

Virtual Reality to Help Relieve Travel Anxiety

Jong-Chang Ahn¹, Sung-Phil Cho,¹ and Soon-Ki Jeong²

¹Department of Information Systems, Hanyang University
Seoul, Republic of Korea

[e-mail: ajchang@hanyang.ac.kr; okland2002@naver.com]

²Department of Electronics Computer Engineering, Hanyang University
Seoul, Republic of Korea

[e-mail: skjeong@hanyang.ac.kr]

*Corresponding author: Sung-Phil Cho

*Received December 4, 2012; revised February 23, 2013; revised April 18, 2013; accepted May 18, 2013;
published June 26, 2013*

Abstract

This study presents empirical evidence of the benefit of viewing narrative video clips on embedded virtual reality (VR) websites of hotels to relieve travel anxiety. As the effectiveness of using VR functions to relieve travel anxiety has been shown, we proposed that a VR website enhanced with narrative video clips could relieve travelers' anxiety about accommodations by showing the important aspects of a hotel. Thus, we created a website with a narrative video showing the escape route from a hotel room and another narrative video showing the surrounding neighborhood. We then conducted experiments by having human subjects explore the enhanced VR website and fill out a questionnaire. The results confirmed our hypothesis that there is a statistically significant relationship between relief from travel anxiety and the use of narrative videos on embedded VR websites of hotels.

Keywords: virtual reality (VR), travel anxiety, video clips, trust

A preliminary version of this paper appeared in ICISA, May 23–25, 2012, Suwon, Korea. This version includes a concrete analysis and supporting implementation results on virtual reality. We express our thanks to Dr. Ook Lee for checking our manuscript.

<http://dx.doi.org/10.3837/tiis.2013.06.005>

1. Introduction

Travel is often a source of anxiety when people visit completely unfamiliar places or new accommodations, even in places they have previously visited. This is called travel anxiety [10, 21]. In this study, we focused on travel anxiety associated with staying in unfamiliar accommodations such as hotels. Even for people who do not fear flying, a destination might cause anxiety when it is located in an area that differs culturally from the traveler's own background. Only a real-life experience of visiting a hotel at the destination will resolve this travel anxiety [6, 17], but this is not possible in actual practice. In other words, there is always a first time for visiting a new hotel at a new place, which can always cause some degree of travel anxiety. However, thanks to the development of information technology, we can now construct websites that provide information about hotels and their surroundings that is otherwise unavailable. Virtual reality (VR) technology [4, 18], which can be embedded into hotel websites, allows potential travelers to see what the inside of a hotel room or other areas of the hotel look like in an interactive way. Utilizing embedded VR in a hotel website provides a near-real-life experience that is very helpful for travelers who feel insecure about the hotel and the destination city [8, 11]. That is, travelers' anxiety will be reduced by the use of the hotel's embedded-VR website [12]. However, even with VR functions embedded, hotel websites cannot be fully informative. Pictures of various areas of a hotel are not sufficient to familiarize travelers with the location and make them feel secure. Therefore, another technique is needed to enhance embedded-VR websites in order to create an experience that is as near to real life as possible [22].

In this research, we introduce a new concept called the embedded VR site with a narrative video. This new technique adds a narrated video that shows actual footage of a virtual traveler and explains what is going on while the camera is moving. Drawing from the literature on anxiety disorders [2], we posit that people with anxiety who need to stay in an unfamiliar building tend to look for an escape route and to make sure that they know where to go in case of an emergency. In this research, we incorporated a narrated video clip of an escape route into the embedded VR function of a hotel website. We show empirical evidence that this technique provides strong psychological relief to highly anxious people. Another source of anxiety is the lack of familiarity with the surrounding neighborhood, which is normally shown with a few pictures of the city in which the hotel is located [5]. In this research, we shot a narrated video of important landmarks that would be useful for travelers. This narrated video also shows footage of a virtual traveler and explains the landmarks shown on the screen while the camera is constantly moving. This technique provides vivid and abundant information about the neighborhood surrounding the hotel, which can make travelers feel secure and familiar with the area almost as well as a real-life trip around the hotel would. We present empirical evidence to show the effectiveness of the embedded VR website with a video clip compared to one without a video clip. In addition to travel anxiety, many people suffer with anxiety disorders, including agoraphobia and claustrophobia [15, 20]. For those who have these disorders, knowing an escape route and feeling prepared to reach a safe area are great concerns. We propose that a hotel website that encompasses our embedded VR features can reduce these anxieties. The Information System (IS) lab of Hanyang University in Seoul, Korea previously created an embedded VR website in which embedded pictures of escape routes were included on the hotel web page, and its effectiveness was proven with an empirical experiment with human subjects.

The IS lab has now added more powerful features to the existing embedded VR website. These features include the following:

1. The embedded VR shows a 360-degree view of a hotel room that is navigated by moving a mouse. When a window in the room is clicked, a video describing the neighborhood in Korean and in English is shown. The narrated video clip will help travelers understand where important milestones such as a subway station, police station, and convenience store are located in the neighborhood [16].
2. Another aspect addresses the concerns of people with generalized anxiety disorder who are very interested in the escape route when they stay at unfamiliar places. To relieve this anxiety, the entrance door to the hotel room is shown on the website with embedded VR functions, and when the door is clicked on, the narrated video starts to play. The video shows a camera that starts from the room; moves to an emergency exit, and then down the stairs to the first-floor lobby. The narration explains that the emergency exit is always unlocked (some people worry about the door automatically closing once it is opened). To relieve travelers' concerns about the amount of time required to exit the hotel in case of an emergency or a sudden panic attack, the narration also mentions how many minutes it takes to reach the first floor from the top floor.

2. Prior Research

2.1 Travel Anxiety

Anxiety is a subjective feeling of being very worried about real or potential danger. This feeling is frequently concomitant with emotional phenomena: stress, fright, embarrassment, inconvenience, worry, and fear. Anxiety is also concomitant with physical symptoms: feeling bloated, difficulty in breathing, and increased heart rate [17]. Gudykunst and Hammer defined anxiety as an emotion involving the "fear of a negative outcome" [10]. Planning a dangerous action causes human beings to feel fear and anxiety [15]. Many other factors induce anxiety. Travel anxiety arises from concern about travel, and it can be a debilitating condition that restricts everyday involvement in sufferers' lives and the lives of those around them [27]. For these individuals, it is important to take preventative measures before they travel.

Travelers generally experience anxiety when they leave for an unfamiliar place. When they travel to far places or ones that are not well known, they experience increased anxiety. Because today's hotel industry is very competitive, hotels feature a great deal of information on their websites. They seek to reduce guests' travel anxiety by providing essential information about the hotel's surrounding environment rather than detailed visual information about the hotel facilities. Individuals may have different symptoms of anxiety. Travelers who have never stayed at a hotel and do not feel that they have adequate information might experience highly elevated travel anxiety [6]. Moreover, many people who have symptoms of travel anxiety also suffer from anxiety syndromes such as claustrophobia and agoraphobia [20]. These individuals tend to look for escape routes in case of danger. Travelers prefer destinations that confirm their security and convenience [16].

People tend to give up a trip if they feel anxious and unsafe. The perceived security of a tourist destination is related to an increase or a decrease in travelers' anxiety. An increase in anxiety symptoms leads to distrust of security and abandonment of travel. A consumer's intention to buy a travel package from a travel agency is related to the expectancy that travel anxiety will be resolved [12].

2.2 Virtual Reality

VR can be defined as a way for humans to visualize, manipulate, and interact with computers and extremely complex data [26]. VR also refers to technology that applies to computer-generated environments that can simulate physical presence in real places and in imaginary worlds. Users are immersed in a VR environment by spatial and visual experience through the five senses. VR systems consist of computer-generated space or virtual environment experienced from the user's point of view.

VR was originally developed to design games for military purposes, but it is currently used in a variety of fields, including scientific or medical purposes. Recently, the development of Information and Communication Technology (ICT) technology has made it possible to create more realistic VR with faster and more colorful graphics. VR is now widely used because of its lowered cost, even when it is used for purposes other than military or medical applications. For instance, the lodging industry is adopting VR in promoting businesses.

Despite limitations to the technology, the first VR experiment was carried out in 1992 [20]. The development of VR applications has continued, especially for the treatment of certain mental disorders such as agoraphobia, since 1993. Medical treatment using VR has had a high success rate [6]. Recently, a more sophisticated and valid VR-exposure treatment has been made possible with the development of IT. VR offers many possible applications for research and therapeutic purposes in medical sciences. In fact, public funds in the United States have been invested in VR research for military purposes or physical and mental treatment. VR is well known to have many effects for medical purposes. VR exposure is especially well known for the treatment of patients with anxiety disorders [20].

There are three conditions for efficient treatment using VR [8]: First, recipients of the treatment should feel that they are visiting actual places rather than watching a VR video [22]. Second, a change in their feelings should be experienced through VR [11]. Lastly, they should recognize the possibility that with patience, real-life situations can be experienced with reduced anxiety.

The VR system can be explained as input signals coming from the five senses being changed to outputs so that users feel a real experience. A system for the implementation of VR is shown in Fig. 1.

Source: [28] virtual reality introduction, <http://www.postech.ac.kr/cse>

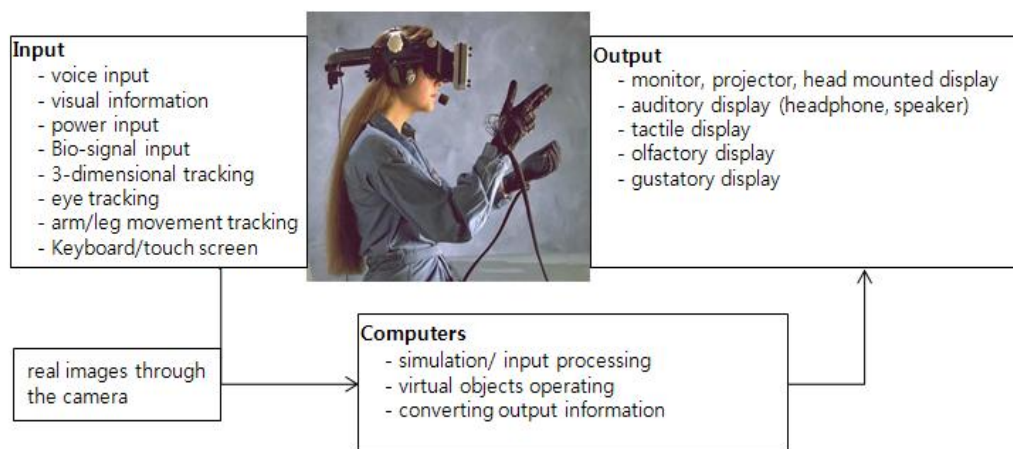


Fig. 1. Typical configuration of a VR system

The typical VR display is a wall-projection display that uses either a large computer screen or a rear projection display. These systems can provide a good sense of depth, but the feeling of immersion is very low [26]. While general websites show two-dimensional pictures, for the website used in this study we created a VR hotel environment by providing three-dimensional video and voice commentary at the same time. We especially aimed to provide real images similar to an actual environment rather than graphical information about the hotel.

3. Materials and Methods

The Itaewon Hotel in Seoul, Korea, was the object of the embedded VR website. We selected this hotel, because it is located in an area frequented by many foreign visitors. Because concerns about public security can lead to travel avoidance with anxiety, it is critical for the hotel to provide information about itself as well as the surrounding neighborhood. A VR website was constructed for this experiment even though the hotel’s official website already existed.

The following are captured pictures of this website. Fig. 2 is the page of the hotel website that contains the embedded VR room picture showing the entrance door where the “click” symbol is located.



Fig. 2. Hotel webpage with VR showing a room with the “click” symbol on the entrance door

Fig. 3 is the page of the hotel website that contains the embedded VR room picture showing the front window where the “click” symbol is located.



Fig. 3. Hotel webpage with VR showing a room with the “click” symbol on the front window

Fig. 4 is the video capture that narrates the emergency route.



Fig. 4. Hotel video capture explaining emergency route

4. Research Model and Design

4.1 Research Model

The purpose of this study was to evaluate whether the VR website reduced subjects' anxiety. Trust can be a key to alleviating anxiety; thus, we constructed variables based on the trust model of Mayer et al. [14], which proposes that trust is derived from ability, benevolence, and integrity. This model has been referenced and applied to various disciplines. "Ability is that group of skills, competencies, and characteristics that enable a party to have influence within some specific domain. Benevolence is the extent to which a trustee is believed to want to do good to the trustor, aside from an egocentric profit motive. The relationship between integrity and trust involves the trustor's perception that the trustee adheres to a set of principles that the trustor finds acceptable" [14]. A trust creator's ability, benevolent attitude toward a subject, and consistent pursuit of a set of principles are connected to trust shaping. If a trust relationship is shaped, there is a tendency to preserve the relationship by accepting perceived risk [7], and this result influences the three factors of the trust construct. This is the main premise of Mayer et al.'s trust model, in which trust is shaped and accumulated through this cyclical feedback process [14]. A company's website is the encounter page when customers want to obtain information on the company. Companies make every endeavor to create a good impression for their customers, and they try to convey their competency to meet customers' needs. In this study, we noted that a website acts as a gateway between companies and customers, and we incorporated Mayer et al.'s trust model.

Mayer et al. [14] identified one of the bases of trust as functional/specific competence, or a kind of ability. We considered this ability to be the bridge between a hotel website and relief of travelers' anxieties. Benevolence is the perception of a positive orientation of the trustee toward the trustor. Those in the hotel industry want relieve travelers' anxieties. The relationship between the trustees toward the trustor can be expressed as the relationship between a hotel website and a traveler with anxiety. Most companies want to communicate their integrity to their customers. There is a direct relationship between a company's integrity and its customers' trust. When travelers with anxiety accept a hotel website's integrity, they

may choose that hotel for their accommodation. Our modified Mayer's trust model can explain the relationship (risk perception) between a hotel website with VR and travelers with anxiety. This study revised Mayer et al.'s trust model as shown in Fig. 5. We tested the model with cases using a website with and without embedded VR narrated video clips, and we tested the differences through a comparative evaluation of prior cases.

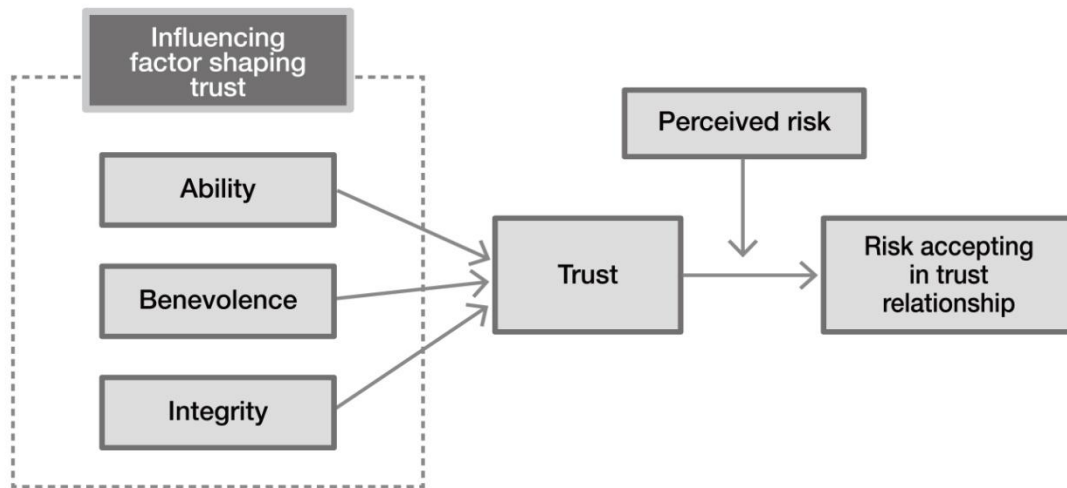


Fig. 5. Research Model

There is a trust-shaping cycle that begins with the hotel's VR website communicating an ability to meet travelers' needs, to travelers perceive the hotel as having a benevolent attitude, and to travelers then expect that the hotel's offerings are consistent with the website. Once a trust relationship is shaped, we predict that travelers will accept perceived risk and will tend to visit and stay at an unfamiliar place despite having travel anxiety. Travelers will gain psychological stability and anxiety symptoms will be reduced through this process. This is certainly the reason hotel web services must be trusted. Trust will make the least loss of being brought about relationship (tangible or intangible loss by the travel anxiety concern) for achieving organizational and individual safe stay and emergency reaction. However, we did not find a causal relationship among trust-shaping factors, perceived risk, and trust. We developed the research model and hypotheses from prior theoretical studies [7, 14].

- H1: The trust-shaping factors achieved with a VR-embedded website will have a positive influence on participants' trust.
- H2: Trust shaped through the use of a VR-embedded website will have a positive influence on subjects' acceptance of risk.
- H3: The VR-embedded website with narrated video will provide more psychological relief than will the VR-embedded website without narrated video.

4.2 Questionnaire Composition and Analysis Method

The survey questionnaire was constructed on the basis of research models and prior studies [2, 5, 7, 10, 14, 15, 16, and 20]. The questionnaire consisted of 30 items in seven sections and was scored with five Likert scales, excluding demographic items. Table 1 presents the questionnaire content and related references. Subjects were randomly assigned to a VR-with-narrated-video or VR-without-narrated-video group. Each group consisted of 100 subjects who were recruited by an Internet bulletin or e-mail. The data was gathered from

2011/5/10 to 2011/5/31. Statistical processing of the data was by PASW 18.0 (SPSS Inc.), including the SPSS/AMOS package for the data coding process to test the hypotheses.

Table 1. Content of Questionnaire

Variable	Item	References
Demographic elements	Gender, age range, travel frequency, security-concern symptoms [10, 15] etc.	[10, 15]
Perception of travel security concerns	Simple security concerns	Based on [2, 5, 15, 16, 20]
	Transportation-security concerns	
	Convenience installations security concerns	
	Police security concerns	
	Safe installations security concerns	
	Emergency behavioral security concerns	
Website ability	Emergency accommodations security concern	[2, 5, 15, 16, 20], Relief from perception of travel security concerns
	Simple security concern relief	
	Transportation-security concern relief	
	Convenience installations security concern relief	
	Police security concern relief	
	Safe installations security concern relief	
Website benevolence	Emergency behavioral security concern relief	Revised from Mayer et al. trust model [7, 14]
	Kind feeling	
	Convenient feeling	
Website integrity	Good image	
	Continuity forecasting	
	Considerate feeling	
Website trust	Consistency feeling	
	Intention to use in the future	
	Intention to Website affiliation	
	Intention to use hotel chain	
Website and risk acceptance	Intention to recommend	
	Intention to use accommodations in the future	
	Preference of hotel	

5. Empirical Analysis

5.1 Demographic Attributes

A frequency analysis of respondents' demographic attributes, including gender, age, travel frequency requiring lodging, and anxiety symptoms, was conducted. In the group that viewed the VR website with the narrated video, 63 (63%) were male and 37 (37%) were female. Ninety-one (91%) were in their twenties. Travel frequency requiring domestic lodging was 3.02 times per year and travel frequency requiring foreign lodging was 0.56 times per year. In the group that viewed the VR website without narrated video, 66 (66%) were male and 34

(34%) were female. Ninety-four (94%) were in their twenties (20-29 years old). Travel frequency requiring domestic lodging was 3.0 times per year, and travel frequency requiring foreign lodging was 0.58 times per year.

Over 40% of the respondents said that they had experienced symptoms of anxiety, including anxiety, vomiting, dizziness, insomnia, chest tightness, and increased heart rate. More than 11% of all respondents said they experienced panic disorder, phobia, or social phobia. The prevalence of symptoms was greater in the group viewing the VR without narration (without narration, 14%; with narration, 11%).

5.2 Pre-test for Hypothesis Testing

Reliability was estimated using an internal consistency index (Cronbach’s alpha). The alpha value criterion was set at >0.6. **Table 2** presents reliability coefficients estimated for each factor’s scale. A satisfactory level ranged from 0.786 to 0.916.

Table 2. Results of reliability analysis

Factors	VR with narrated video	VR without narrated video
Security concerns	0.916	0.897
Ability	0.862	0.847
Benevolence	0.874	0.856
Integrity	0.807	0.786
Trust	0.889	0.891
Risk acceptance	0.837	0.823

Confirmatory factor analysis (CFA) is a method using confirmatory purpose of common factor model in two-factor analysis models. The chi-square method produces estimates often used to evaluate null hypotheses regarding a model’s fit to data, but these estimates are more subject to the degrees of freedom [3]. That is, results are affected by sample size; therefore, the method was not used alone. Goodness of fit indices quantify the degree to which a model explains data variance and covariance, and they are reported to evaluate goodness of fit independently from degrees of freedom [13]. We selected CMIN/df [25], GFI, and AGFI as absolute goodness of fit to evaluate our model’s overall fitness as well as CMIN. We also selected the incremental goodness of fit and the parsimony goodness of fit to compare the difference between the proposed model’s complexity and objectivity. Goodness of fit is considered satisfactory if CMIN/df is < 5 and GFI/NFI/CFI are each > 0.9. Other recommended levels for indices are shown in **Table 3**.

Fig. 6 illustrates the factor model for Ability, Benevolence, and Integrity as three trust-shaping factors. The results of the first confirmatory factor analysis found unsatisfactory results for goodness of fit. To improve goodness of fit, emergency behavioral anxiety relief (Q8_6), which had the lowest observable variance in the Ability factor correlation analysis, was removed. The resulting goodness of fit for VR with narrated video was CMIN 74.540 (p < .05) and CMIN/df was 1.818. These results indicate that the model fit the data well.

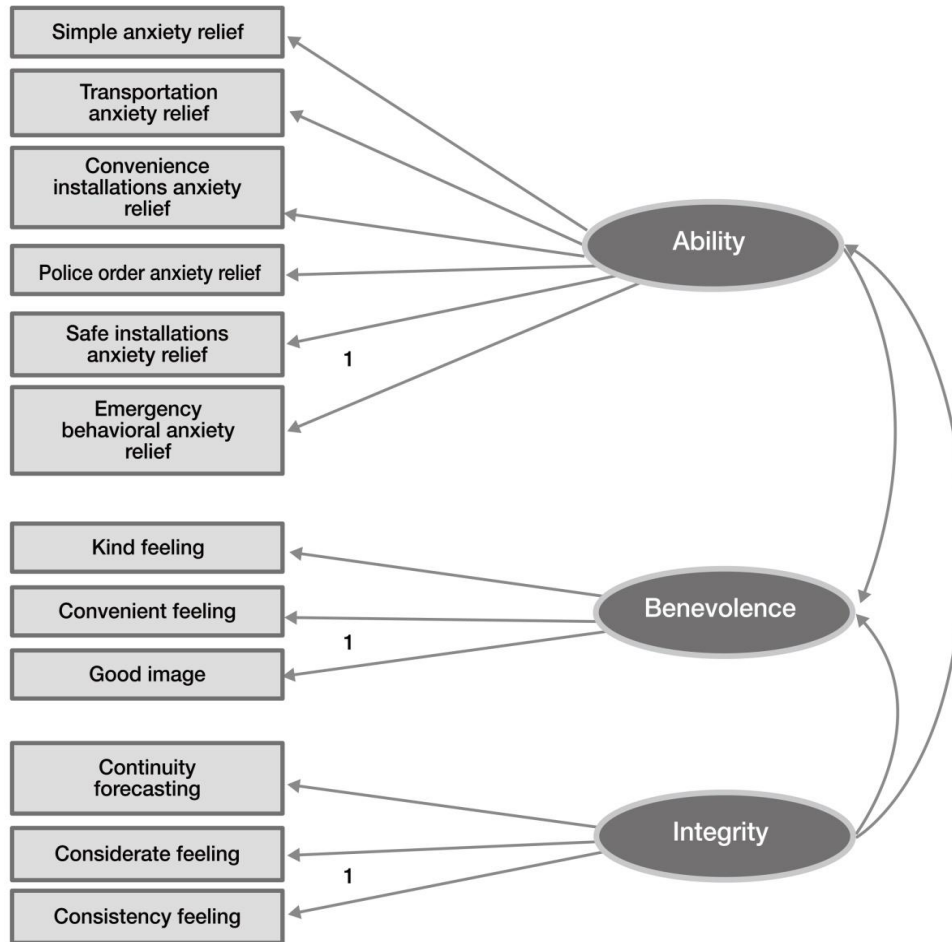


Fig. 6. Confirmatory factor analysis for the research model

For the analysis of VR without narrated video, the variable “emergency behavioral anxiety relief” (Q8_6) was removed and confirmatory factor analysis was conducted. Analysis of the theoretical model's goodness of fit revealed CMIN 62.280 ($p < 0.05$). A statistically significant difference was found between the structure model and the model presenting real data. The CMIN/df considering sample size was 1.519, indicating the model explained the data well. All CFA results are shown in [Table 3](#).

Table 3. Confirmatory factor analysis results

Indices	VR with narration video	VR without narration video	Accepting criteria [3, 13]
CMIN(χ^2)	74.54(.001)	62.280(.018)	p < 0.05
DF	41	41	-
CMIN/DF	1.818	1.519	-
RMR	0.043	0.046	< .005
RMSEA	0.091	0.072	< 0.08
NFI	0.891	0.893	> 0.9
TLI	0.929	0.946	
CFI	0.947	0.960	
GFI	0.883	0.899	
AGFI	0.812	0.832	
PNFI	0.664	0.666	> 0.6
PCFI	0.706	0.715	
IFI	0.948	0.961	> 0.9

5.3 Hypothesis Testing

We converted frequencies into percentages of basic attributes to determine tendencies through frequency analysis. After classifying survey respondents' "never do," "sometimes do not," "neutral," "often do," or "always do" responses, we examined the statistical significance of the frequency of each item with χ^2 -testing. Factor items were statistically significant at $p < .001$. To analyze causal relationships among the trust-shaping factors of Ability, Benevolence, Integrity, and Trust, multi-regressions of VR with narration video or VR without narration video were conducted. In addition, a simple regression analysis of Trust and Risk-acceptance was conducted. The results of the multi-regressions are presented in Table 4. The regression model's F value of 37.349 and adjusted R^2 value of .542 in reciprocal relationship between trust-shaping factor and Trust indicate that trust-shaping explains 52.4% of Trust. There was no multicollinearity problem among independent variables, as evidenced by Tolerance ($> .1$) and VIF (< 10) [19].

Table 4. Influence of VR with narration video on trust in Ability, Benevolence, and Integrity

Dependent variable	Independent variable	b	β	t value	Significant prob.	Collinearity statistic	
						Tolerance	VIF
Trust	Ability	0.396	0.343	4.037	0.000	0.667	1.500
	Benevolence	0.325	0.331	3.087	0.003	0.419	2.386
	Integrity	0.209	0.187	1.635	0.105	0.368	2.718

Constant variable = .038, df = 3, F = 37.349, $R^2 = .539$, (Adjusted) $R^2 = .524$, $p < 0.01$

The Ability factor ($t = 4.037$, $p = .000$) and Benevolence factor ($t = 3.087$, $p = 0.003$) affecting Trust were significant at $p < .01$. The unstandardized regression coefficient value (b)

of the Ability factor was .396 and influencing power (β) was .343. The non-standardized regression coefficient value of the Benevolence factor was .325 and influencing power was .331, indicating influencing power affecting trust-shaping. The Integrity factor ($t = 1.635$, $p = .105$) was not statistically significant at $p < .05$, but it positively affected the degree of trust; the non-standardized coefficient value was .209 and influencing power was .187. Simple regression results are presented in **Table 5**. The regression model's F value of 112.158 and adjusted R^2 value of .529 in the reciprocal relationship between the Trust factor and Risk-acceptance indicates that Trust explains 52.9% of Risk-acceptance. The t-value of Trust ($t = 10.59$, $p = .000$) affecting Risk-acceptance is significant at $p < .001$. The unstandardized regression coefficient value for the Trust factor was .740 and influencing power was .731, indicating that Trust can adequately explain Risk-acceptance.

Table 5. Influence of Trust in the VR with narrated video on Risk-acceptance

Dependent variable	Independent variable	b	β	t value	Significant prob.	Collinearity statistic	
						Tolerance	VIF
Risk-acceptance	Trust	0.740	0.731	10.59	0.000	1.00	1.00

Constant variable = .038, $df = 1$, $F = 112.158$, $R^2 = .534$, (Adjusted) $R^2 = .529$, $p < 0.001$

The regression analysis results for VR without narrated video are below. The results of multi-regression analysis of the influence of trust-shaping factors on Trust are presented in **Table 6**. The model shows an F value of 35.974 and determinant coefficient (adjusted R^2 value) of .515, indicating that Ability, Benevolence, and Integrity explain 51.5% of Trust-shaping. In addition, the Ability factor ($t = 3.046$, $p = .003$), Benevolence factor ($t = 3.039$, $p = .003$), and Integrity factor ($t = 3.100$, $p = .003$) are significant at $p < .01$. Each factor's unstandardized regression coefficient (Ability = .273, Benevolence = .289, and Integrity = .341), and each factor's influencing power (Ability = .243, Benevolence = .304, and Integrity = .324) indicate statistical power to influence trust-shaping.

Table 6. Influence of VR without narrated video on trust of Ability, Benevolence, and Integrity

Dependent variable	Independent variable	b	β	t value	Significant prob.	Collinearity statistic	
						Tolerance	VIF
Trust	Ability	0.273	0.243	3.046	0.003	0.768	1.302
	Benevolence	0.289	0.304	3.039	0.003	0.491	2.038
	Integrity	0.341	0.324	3.100	0.003	0.450	2.224

Constant variable = 0.161, $df = 3$, $F = 35.974$, $R^2 = 0.529$, (Adjusted) $R^2 = 0.515$, $p < 0.01$

The results of simple regression to determine the influence of the Trust factor on Risk-acceptance are shown in **Table 7**. The model shows an F value of 134.350 and adjusted R^2 value of .574, indicating that Trust explains 57.4% of Risk-acceptance. The Trust factor's unstandardized coefficient (.820) and influencing power (.760) indicates that it has adequate power to influence Risk-acceptance. The t-value of Trust ($t = 11.591$, $p = .000$) affecting

Risk-acceptance is statistically significant at $p < .001$.

Table 7. Influence of Trust in VR without narrated video on Risk-acceptance

Dependent variable	Independent variable	b	β	t value	Significant prob.	Collinearity statistic	
						Tolerance	VIF
Risk acceptance	Trust	0.820	0.760	11.591	0.000	1.00	1.00

Constant variable = 0.612, df = 1, F = 134.350, $R^2 = 0.578$, (Adjusted) $R^2 = 0.574$, $p < 0.001$

T-tests analyze differences between two groups. The principle of a t-test is to assess whether the average of two groups is significantly different using two groups' variance and sum of two groups' variance. The assumption of variance homogeneity is tested prior to the t-test process. This study tests the difference (hypothesis) between the websites with and without narrated video on Ability, Benevolence, Integrity, Trust, and Risk-acceptance. The average of trust-shaping factors was 3 (normal) whether video was narrated or not, so we think most respondents responded positively regarding the VR website's effect on Ability, Benevolence, Integrity, Trust, and Risk-acceptance. In addition, we tested variance homogeneity using Levene's test to make the independent samples t-test useful.

Table 8. Difference testing of video with and without narration

Variable	Video with or without narration	Average	S. D.	t-value	P-value
Ability	With	3.5580	0.68831	3.817***	0.000
	Without	3.1860	0.69005		
Benevolence	With	3.8000	0.80959	2.089*	0.038
	Without	3.5600	0.81496		
Integrity	With	3.9200	0.71086	2.152*	0.033
	Without	3.7000	0.73474		
Trust	With	3.5025	0.79574	1.621	0.107
	Without	3.3225	0.77467		
Risk-acceptance	With	3.5500	0.80560	1.853	0.065
	Without	3.3225	0.83501		

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results of independent samples t-tests are as follows: Ability factor (F-value = .024, $p = .876$), Benevolence factor (F-value = .296, $p = .587$), Integrity factor (F-value = .222, $p = .638$), Trust factor (F-value = .117, $p = .733$), and Risk-acceptance factor (F-value = .511, $p = .475$). These values indicate homogeneity in variance at $p < .05$. We used the "variance homogeneity assumption" test statistic. The results were as follows: Ability factor (t-value 3.817, p-value .000, $p < .001$), Benevolence factor (t-value 2.089, p-value .038, $p < .05$), and Integrity factor (t-value 2.152, p-value .033, $p < .05$), indicating significance irrespective of whether the website had VR with or without narration. However, the Trust factor (t-value 1.621, p-value .107 at $p < .05$) was not significant irrespective of whether the website had VR

with or without narrated video. In addition, the Risk-acceptance factor (t value 1.853, p-value .065, $p < .05$) was not significant irrespective of whether the website had VR with or without narrated video.

5.4 The Abstract and Analysis about Hypothesis Testing

Overall results show that the reaction to the website embedded with VR with narrated video was significantly positive. Reaction to the website embedded with VR without narrated video was lower, especially with regard to the Ability factor, but with or without narration, the website with embedded VR was effective. First, irrespective of whether the embedded VR included a narrated video or not, there was a positive influence on the trust-shaping factors of Ability, Benevolence, and Integrity. Those factors had different influences on Trust and were different depending on whether the VR video was narrated. In the case of VR with narrated video, trust-shaping by Integrity was slightly affected. Second, Trust shaped by the website embedded with VR positively affected Risk Acceptance. Trust shaped by Ability, Benevolence, and Integrity had a causal relationship with shaping Risk Acceptance. Users felt trust due to ability, benevolence, and integrity after viewing the hotel website embedded with VR whether or not the video was narrated, and their intention to use the hotel was influenced by shaped trust. Finally, there were differences in Ability, Benevolence, and Integrity shaping trust depending on whether or not the video was narrated. This study demonstrated by t-test results that the effect of the narrated video was more significant than the effect of the video without narration. However, this study does not explain the difference between trust and risk acceptance. Although there was no difference in users' behaviors and self-efficacy [1] irrespective of whether the video was narrated, we can understand that a difference was found in the way VR-website users felt with regard to the hotel's ability, benevolence, and integrity.

6. Conclusion

6.1 Research Abstract and Suggestions

Although we did not conduct this study with real tourists, it was executed with conditions simulating real travel circumstances. We studied the effects on human activity by using VR embedded in a hotel web site. Our results provided statistically reliable and meaningful outcomes. In testing H1 and H2, regardless of whether the VR video was narrated, the website with VR helped users perceive the hotel's ability, benevolence, and integrity, and influenced their intention to visit the hotel. However, in testing H3, we found no statistical difference between trust and risk acceptance. We expected the VR video with narration to have a greater effect, but this study could not explain the difference of real travel and accommodations activities.

6.2 Study Limitation and Further Study

In our research design, we assumed there is no difference in the degree of risk-perception according to subjects' age [23]. However, the sample predominantly comprised respondents in their twenties because this age group most actively uses the Internet, and we recruited a random sample online. Consequently, the results of our survey showed a tendency of decreased perception of risk associated with travel because of our subjects' young age [9]. Thus, the factor of perceived travel anxiety that was included in the first research model was removed to clarify hypothesis testing. If a sample with a larger age-range had participated in the survey, the results might have been different. Most of respondents who viewed the VR

website were relieved from travel anxiety, and the VR with narrated video was more effective. This point provides useful information for lodging suppliers, because it is reported that 10%–30% of adults around the world have anxiety [24]. The more anxious people are, the more helpful this kind of website is. To overcome the study limitation, subjects in future research could be limited to people with anxiety. This would allow more sophisticated testing on travel anxiety as it concerns our hypotheses. VR with narrated video could apply not only to hotel websites but also to website guides to various places and for more platforms or devices, including tablets and smartphones. This would be helpful for travelers with anxiety and tourists in general.

References

- [1] A. Bandura, *Self-efficacy: The Exercise of Control*, WHFreeman, New York, 1997.
- [2] D. Barlow, *Anxiety concern and its disorders: The nature and treatment of anxiety concern and panic*, The Guilford Press, New York, 2004.
- [3] P. M. Bentler and D. G. Bonett, "Significance tests and goodness of fit in the analysis of covariance structures," *Psychological Bulletin*, vol. 88, pp. 37-51, 1980. [Article \(CrossRef Link\)](#)
- [4] K. W. Brenda, "The Potential for Virtual Reality to Improve Health Care," *The Virtual Reality Medical Center*, 2006.
- [5] N. Carr, "An Exploratory Study of Gendered Differences in Young Tourists' Perception of Danger within London," *Tourism Management*, vol. 22, pp. 565-570, 2001. [Article \(CrossRef Link\)](#)
- [6] S. Carter, "Tourists and Traveler's Social Construction of Africa and Asia as Risky Locations," *Tourism Management*, vol. 19, pp. 349-358, 1988. [Article \(CrossRef Link\)](#)
- [7] G. Dowling and R. Staelin., "A Model of Perceived Risk and Intended Risk-Handling Activity," *Journal of Consumer Research*, vol. 21, no. 1, pp. 119-35, 1994. [Article \(CrossRef Link\)](#)
- [8] E. B. Foa, and M. J. Kozak, "Emotional processing of fear: Exposure to corrective information," *Psychological Bulletin*, 99, pp. 20-35, 1986. [Article \(CrossRef Link\)](#)
- [9] A. Lepp and H. Gipson, "Tourist roles, perceived risk and international tourism," *Annals of Tourism Research*, vol. 30, no. 3, pp. 606-624, 2002. [Article \(CrossRef Link\)](#)
- [10] W. Gudykunst and M. Hammer. *Strangers and Hosts: An Uncertainty Reduction Base Theory of Intercultural Adaptation*, In *Cross-Cultural Adaptation: Current Approaches*, edited by Y. Kim and W. Gudykunst. Newbury Park, CA: Sage, pp. 106-139, 1988.
- [11] L. Hodges, B. O. Rothbaum, R. Kooper, D. Opdyke, T. Meyer, J. J. de Graaf and J. S. Williford, "Presence as the defining factor in a VR application," *Technical report GIT-GVU-94-5*, Georgia Institute of Technology, 1994.
- [12] O. Lee, J. Oh, "The Impact of Virtual Reality Functions of a Hotel Website on Travel Anxiety concern," *Cyberpsychology & Behavior*, vol. 10, no. 4, pp. 584-586, 2007. [Article \(CrossRef Link\)](#)
- [13] H. W. Marsh, J. R. Balla and R. P. McDonald, "Goodness-of-fit indexes in confirmatory factor analysis: The effect of sample size," *Psychological Bulletin*, vol. 103, pp. 391-411, 1988. [Article \(CrossRef Link\)](#)
- [14] R. C. Mayer, J. H. Davis, F. D. Schooman, "An Integrative Model of Organizational Trust," *The Academy of Management Review*, vol. 20, no. 3, pp. 709-734, 1995.
- [15] N. McIntyre, and J. Roggenbuck., "Nature/Person Transactions during an Outdoor Adventure Experience: A Multi-Phasic Analysis," *Journal of Leisure Research*, vol. 30, no. 4, pp. 401-22, 1998.
- [16] D. S. Michael, C. G. David, *Contemporary Behavior Therapy* (4th ed.). KY: Wadsworth Publishing Company, Florence, 2002.
- [17] V. F. Mitchell, L. M. Davies, and V. Vassos., "Using Neural Networks to Understand Service Risk in the Holiday Product," *Journal of Business Research*, vol. 46, no. 2, pp. 167-80, 1999. [Article \(CrossRef Link\)](#)
- [18] M. M. North, S. M. North and J. R. Coble, "Effectiveness of Virtual Environment Desensitization

- in the Treatment of Agoraphobia,” *Presence: Teleoperators and Virtual Environments*, vol. 5, pp. 346-352, 1996.
- [19] R. M. O'Brien, “A Caution Regarding Rules of Thumb for Variance Inflation Factors,” *Quality and Quantity*, vol. 41, no. 5, pp. 673-690, 2007. [Article \(CrossRef Link\)](#)
- [20] C. Pull, “Current Status of Virtual Reality Exposure Therapy in Anxiety concern Disorders: Editorial Review,” *Current Opinion in Psychiatry*, vol. 18, no. 1, pp. 7-14, 2005.
- [21] Y. Reisinger and F. Mavondo, “Travel Anxiety concern and Intentions to Travel Internationally: Implications of Travel Risk Perception,” *Journal of Travel Research*, vol. 43, no. 3, pp. 212- 225, 2005. [Article \(CrossRef Link\)](#)
- [22] M. Slater, D. Pertaub and A. Steed, “Public speaking in virtual reality: Facing an audience of avatars,” *IEEE Computer Graphics and Applications*, vol. 19, pp. 6-9, 1999. [Article \(CrossRef Link\)](#)
- [23] S. Sonmez and A. Graefe., “Influence of Terrorism Risk on Foreign Tourism Decisions,” *Annals of Tourism Research*, vol. 25, no. 1, pp. 112-44, 1998. [Article \(CrossRef Link\)](#)
- [24] S. Taylor, W. Koch and R. McNally, “How does anxiety concern sensitivity vary across the anxiety concern disorders?,” *Journal of Anxiety concern Disorders*, vol. 6, no. 3, pp. 249-259, 1992. [Article \(CrossRef Link\)](#)
- [25] B. Wheaton, B. Muthen, D. F. Alwin and G. F. Summers, *Assessing reliability and stability in panel models*, In D. R. Heise (Ed.), *Sociological methodology* 1997 (84-136), Jossey-Bass, San Francisco: 1977.
- [26] Virtual reality in flexible manufacturing, http://www.sztaki.hu/~kopacsi/vr/vr_main.htm
- [27] M. H. Karen, Travel Anxiety Symptoms, eHow Contributor, http://www.ehow.com/about_5108477_travel-anxiety-symptoms.html#ixzz160YAF1QC
- [28] J. H. Kim, Virtual Reality Introduction, <http://www.postech.ac.kr/cse>



Jong Chang Ahn is a professor at the department of Information Systems in Hanyang University. He received his B.S. degree in economics from Korea University and his M.S. degree in Software engineering from Sejong University. He received his Ph. D. in Information Systems from Hanyang University. He has great interest in Knowledge Management, Social Networks, and IT Philosophy.



Sung-Phil Cho is a Ph.D. candidate at the department of Information Systems in Hanyang University. He received his B.S. in Information Systems from Hanyang University. He received his M.S. in Information Systems from Claremont Graduate University. He has great interest in E-government, ERP, IT Policy.



Soon Ki Jeong received Ph.D. degree at the department of Electronics and Computer Engineering in Hanyang University. He received also his B.S. and M.S. degrees in Electronics and Computer Engineering from Hanyang University. He has great interest in Knowledge Management Systems and IT convergence. His research interest includes Convergence through IT technology and knowledge.