability analysis, validity analysis, factor analysis, Pearson correlation analysis, and regression analysis.

Study Results

In this study, the online questionnaires are linked to the social networks and the comprehensive discussion of Bahamut VR virtual reality. The physical questionnaires are distributed to the target objects through class students. A total of 227 formal questionnaires were collected, 12 of them did not used VR game related products and 5 of them were incomplete, so they were regarded as invalid questionnaires. The remaining 210 valid questionnaires were obtained, and their effective return rate reached 92.5%. According to Nunnally (1967), it is suggested that the number of samples should be 10 times more than the number of observation variables or indicator variables in the questionnaire, and Boomsma (1985) suggests that the sample size has to be at least 100, and should better be greater than 200. In this study, it is expected that the number of valid questionnaires collected will be 200, so the number of valid questionnaires collected meets this requirement.

The demographic characteristics of samples are gender, age, education level, occupation, years of work, and salary. In this research, 60% of the samples were female. 44.8% of them were aged from 20 to 25. 42.9% of them were in universities. Students account for 64.8% in occupation. 64.3% of them have less than one year work experience. Salary income is below NT$10,000 accounts for a maximum of 55.7%. The results of the reliability analysis show that the Cronbach's α value of perceived usefulness is 0.806, perceived ease of use is 0.861, perceived playfulness is 0.907, immersion experience is 0.869, attitude toward using is 0.920, use intention is 0.930, and the overall Cronbach's α value is 0.882. Therefore, the Cronbach's α value of the reliability analysis in this study is > 0.7, that is, the reliability of the questionnaire in this study is high, indicating that the questionnaire is acceptable. In addition, the KMO value is 0.949 and Bartlett's spherical test is 4408.067, $p<0.001$, which means that the sample data is suitable for factor analysis.

Table 2 shows that all of the items had high factor loadings greater than 0.5 except for the factor load of PU1 is less than 0.5, which is deleted. The results of Pearson's correlation coefficient analysis are shown in Table 3, perceived usefulness, perceived ease of use, perceived playfulness, immersion experience, attitude toward using, and use intention are found to be a very significant level ($P < 0.01$) ranging from 0.308 to 0.886. Regression analysis was used to test the hypothesis in this study. It can be seen from table 4 that perceived ease of use had a positive effect on perceived usefulness, D-W=1.785 are close to 2 and VIF = 1.000, showing no self-correlation and the collinearity problem is not serious. R2=0.397, Adj-R2=0.394, F=137.163, $P<0.001$ reached a significant level. Perceived ease of use had a positive effect on perceived playfulness, D-W=1.884 are close to 2 and VIF=1.000, which indicates no self-correlation and there is no critical

collinearity problem. R2=0.351, Adj-R2=0.348, F=112.718, P<0.001 reached a significant level. Perceived usefulness had a positive effect on attitude toward using, D-W=1.840 are close to 2 and VIF=1.000, which shows no self-correlation and the collinearity problem is not serious, R2=0.560, Adj-R2=0.558, F=264.571, P<0.001 reached a significant level. Perceived ease of use had a positive effect on attitude toward using. D-W=1.635 are close to 2 and VIF=1.000, which shows no self-correlation and the problem of collinearity is not serious. R2=0.413, Adj-R2=0.410, F=146.446, P<0.001 reached a significant level. Perceived playfulness had a positive effect on attitude toward using, D-W=1.840 are close to 2 and VIF=1.000, which shows no self-correlation and the colinearity problem is not serious. R2=0.579, Adj-R2=0.577, F=286.403, P<0.001 reached a significant level. Immersion experience had a positive effect on attitude toward using, D-W=1.721 and VIF=1.000, shows that there is no self-correlation and the collinearity problem is not serious. R2=0.512, Adj-R2=0.510, F=218.646, P<0.001 reached a significant level. Immersion experience had a positive effect on use intention, D-W = 1.957 and VIF = 1.000, shows that there is no self-correlation and the colinearity problem is not serious. R2=0.512, Adj-R2=0.510, F=218.646, P<0.001 reached a significant level. Attitude toward using had a positive effect on use intention, D-W=1.957 and VIF=1.000, shows that there is no self-correlation and the colinearity problem is not serious. R2=0.512, Adj-R2=0.510, F=218.646, P < 0.001 reached a significant level.

Study Results

Based on the analysis of the purpose and results of this study, the conclusion is summarized. The empirical study results show that perceived ease of use has a significant and positive impact on perceived usefulness. The higher the degree of users' recognition of perceived ease of use, the higher the degree of their recognition of perceived usefulness. Perceived ease of use has a significant and positive impact on the results of perceived playfulness. Perceived usefulness also has a significant and positive impact on the attitude toward using. The user's recognition of the attitude toward using will be higher when the user's recognition of perceived usefulness is higher. Perceived ease of use has a significant and positive impact on the results of attitude toward using. Perceived playfulness has a significant and positive impact on the results of attitude toward using. Immersion experience has a significant and positive impact on the results of attitude toward using. The higher the user's recognition of immersion experience, the higher the user's recognition of attitude toward using. The results showed that immersion experience has a significant and positive impact on the use intention. The user experiences are more immersive, the higher degree of user's recognition with attitude toward using. Attitude toward using has a significant and positive impact on the use intention. In other words, user's positive attitude will lead to higher use intention.

Table 2. The results of factor analysis

Variable	Component		
	1	2	3
PU2	0.614		
PU3	0.664		
PU4	0.580		
PE1			0.831
PE2			0.812
PE3			0.804
PE4			0.507
PP1	0.638		
PP2	0.693		
PP3	0.664		
PP4	0.666		
IE1		0.679	
IE2		0.725	
IE3		0.719	
IE4		0.678	
IE5		0.728	
AU1	0.709		
AU2	0.680		
AU3	0.681		
AU4	0.694		
UI1	0.838		
UI2	0.827		
UI3	0.856		
UI4	0.820		

Table 3. The Pearson's correlation coefficient

	PU	PEU	PP	IE	AU	UI
PU	1					
PEU	0.630**	1				
PP	0.760**	0.593**	1			
IE	0.694**	0.602**	0.715**	1		
AU	0.748**	0.643**	0.761**	0.716**	1	
UI	0.793**	0.552**	0.787**	0.610**	0.839**	1

Table 4. The results of regression analysis

Hypothesis	Predictor	Dependent variable	β	t	Std. Error	VIF
H1	PEU	PU	0.630	11.712	0.048	1.000
	*R^2 =0.397, Adj-R^2 =0.394, F=137.163, P=0.000***, D-W=1.785*					
H2	PEU	PP	0.593	10.617	0.052	1.000
	*R^2 =0.351, Adj-R^2 =0.348, F=112.718, P=0.000***, D-W=1.884*					
H3	PU	AU	0.748	16.266	0.050	1.000
	*R^2 =0.560, Adj-R^2 =0.558, F=264.571, P=0.000***, D-W=1.840*					
H4	PEU	AU	0.643	12.101	0.052	1.000
	*R^2 =0.413, Adj-R^2 =0.410, F=146.446, P=0.000***, D-W=1.635*					
H5	PP	AU	0.761	16.923	0.047	1.000
	*R^2 =0.579, Adj-R^2 =0.577, F=286.403, P=0.000***, D-W=1.840*					
H6	PP	AU	0.716	14.787	0.047	1.000
	*R^2 =0.512, Adj-R^2 =0.510, F=218.646, P=0.000***, D-W=1.721*					
H7	IE	UI	0.610	11.104	0.057	1.000
	*R^2 =0.372, Adj-R^2 =0.369, F=123.301, P=0.000***, D-W=1.957*					
H8	AU	UI	0.610	11.104	0.057	1.000
	*R^2 =0.703, Adj-R^2 =0.702, F=492.857, P=0.000***, D-W=2.116*					

Managerial Implications

The technology of smart phones and mobile devices is getting saturated today. In 2017, science and technology shifted to virtual reality, self-driving, wearable devices, artificial intelligence, cloud computing and Internet of things. Cloud computing and the Internet of things, virtual reality games gradually emerged in 2015. Since 2006, scholars and practitioners began to turn to the development of virtual reality, while few literature studies focusing on user VR games. Therefore, this study focuses on the integration of perceived usefulness, perceived ease of use, perceived playfulness, immersive experience, attitude toward using and use intention. The hypothesis proved to be tenable after analysis and demonstration. The results of this study can be used as a reference for the subsequent research and practice. It can also be used for the market analysis of various businesses to let businesses better understand the mentality of consumers. From the above results, the relevant variables of this study are important factors affecting VR games. If the players or users feel satisfied and that the game is easy to learn, it is very helpful for the first-time players. The industry can pay attention to the user's perception of ease of use, which will increase the willingness of players to use VR games.

The clear and interesting picture presentation of the game will stimulate the curiosity and excitement of the players. If the pixels presented in the gam can meet the expectations of the players, they will have pleasant mood during the

game, which gives the users a positive evaluation on the VR games. In other words, if the overall operation of the games is easy for players, it will make the players feel good in the game, which can arouse the players' curiosity and interesting, resulting the feedback of a good leisure activity. In addition, the use intention of the players will be higher, if the industry can value the perceptual interestingness of users and persuade them to engage in the plot without noticing the passage of time and the current environment. When players think virtual reality games are good and it's a good leisure activity, it will make players willing to take the initiative to use it and recommend it to others in the future.

Research Limitations and Suggestions

Virtual reality games are gradually starting to set out, as smart phones and mobile devices tend to be saturated. Therefore, this study is biased towards emerging industries, and it is relatively difficult to collect data. There are not many users who have used virtual reality games. Since VR games are mainly used by the young group, the majority of the participants in this research are students, accounting for 64.8%. In addition, users of different age groups have significant differences in use intention, among which those aged 20 to 25 have high willingness to use. Meanwhile, different occupations also have significant differences in willingness to use VR games, but students are still more interested. Besides, the charges of current VR games are relatively high, and the wearable devices are too heavy, causing a burden. Only a few games do not produce a sense of dizziness. And most of them are horror games, so many players are too scared to have a try. If the games can be improved to meet the needs of most people, more users are willing to experience them in the future.

This research also suggests that companies shall pay more attention to changes in the market and the responses of users to make more functions that meet their expectations; and propose more attractive content for potential users who have not tried VR games, which will not only retain old users, but also attract more potential users. Moreover, companies are also suggested to develop VR games easy in operation and clear in image so as to attract people to experience. The existing users are also great materials for advertising, which could be a good impression for new users on the companies. The samples of this research are relatively young, so if the developers want to promote their virtual reality games to different groups, such as the middle-aged, they must have a deep understanding on the opinions of various age groups before developing games suitable for different age groups, and expand the range of potential users. Finally, the results of this study can provide references for future research on VR games.

References

Bandai Namco Entertainment. (2020). Summer Lesson サマーレッスン

[online] https://summer-lesson.bn-ent.net/ (accessed 20 February, 2020).

BENEVO (2017). Four Realities-VR, AR, SR, MR [online] https://benevo.pixnet.net/blog/post/63012046%E5%9B%9B%E7%A8%AE%E5%AF%A6%E5%A2%83-vr%E3%80%81ar%E3%80%81sr%E3%80%81mr (accessed 22 February, 2020).

Boomsma, A. (1985). Nonconvergence, improper solutions, and starting values in LISREL maximum likelihood estimation. Psychometrika, 50(2), 229-242.

Cant, R., Cooper, S., Sussex, R., & Bogossian, F. (2019). What's in a name? Clarifying the nomenclature of virtual simulation. Clinical Simulation in Nursing, 27(1), 26-30.

Capcom (2020). Resident Evil 7: Biohazard [online] http://www.residentevil7.com/ (accessed 20 February, 2020).

Carlos Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2019). The impact of virtual, augmented and mixed reality technologies on the customer experience. Journal of Business Research, 100(1), 547-560.

Choi, D., & Kim, J. (2004). Why people continue to play online games: In search of critical design factors to increase customer loyalty to online contents. Cyberpsychology and Behaviour, 7(1), 11-24.

Cowan, K., & Ketron, S. (2019). A dual model of product involvement for effective virtual reality: the roles of imagination, co-creation, telepresence, and interactivity. Journal of Business Research, 100(1), 483-492.

Csikszentmihalyi M. (1975). Play and intrinsic rewards. Journal of Humanistic Psychology, 5(3), 41-63.

Csikszentmihalyi, M. (1975). Beyond boredom and anxiety. Jossey Bass, San Francisco.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319-340.

Eiris, R., Gheisari, M., & Esmaeili, B. (2020). Desktop-based safety training using 360-degree panorama and static virtual reality techniques: a comparative experimental study, 109(1), 1-14.

Fishbein, M., & Ajzen, I. (1975). Beliefs, attitude, intention, and behaviour: An introduction to theory and research, Reading, Addison-Wesley, MA.

Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2019). The impact of virtual, augmented and mixed reality technologies on the customer experience.

Journal of Business Research, 100 (1), 547-560.

Ghani, J. A., & Deshpande, S. P. (1994). 'Task characteristics and the experience of optimal flow in human-computer interaction. The Journal of Psychology, 128(4), 381-391.

Grau, O. (2007). Media Art Histories, Cambridge, MA, MIT.

Hsu, C. L., & Lu, H. P. (2004). Why do people play on-line games? an extended TAM with social influences and flow experience. Information & Management, 41(7), 853-868.

Kim, M., J, C., & Kim, J. (2017). A study on immersion and presence of a portable hand haptic system for immersive virtual reality. Sensors, 17(5), 1-18.

Moon, J. W., & Kim, Y. G. (2001). Extending the TAM for a World Wide Web context. Information Management, 38(4), 217-230.

Nunnally, J. C. (1978). Psychometric theory (Second ed.), McGraw-Hill, New York.

Pan, X., Gillies, M., Barker, C., Clark, D. M., & Slater, M. (2012). Socially anxious and confident men interact with a forward virtual woman: an experimental study. PLoS One, 7, e32931.

Pine, B. J., & Gilmore, J. H. (1998). Welcome to the experience economy. Harvard Business Review, 76(4), 97-105.

Privette, G., & Bundrick, C. M. (1987). Measurement of experience: construct and content validity of the experience questionnaire. Perceptual and Motor Skills, 65(1), 315-332.

Rubio-Tamayo,J. L., Barrio, M. G., & García, F. G. (2017). Immersive environments and virtual reality: systematic review and advances in communication, interaction and simulation. Multimodal Technologies and Interact, 1(21), 1-20.

Servotte, J. C., Goosse, M., Campbell, S. H., Dardenne, N., Pilote, B., Simoneau, I. L., Guillaume, M., Bragard, I., & Ghuysen, A. (2020). Virtual reality experience: immersion, sense of presence, and cybersickness. Clinical Simulation in Nursing, 38(1), 35-43.

Sheridan, T. (2000). Interaction, Imagination and Immersion: Some Research Needs, Proceedings of the ACM symposium on Virtual reality software and technology, Seoul, Korea, 1-7.

Taylor, S., & Todd, P. (1995). Assessing IT usage: the role of prior experience. MIS Quarterly, 19(4), 561-570.

Teo, T. S. H., Lim, V. K. G., & Lai, R. Y. C. (1999). Intrinsic and extrinsic motivation in internet usage. Omega, 27(1), 25-37.

Venkatesh, V., & Davis, F. (2000). A theoretical extension of the technology acceptance model: four longitudinal field studies. Management Science,46(2), 186-204.

Webster, J., & Martocchio, J. J. (1992), Microcomputer Playfulness: Development of a Measure with Workplace Implications. MIS Quarterly, 16(2), 201-226.