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THE IMPACT OF THE VIRTUAL REALITY AND AUGMENTED REALITY NOSTALGIA SYSTEM ON THE ELDERLY BEHAVIOR MODEL

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Abstract

With the aging of the population, elderly people have many problems in cognition, emotion, and behavior. This research is based on the previously developed 3ds Max ancient house model (Tsao et al., 2019). We use Unity engine integration technology to modify it to the "VR/AR Nostalgia system", which can be watched by HTC VIVE. It allows users to immerse the experience and trigger the VR/AR audio-visual interaction of nostalgic elements. The nostalgic system indeed allows users to fully recall and think. This research is based on the well-known three-component theory of attitudes (Rosenberg et al., 1960) and Bem (1972)'s self-perception theory, and expands Davis et al.'s (1989) technology acceptance model. This article uses a questionnaire survey to interview 405 elderly users about their attitudes towards the use of VR and AR nostalgia systems. Let elderly users measure the usage attitude and intention to use of VR / AR nostalgic system from three aspects which are cognition, emotion and behavior. And SPSS 21 test is used to test the fitness and related hypotheses of this new model.

This article obtains the following conclusions: (1) The VR/AR nostalgia system with cognitive, emotional and behavioral components proposed in this article has a good fit with the empirical data. (2) In terms of cognitive variables, perceived usefulness, perceived ease of use, personal innovativeness, and compatibility of VR / AR nostalgic system have a positive effect on the elderly's attitude towards VR / AR nostalgia system. (3) In terms of emotional variables, Fun and Emotional Attachment of the VR/AR nostalgia

system have a positive effect on the usage attitude of the VR/AR nostalgia system. (4) In terms of behavioral variables, the use of VR/AR nostalgia system has a positive effect on the usage attitude of VR/AR nostalgia system. (5) The usage attitude of VR/AR nostalgia system has a positive effect on the intention to use of VR/AR nostalgia system. The empirical results of this research show that the VR/AR nostalgia system should be able to effectively enhance the cognition, emotion, and behavior of the elderly, so that it can improve the life of the aging population. It is promoted and applied to the nostalgia treatment to prevent dementia and solve lack of manpower in long-term care.

Keywords: Nostalgia System, Virtual Reality, Augmented Reality, Technology Acceptance Model

Introduction

With the reduction of fertility rate and the progress of medical technology, the problem of population aging is becoming more and more serious. With the increase of the elderly population, the related diseases such as dementia also increase at the same time, which makes the problems and difficulties of the elderly in life more obvious. Therefore, the number of cognitive, emotional, and behavior-related problems of the elderly such as dementia and psychological emotional dissatisfaction increases, which brings troubles and difficulties to the daily life of the elderly. Li et al. (2012) shows that the use of high-tech, through the way of extensive participation, enables the elderly to access diversified and unrestricted distance activities, so as to improve their physical, psychological and social benefits. Improve the psychological well-being and happiness of the elderly, and give the elderly a higher sense of value. Concerning the research of nostalgia therapy, Cutler et al. (2016) used highly interactive mobile vehicles to help the elderly to strengthen their communication and establish positive emotions. The intervention program of nostalgic therapy activities through digital somatosensory games helps them to live a healthy life, interacting with the healthy generation of the family and support positive life feelings. Subramaniam et al. (2014) said that nostalgia therapy is not only for the mental health of the elderly, but more importantly, through the participation and consensus of the elderly in the nostalgia treatment activities, we can help them improve their life satisfaction of interpersonal interaction and experience exchange. Sellers and Stork (1997) found that nostalgia therapy can integrate the past experience has a positive effect on psychological, physical and social functions. In addition, it can improve the physical and mental health and life quality of the elderly.

The current high-tech and social networking websites lack further discussion on the behavior patterns of elderly users, such as perceived usefulness, perceived ease of use, usage attitude, emotional attachment and intention to use (Tsai and Tsai, 2015). Based on the VR case navigation glasses version of "VR / AR nostalgic system" (Tsao et al., 2019), which was developed by the previous development of the 3ds Max ancient house model, this study improved the previous

design by using the mobile device Samsung note 5 mobile phone and VR Case Guide glasses, so as to expand and modify it into the "VR / AR nostalgic system" of HTC vive version. The elderly were invited to use 360VR / AR nostalgic HTC for the study of healthy and sub-healthy elderly in Miaoli and Zhunan areas. Vive system enables users to experience their environment, making the picture more lively, interactive and realistic, and provides an immersive virtual experience environment for the elderly.

In order to understand usage attitudes and intention to use of elderly users toward the VR/AR nostalgia system, the results of questionnaire were analyzed by statistical software after users finished the tests. This study adopts the first version of Tami proposed by Davis (1986), which uses two variables that affect users' attitude towards information technology - perceived usefulness and perceived ease of use. In addition, Davis et al. (1989) proposed a revised Technology Acceptance Model (TAM II). The main arguments of this integrated TAM model are "perceived usefulness" and "perceived ease of use".

These two variables will affect the users' "attitude towards the use of the technology", and then affect the "intention to use" and "actual usage behavior". Moon and Kim (2001) explored the user's attitude towards the use of technology based on the acceptance model of science and technology, adding the variables that reinforce the fun of emotional level. Based on the well-known attitude three component theory (Rosenberg et al. 1960), this study also strengthens the usage attitude towards VR / AR, because besides cognition, there are emotions and behaviors that affect the usage attitude. Therefore, this study will confirm the effectiveness and intention of use of the "VR/AR nostalgia system" experienced by the elderly through the HTC VIVE interactive device in cognition, emotion and behavior. Hope that it can be promoted and applied to nostalgia treatment in the future to prevent dementia and solve the manpower shortage of long-term care.

Research Background

Reminiscence Therapy

Chien et al. (2010) pointed out that the United Nations World Health Organization (WHO) defined that when the proportion of the elderly over 65 years old in the total population reaches 7%, it is called an "ageing society" "When it reaches 14%, it is called an "aged society". When the proportion of the elderly population reaches 20%, it is called a "super-aged society". With the aging of the population, the influence on the elderly's health, psychology, environment and social relations makes them design what can improve their quality of life, increasing their satisfaction and fun in life, promoting their health and reduce the risk of dementia. The device which can not only improve the abilities of the sensory system but also accompany with users has become very important.

Sedikides et al. (2008) believed that nostalgia is traditionally conceptualized as medical illness and mental illness. However, this group of doctoral researches pointed out that nostalgia is a

major positive, self-related social emotion with important psychological functions. Haight et al. (1993) believed that nostalgia therapy is a common and effective nursing measures and activities for elderly care, which can maintain the physical and mental health and quality of life of the elderly. It mainly focuses on pleasant memories, reducing alienation and loneliness, increasing society improving self-affirmation and positive feedback.

Research model design

This research is based on the VR CASE guide glasses version "VR/AR Nostalgia System" (Tsao et al., 2019) developed by the previous 3ds Max ancient house model. The original nostalgia treatment system is developed by shooting VR 360 videos, combining virtual reality and augmented reality, using AR cloud graphics recognition on Vuforia website, and cloud VR recognition on Fader website to switch scenes. Previously Tsao et al. (2019) system used the VR/AR nostalgia system and VR CASE guide glasses. While accompanying with mobile phones to perform the VR/AR nostalgic experience, although the mode of navigation glasses is convenient to carry, it is difficult for the experiencer to have a deep sense of immersion. The system diagram is shown in Figure 1.

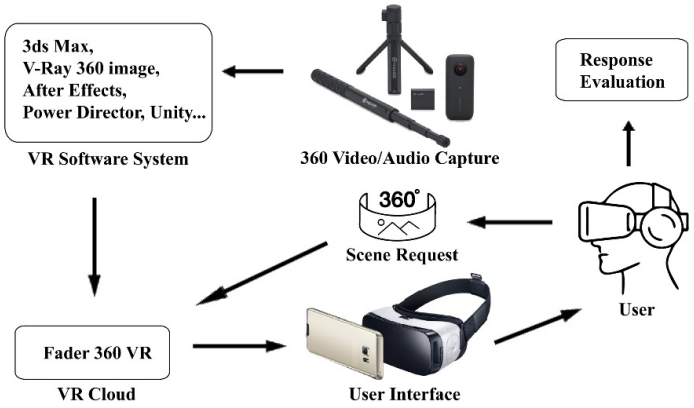

Figure 1. Simulation processes in an interactive VR system. (Tsao et al., 2019)

This research removed the previous mobile device, Samsung Note 5, and VR CASE navigation glasses to make expansion and modification as HTC VIVE version entitled "VR/AR nostalgia system". It will use Unity 2019.3.8f1 (64-bit) software to integrate VR/AR 3D scenes, 360 VR videos, graphics recognition, nostalgic music, C# program interaction. Elderly testers can choose to trigger various nostalgic question types that they are interested in, and improve the use of text or photos that are too flat in the past, as shown in Figure 2.

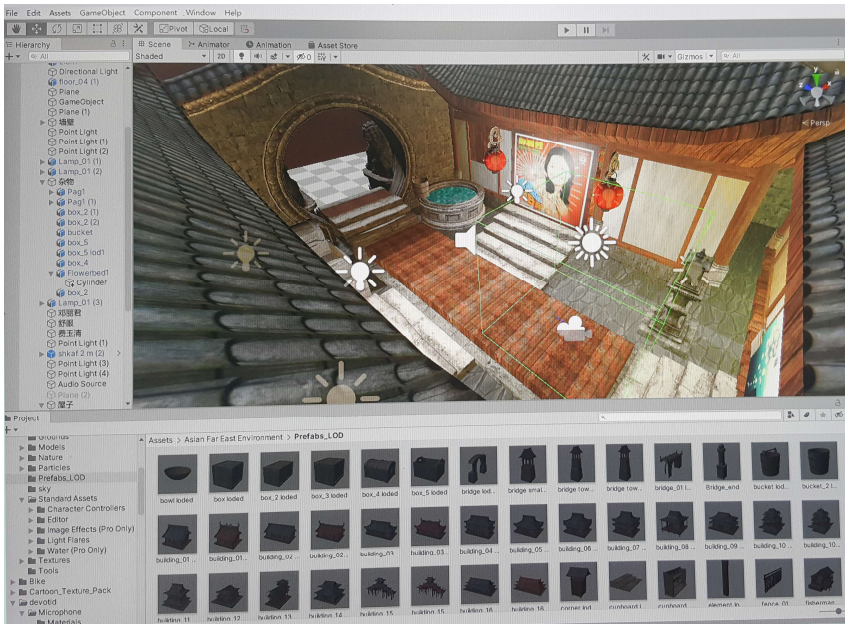

Figure 2. Unity engine integrates 3D nostalgic scenes used in HTC VIVE images

This research puts the 3ds Max 2018 ancient house scene model into Unity 2019.3.8f1 (64-bit). The AR part is integrated by the Unity engine with the recognition of AR cloud graphics on Vuforia website. At the same time, the Makar AR cloud graphics recognition is used to perform virtual reality and the navigation interface identification of augmented reality for nostalgia therapy. The VR part is embedded with the nostalgic text, music and 3D scene pictures from the 1950s to 1960s by the Unity engine. It allows the testers to wear HTC VIVE hardware devices as the trigger point for switching spaces, enter this nostalgic virtual space for testing, and lead the elderly Candidates experience the nostalgic audio-visual interaction and trigger 3 guided interfaces. The guided interface 1 unit contains multiple nostalgic music by multiple music singers, such as well-known nostalgic Taiwanese music singers Su Rui, Feng Feifei, Teresa Teng, Fei Yuqing, etc. As shown in Figure 3, the guide interface 2 unit has added a number of pictures of nostalgic artifacts, and the guide interface 3 unit allows the experiencer to enter a number of warm nostalgic family stories. This study actively uses 3ds Max with HTC VIVE hardware equipment.

To calculate the 3D scene to become more realistic and immersive, and nostalgic historical evidence, we continue to use the Unity engine to modify, build and control the integration of "somatosensory", "controller" and "motion detection". We also add c# program and a handle to enhance the interactivity and immersion, and improve the smoothness and simplicity of the screen.

Figure 3. Experiencers use HTC VIVE as a nostalgic space map for switching VR/AR

TAM (Technology Acceptance Model)

Information technology brings a lot of convenience to people, but some of its own cognitive factors often affect the perception of this new technology. In order to clarify users' cognitive attitudes and willingness to use information technology, Davis (1986) proposed the first version of the Technology Acceptance Model (TAM I). Davis believes that "Perceived Usefulness" (Perceived Usefulness) will affect "Perceived Ease of Use" and "Perceived Ease of Use". The "cognitive usefulness" will affect user's attitude to use technology, and the effect of ease to use will vary with gender and age, usually women or older people have a significant impact (Venkatesh et al., 2003). Davis et al. (1989) once again proposed amendments to the technological acceptance model and added external variables. They believe that external variables will affect users' internal variables (cognitive usefulness and cognitive ease of use), and cognitive usefulness and cognitive ease of use. It will affect the user's attitude, and indirectly affect the intention and actual behavior of use. Figure 4. is the structure of the second edition of the Technology Acceptance Model (TAM II):

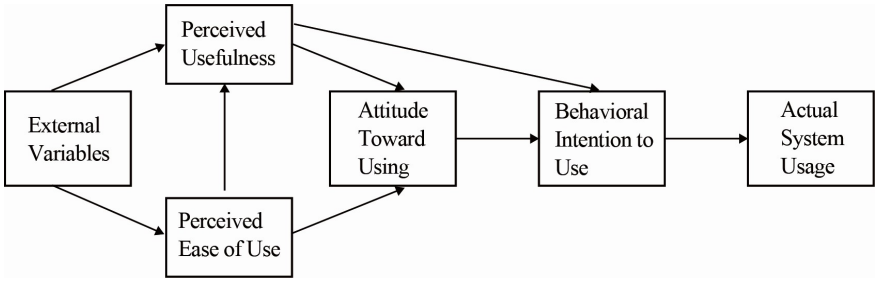

Figure 4. The structure of the second edition of the Technology Acceptance Model II

The cognitive, emotional, and behavioral components of Information Technology used attitude

Attitude is how people think, feel, and act on certain things in the environment (Crespi, 1971). Rosenberg et al. (1960) pointed out [2] attitude is a cognitive, emotional and behavioral response to a certain type of stimulus. This behavior refers to behavioral intentions, and the inner intentions can only be inferred through explicit behaviors. Therefore, in psychology and social psychology, attitudes are often classified as having three components: cognition, affective and behavior. Based on the above, TAM I and TAM II are the cognitive components of attitudes, including cognitive usefulness and cognitive ease of use, to influence attitudes towards the use of technology. Moore and Benbasat (1991) found that when discussing the technological acceptance model, innovation and compatibility are significant aspects that can make up for the lack of technological acceptance models. Personal innovation (Personal Innovativeness) is regarded as a personal willingness to try any new information technology (Agarwal and Prasad, 1998). Compatibility is regarded as the user's innovative values and beliefs, which are consistent with previous ideas or needs (Cho, 2006).

Therefore, when developing the new model of this research in the cognitive component of attitude, the four cognitive component variables of cognitive usefulness, cognitive ease of use, personal innovation and compatibility will be used as indicators of information technology use attitude.

Moon and Kim (2001) extended the Technology Acceptance Model (TAM), adding fun to measure user acceptance of World-Wide-Web (WWW). Cheung et al. (2008) pointed out that the stronger the user's emotional attachment to virtual technology, the stronger the possibility of recommending this community to others through word of mouth, and the higher the re-use behavior. Interestingness refers to the degree of pleasure a person feels when participating in an activity or adopting a system (Barnett, 1990). Emotional Attachment refers to the deep emotional connection between a person and a specific object and a specific goal, which stimulates meaningful development through interaction and induces strong feelings for attachment to the goal (Thomson et al., 2005).

Bem (1972)'s self-perception theory argues that usually one cannot directly know when one's attitude is, but only by observing the behavior and the situation when the behavior occurs to infer one's attitude and feelings. When the internal information is weak or unexplainable, we will infer our internal state based on our external behavior, and generate self-consciousness by observing our behavior. In addition, a study by Shin and Kim (2008) found that users use information systems while they are fully invested in the system and only if they feel happy or fulfilled. The above research shows that users must first use, experience, and try actual behaviors before they can form attitudes from personal experience. Therefore, to develop the new model of this research, the behavioral component will be the actual use of VRAR nostalgia system as a variable of the behavioral component as an indicator of IT usage

attitude, rather than traditional behavioral intentions.

Research Design

Research framework and hypothesis

This study refers to Tsai and Tsai's (2015) views and framework on the behavior patterns of social networking sites, and is based on the three-component theory of attitude and BEM (1972) self-perception theory. In addition, it expands the technology acceptance models proposed by Davis (1986), Davis et al. (1989) and Moon and Kim (2001) in different years, and on the basis of the original independent variables of these models. In order to explain users' attitudes towards the use of social networking sites more effectively, this study increases personal innovation and compatibility in terms of cognitive variables; increases fun and emotional attachment in terms of emotional variables; adds usage behavior in terms of behavior variables. In other words, let the independent variables of the new model proposed in this study cover the cognition, emotion and behavior of the three components of attitude, so as to explain fully the usage attitude and intention to use of VR / AR nostalgic system users. The research framework is shown in Figure 5.

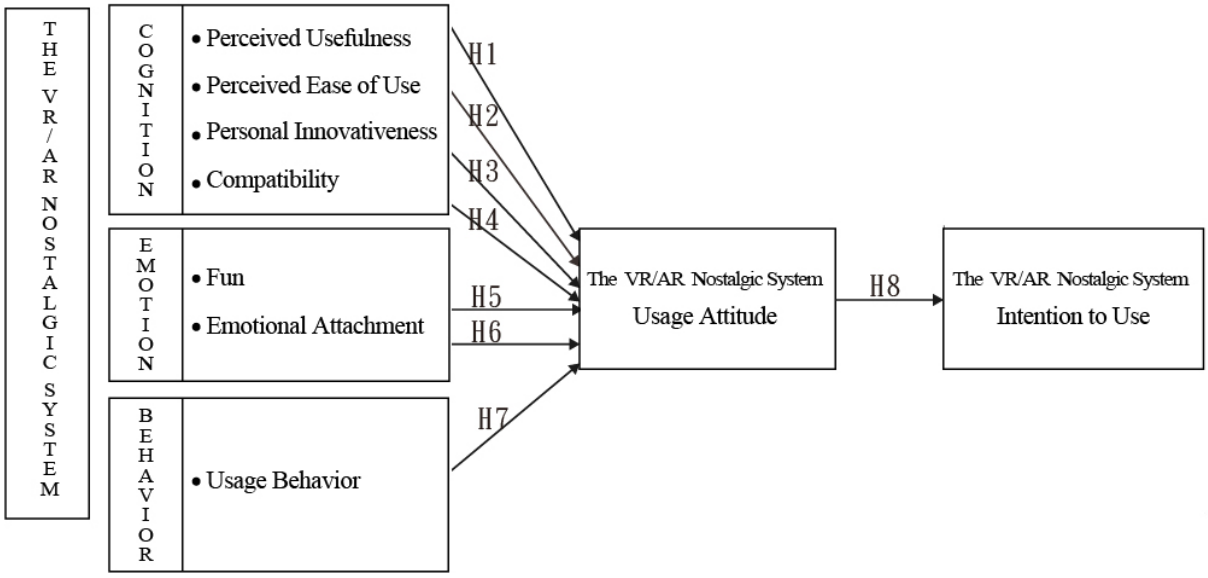

Figure 5. The research framework

According to the theoretical framework, the hypotheses of the path relationship between potential variables are described as follows: Davis et al. (1989) has confirmed a positive relationship between usefulness and adoption intention in TAM model, which means that the more users believe that technology can improve their work performance, life convenience and efficiency, the higher their willingness is. There are also many studies confirming that perceived usefulness and perceived ease of use will affect usage attitude and intention to use,

and this relationship exists (Wang et al., 2003; Yiu et al., 2007). Lin and Lu (2000) pointed out that users' perceived usefulness and perceived ease of use of social networking sites affect their attitudes and intentions. According to the above discussion, the hypothesis of [H1] is established.

[H1] The "perceived usefulness" of the VR/AR nostalgia system has a significantly positive impact on users' "usage attitude".

Davis et al. (1989) explained that when users find the information system easy to use, they will quickly get used to it. Riemenschneider et al. (2003) pointed out that the perceived ease of use of information technology by employees of SMEs will affect attitude, perceived usefulness and perceived behavior control. According to the above discussion, the hypothesis of [H2] is established.

[H2] The "perceived ease of use" of the VR/AR nostalgic system has a significantly positive impact on users' "usage attitude".

Agarwal and Prasad (1998) surveyed the determinants of bank customers' adoption rate of mobile banking service. The study used innovativeness to increase users' confidence in the use of mobile banking service. Jones et al. (2002) conducted a research on sales-automatic systems for business personnel and pointed out that personal innovativeness has a significant relationship with the attitude toward using the new system. This study believes that the user's personal innovativeness will affect the individual's perception of IT innovation, so it will also affect their attitude towards using the VR/AR nostalgic system. According to the above discussion, the hypothesis of [H3] is established.

[H3] The "personal innovativeness" of the VR/AR nostalgia system has a significantly positive impact on users' "usage attitude".

Davis et al. (1989) proposed that the relationship between innovative features and users' attitude towards information technology and their adoption has been proven by many literatures. Compatibility refers to the degree to which users are aware that new technologies or services are consistent with their existing values, concepts and experiences. Chen et al. (2002) pointed out that when new technologies or services are compatible with users' needs, the uncertainty they face will also decrease. In other words, compatibility will positively affect usage attitude. Takacs and Freiden (1998) considered that when users already have the habit of using computers, they are more prone to use Internet technology. Which means that the higher the compatibility, the higher the willingness. Liao et al. (1999) conducted a study on consumers' adoption of virtual banking and found that the higher the compatibility, the higher the adoption attitude. According to the above discussion, the hypothesis of [H4] is established.

[H4] The "compatibility" between the VR/AR nostalgia system and users has a significant positive impact on users' "usage attitude".

Moon and Kim (2001) added fun as an independent variable in Tam II model, and proved that fun has a significantly positive impact on Internet users' usage attitude. Lin et al. (2000) included the value of "fun" in the Expectation Confirmation Theory (ECT) when studying the factors of continuous use of websites. The results show that the recognition of "fun" for satisfaction and perceived usefulness contribute significantly to the attitude of users to reuse websites. According to the above discussion, the hypothesis of [H5] is established.

[H5] The "fun" of the VR/AR nostalgic system has a significantly positive impact on users' "usage attitude".

Allen and Meyer (1990) proposed that the emotional component of organizational commitment refers to employees' emotional attachment, approval and participation to the company. The results show that affective and persistent components of organizational commitment are empirically distinguishable and have different correlations. Wirtz et al. (2000) pointed out that some consumer behavior studies have also pointed out that people's emotional response is one of the antecedent variables of usage attitude. According to the above discussion, the hypothesis of [H6] is established.

[H6] The "emotional attachment" of the VR/AR nostalgia system has a sig-nificant;y positive impact on users' "usage attitude".

Moon and Kim (2001) proposed that ease of use and practicality are considered to be the basis for the acceptance and use of various enterprise IT. Therefore, entertainment is introduced as a new factor that reflects the uses' internal beliefs about technology network acceptance. Use it as an internal motivating factor to expand TAM and find the relationship between "usage behavior" and "usage attitude". Bem(1972) proposed the self-perception theory, which considered ‘‘attitude’’ is to infer something based on past behavior after things happened. According to the above discussion, the hypothesis of [H7] is established.

[H7] The "usage behavior" of the VR/AR nostalgic system has a significantly positive impact on users' "usage attitude".

Hsu and Lin (2008) confirmed that if users continue to use technology websites, their satisfactory attitude will positively and significantly affect users' intention to use. According to the technological acceptance model of Davis et al. (1989), the more positive the usage attitude is, the higher the behavior intention will be. Ahn et al. (2007) pointed out that the attitude of customers towards technology websites will positively and significantly affect the intention to use technology. According to the above discussion, the hypothesis of [H8] is established.

[H8] The "usage attitude" of the VR/AR nostalgic system has a significantly positive impact on users' "intention to use".

Operational definition and measurement of research constructs

The framework of this research contains a total of nine constructs, and each construct is defined and operationalized with reference to relevant literature. In terms of variable measurement items, appropriate modifications are made based on the use of the "VR/AR nostalgia system" by the elderly. The measurement items of each construct use the Likert five-point scale (strongly disagree) = 1 to strongly agree = 5). The definition of variable operation type is summarized as shown in Table 1.

Table 1. Definition of variable operational type in this study

Construct	Definition
1. Perceived Usefulness (PU)	Users feel how useful when using the VR/AR nostalgic system.
2. Perceived Ease of Use (PE)	The user thinks how easy to use about the VR/AR nostalgic system function.
3. Personal Innovativeness (PI)	The user's willingness to use any innovative things.
4. Compatibility (CP)	The degree for the VR/AR nostalgia system that fits the individual's original values and needs.
5. Fun (FN)	When users use the VR/AR nostalgia system, they feel the degree of fun.
6. Emotional Attachment (EA)	The degree of connection for the emotional relationship between the user and the VR/AR nostalgia system.
7. Usage Behavior (UB)	How often users want to use the VR/AR nostalgic system.
8. Usage Attitude (UA)	The user's positive or negative comments on the behavior of using the VR/AR nostalgic system.
9. Intention to Use (IU)	The user's feelings about the VR/AR nostalgic system that will reflect the behavior and ideas that they want to use again.

The items of questionnaires and the reference source of the scale are shown in Table 2.

Table 2. Measurement items and item reference sources for each construction

Construct	Number	Question Item	Reference Source
1. Perceived Usefulness (PU)	A1	I think this VR/AR nostalgia system makes my perception of nostalgia very convenient.	Davis et al. (1989) Wang et al. (2003) Lin and Lu (2000)
	A2	I feel that this VR/AR nostalgia system works for me.	
	A3	This VR/AR nostalgia system helps me feel nostalgic.	
	A4	Overall, I think this VR/AR nostalgia system is	

		very useful for nostalgia.	
2. Perceived Ease of Use (PE)	B1	For me, this VR/AR nostalgia system is easy to learn and use.	Davis et al. (1989) Yiu et al. (2007) Riemenschneider et al. (2003)
	B2	I know how to operate this VR/AR nostalgic system to play nostalgic songs.	
	B3	I think the use of this VR/AR nostalgia system is very simple.	
	B4	I think this VR/AR nostalgia system is very easy to use.	
3. Personal Innovativeness (PI)	C1	I am more receptive to innovative ideas or ideas than my friends.	Agarwal and Prasad (1998) Jones et al. (2002)
	C2	I like to try new things.	
	C3	If I hear about new information technology, I will want to try it.	
	C4	Generally, I am hesitant to try new information technology*.	
4. Compatibility (CP)	D1	I use theVR/AR nostalgia system in the same way as my preferred technology.	Davis et al. (1989) Chen et al. (2002) Takacs and Freiden (1998)
	D2	The VR/AR nostalgia system is consistent with my habit of acquiring information technology.	
	D3	The VR/AR nostalgic system is consistent with my current way to obtain information.	
5. Fun (FN)	E1	When I use the VR/AR nostalgia system, I will be immersed in it and forget the time.	Moon and Kim (2001) Lin et al. (2000)
	E2	When I use the VR/AR nostalgic system, it is unlikely to be disturbed by other foreign objects.	
	E3	When I use the VR/AR nostalgia system, I forget other things I have to do.	
	E4	I think this VR/AR nostalgia system will stimulate my curiosity about nostalgia.	
	E5	I think this VR/AR nostalgic system will arouse my desire for nostalgic exploration.	
	E6	I would expect to want to use this VR/AR nostalgic system.	
6. Emotional Attachment (EA)	F1	I will Identify with this VR/AR nostalgia system.	Allen and Meyer (1990) Wirtz et al. (2000)
	F2	I believe in the value of nostalgia attached to this VR/AR nostalgic system.	
	F3	The VR/AR nostalgia system has many personal emotional meanings to me.	
	F4	I think the nostalgia issue on the VR/AR system is my nostalgia issue.	
	F5	I feel that my emotions are connected with the VR/AR nostalgia system.	
	F6	I feel that there is nostalgic attachment to the VR/AR nostalgic system.	
	F7	I feel that I have a strong sense of nostalgia for the VR/AR nostalgic system.	
7. Usage Behavior (UB)	G1	I think I would like to use the VR/AR nostalgic system to immerse myself.	Moon and Kim (2001) Bem (1972)
	G2	I am willing to spend a few hours a week using the VR/AR nostalgia system.	

	G3	I would like to use the VR/AR nostalgia system often.	
8. Usage Attitude (UA)	H1	I like to use the VR/AR nostalgia system.	Hsu and Lin (2008)
	H2	I feel very comfortable using the VR/AR nostalgia system.	
	H3	My attitude for using the VR/AR nostalgia system is positive.	
9. Intention to Use (IU)	I1	I also want to use the VR/AR nostalgia system again.	Wixom and Todd (2005)
	I2	I am willing to continue to use the VR/AR nostalgic system.	
	I3	I would like to recommend the VR/AR nostalgia system to my friends.	

*Note: After the pre-test of the questionnaire, it will be deleted and not included in the formal questionnaire.

This study is based on the well-known three-component theory of attitude (Rosenberg et al., 1960) and Bem (1972)'s self-perception theory, expanding the technological acceptance model of Davis et al. (1989). We interviewed 80 senior users, and there are 77 valid questionnaires (33 males and 44 females). Their attitude towards the use of VR and AR nostalgia systems, allowing senior users to measure the attitude and intention to use of VR/AR nostalgia system by three aspects: cognition, emotion and behavior. Moreover, SPSS 21 test is used to test the reliability, validity and related hypotheses of this new model.

In this study, the elderly in Zhunan town of Miaoli County were selected as the pre-tester. The main purpose of the pre-test questionnaires is to modify the meaning of the questionnaires, deleting questions, and test the reliability and validity of the questionnaire. In the design of the questionnaire, three experts and scholars confirm the validity design, and modify the semantic meaning of the topic to make it more clear and understandable. According to the feedback of the older subjects in the pre-test questionnaires, the reliability analysis results of this study showed that the Cronbach's α values of the 37 items in this study were consistent with the Cronbach's α values of the overall construction items. 928 was significant, and the total scores of the items in each aspect of the study were significant, so the subjects of all dimensions were retained. The results show that the Cronbach's α values of the research variables are as follows: perceived usefulness 0.842, perceived ease of use 0.875, personal innovativeness 0.852 (including question 12, 0.496). In the personal innovativeness questionnaire question 12: Generally speaking, “I am hesitant to try new information technology. The original Cronbach's α value was 0.496. After deleting question 12, it became 0.852; “Compatibility” became 0.830; “Fun” became 0.819; “Emotional attachment” became 0.807; “Usage behavior” became 0.789; Usage attitude became 0.790 and “Intention to use” became 0.779. As for the validity part of the pre-test questionnaires, the measurement items of each variable in this study were modified by referring to the measurement items of previous relevant scholars, and the validation of validity design by three experts and scholars in the field of questionnaire was adopted.

Therefore, the pre-test questionnaires should have content validity.

Information Analysis

Analysis of sample basic data

The official questionnaire of this study collected 420 pretests with the elderly from Zhunan Township, Miaoli County and the Department of Social Work of Yudak University of Science and Technology. Three teaching assistants assisted in the implementation of VR / AR nostalgia system and the distribution of questionnaires, and helped some older people to read and answer the semantic meaning of the questions. However, they did not interfere with the elderly's willingness to fill in the scores. 15 wrong and invalid answers were removed, and 405 valid samples were obtained. In terms of gender, 153 (38%) were male and 252 (62%) were female.

Analysis of construct reliability

The Cronbach's α value of each measure is 0.897 for perceived usefulness, 0.810 for perceived ease of use, 0.791 for personal innovativeness, 0.875 for compatibility, 0.710 for fun, 0.824 for emotional attachment, 0.717 for usage behavior, 0.851 for usage attitude, and 0.891 for intention to use. The above values are generally greater than the minimum standard value of 0.7 recommended by Nunnally (1978), which can show that the constructive measurement items in this research have sufficient reliability.

Analysis of construct validity

Construct validity refers to the degree to which the measurement tool (scale) can correctly measure the research framework and theory, including convergent validity and discriminant validity. This study uses confirmatory factor analysis to test the nine constructs of this study—perceived usefulness, perceived ease of use, personal innovativeness, compatibility, fun, emotional attachment, usage behavior, usage attitude and the convergent validity and discriminative validity of intention to use. In the part of convergent validity, the following three can be used to evaluate:

(1) Individual item reliability: The estimated value of the standardized factor loadings (λ) of the measurement item corresponding to the above nine constructs is distributed between 0.577 and 0.911. The standardized factor loadings (λ) of this study are greater than 0.5, meeting the requirement of 0.5 or higher recommended by Hair et al. (1998). When the factor loadings of the measurement item is greater than 0.5, it reaches a significant level, and it can be concluded that the measurement item has reached acceptable convergent validity. Moreover, all items have reached a significant level of 0.001.

(2) Composite reliability (CR): The Cronbach's α values of the above nine constructs are respectively 0.898 for perceived usefulness, 0.846 for perceived ease of use, 0.857 for personal innovativeness, 0.866 for compatibility, 0.926 for fun, and 0.933 for emotional attachment, 0.885 for usage behavior, 0.908 for usage attitude, and 0.874 for intention to use. All of them meet the required standard of Fornell and Larcker

(1981) which is 0.6 or more, and the required standard of (Nunnally 1978) which is 0.7 or more.

(3) Average variance extracted (AVE): The AVE values of the above nine constructs are respectively 0.688 for perceived usefulness, 0.584 for perceived ease of use, 0.667 for personal innovativeness, 0.683 for compatibility, 0.675 for fun, and 0.666 for emotional attachment, 0.720 for usage behavior, 0.767 for usage attitude, and 0.700 for intention to use. All of them reach the recommended standard value of Fornell and Larcker which is 0.5 or more. Based on the above data, it is known that the nine constructs in this study should have a certain degree of convergent validity.

As for the judgment of discriminative validity, the square root of the average variant extraction amount of each construct must be greater than the correlation coefficient between the paired constructs. In this case, it is called discriminative validity (Fornell and Larcker , 1981). Scholar Hair et al. (1998) pointed out that the square root of AVE of each construct is greater than the number of correlation coefficients of each construct, and it must account for at least 75% of the overall comparison number. In addition, KMO=0.718>0.7, Bartlett's test Chi-sq = 1099.788 (Sig=0.000<0.05), as shown in Table 3, represents capital suitable for factor analysis. As for the correlation coefficient matrix in Table 4, the correlation coefficient between the two constructs in this study is less than the square root of the corresponding AVE of the construct, which shows that the variables of each construct in the measurement model are indeed different from each other, representing each construct There is good discriminative validity between thoughts. In terms of composite reliability, according to Fornell and Larcker (1981), it is recommended that the composite reliability value (CR) should be 0.6 or more, and the average explanatory variation (AVE) should be more than 0.5. If this standard is met, it means each question item can be significantly explained by the factor. Namely, each question item converges to the factor, which means that the measurement question item converges to the corresponding aspect.

Table 3. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.718
Bartlett's Test of Sphericity	Approx. Chi-Square	1099.788
	df	36
	Sig.	.000

Table 4. Correlation Matrix[a]

	Construct	PU	PE	PI	CP	FN	EA	UB	UA	IU
Correlation	PU	**0.829**								

	PE	.343**	**0.764**							
	PI	.132**	.182**	**0.817**						
	CP	.426**	.267**	.180**	**0.826**					
	FN	.275**	.260**	.314**	.458**	**0.822**				
	EA	.217**	.283**	.099**	.213**	.505**	**0.816**			
	UB	.193**	.201**	.142**	.283**	.332**	.439**	**0.849**		
	UA	.316**	.297**	.123**	.247**	.255**	.223**	.290**	**0.876**	
	IU	.299**	.247**	.088**	.250**	.300**	.279**	.331**	.824**	**0.837**

a. Determinant = .064

b. Note 1: The value of the diagonal line (in bold) represents the square root of AVE, which is larger than the correlation coefficient of other facets from non-diagonal line.

c. Note 2: **When the significance level is 0.01 (two-tailed), the correlation is significant.

Conclusion

The purpose of this study is to help the elderly improve their cognition, emotion and behavior through their experience of VR / AR nostalgia system, adjusting the boredom or meaningless situation of self-feeling and interpersonal interaction caused by aging. Reconstruct the overall awareness of life values, outlook on life and life stories through nostalgic memories of past life stories. The results show that:

(1) The VR / AR nostalgia system with cognitive, emotional and behavioral components proposed in this paper has a good fit with the empirical data.

(2) In terms of cognitive variables, the perceived usefulness, perceived ease of use, personal innovativeness, and compatibility of VR / AR nostalgic system positively affect the elderly's usage attitude towards VR / AR nostalgia system.

(3) In terms of emotional variables, the fun and emotional attachment of VR / AR nostalgic system positively affect the usage attitude of VR / AR nostalgic system.

(4) In terms of behavior variables, the usage behavior of VR / AR nostalgic system positively affects on the use attitude of VR / AR nostalgic system.

(5) The usage attitude of VR / AR nostalgic system positively affects on the intention to use of VR / AR nostalgic system.

Through this VR/AR dynamic presentation combined with the audio-visual interactive system of nostalgic therapy music, it should be able to arouse the elderly's recall of past memory fragments, and create more topics to improve curative effects. We hope that the nostalgic therapy can make the elderly improve their recall and think to further prevent the elderly from suffering from dementia, or slow down the speed of memory degradation.

According to the results of this empirical study, the overall model verification results of "VR / AR nostalgia system" are good, which proves that the nostalgic system can help the elderly to reconstruct the social interaction of cognition, emotion and behavior of life, so as to promote and improve the aging life. It is worthy promoting and applying nostalgia treatment to prevent and alleviate dementia and solve the manpower shortage of long-term care. The research model of VR / AR nostalgia system which is designed and developed for the aging society should be further implemented, strengthened and promoted.

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