

The Effect of VR Advertisement Characteristic Components on the Perceived Usefulness and Easiness, and Advertisement Attitude

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Abstract: Background/Objectives: purposes of this study are to identify VR advertisement components and to identify the effect on the perceived usefulness and easiness, and advertisement attitude in order to present the standard for increasing effect of VR advertisement that is growing rapidly due to the IT technology advancement. **Methods/Statistical analysis:** For the analysis method, the first, descriptive statistics and frequency analysis were conducted to identify general characteristics of the subjects. The second, exploratory factor analysis was conducted to confirm the construct validity of the measurement variables used in the study. Finally, the validity of the research problem was analyzed using multiple regression analysis. **Findings:** For the first research result, we have verified that there is a positive effect on most of the perceived usefulness of the VR advertisement properties for Graphic, presence, entertainment, and most other features. In detail, the presence feature of the VR advertisement greatly affected Spatiality, temporality, dynamics, and positive effects on other features mentioned above as well. Second, we have verified that there is a positive effect on most of the perceived easiness of the VR advertisement properties for Graphic, presence, entertainment, and most other features. In detail, the presence feature of the VR advertisement greatly affected on Graphic, presence, entertainment, and had positive effects on feeling of Perspective, Temporality, and Temporality as well. Third, we have verified that there is a positive effect on most of the advertisement attitude of the VR advertisement properties for Graphic, presence, entertainment, and most other features. In detail, the entertainment and new feature of the VR advertisement greatly affected the advertisement attitude, and had positive effects on feeling of Perspective, Amusement, and dynamics as well.

Improvements/Applications: This study would be able to provide meaningful since it attempted advertisement effect verification to vitalize the VR advertisement that is at the starting phase in the advertisement area currently.

Keywords: VR Advertisement, VR Advertisement Characteristics, Perceived Usefulness, Perceived Easiness, Advertisement Attitude, VR Advertising Effect

I. INTRODUCTION

ICT through convergence is the issue that is gaining most attention these days in all different areas. Among the many ICT technologies, however, Virtual Reality (VR) is the core technology that is gaining most attention. The term, VR was utilized for the first time in a research conducted by [1]. Core of the VR technology entails experiencing VR with a goggle (Head-Mounted goggle) using 3D images and human

motions[2]. According to a number of researchers, VR refers to the environment that enables users to experience perceived sense of reality (tele-presence) through VR[3] or it is defined as the ability to make the participants believe in virtual world[4].

Currently, VR market is becoming popular rapidly as the HMD (Head Mounted Display) distribution rate of the ICT companies is rising significantly in the industries related to the VR and as the number of VR product users is increasing significantly[5]. Going steps further, platform market related to the VR is growing rapidly as the investment for the advancement of ICT related technology is growing rapidly and the government's investment for the VR contents is expanding these days. To this, the trend is such that the key ICT companies are entering into the VR market rapidly[6].

According to a research conducted by the Trend Force, worldwide VR device market volume is expected to reach 38 million in 2020 from 14 million in 2016. Goldman Sachs forecasted that the VR and AR markets will grow to 800 Million USD market (approximately 94 Trillion Won) until 2025[7]. Meanwhile, according to a data published by the [7], number of early VR users (early majority) worldwide is growing rapidly to 26 million. In 2018, this number is expected to reach up to 100 million, and the total number of users is expected to reach 170 million. This type of growth will be important for planning for the companies' new marketing and advertising strategies using VR.

A representative case is the 'Facebook'. It invested 200 Billion USD to acquire a VR company called the 'Oculus' after forecasting the bullish outlook of the VR market, and it is expanding investment in the VR industry. On February 2016, Samsung Electronics, a leading Korean company, appeared at the Unpacked of the MWC to share its optimistic view of the VR in a lecture, "VR is the next generation social platform"[8].

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Figure 1. VR AD device used in this study

Likewise, competition in the VR contents market using game, film and advertisement is taking place actively in the VR industry today more than technology advancement as show in figure 1. Among them, advertisement and marketing markets are the areas with very high value of the platform using VR[7]. Advertising market using VR presents immensely large opportunity when perceived from the companies' point of view because time and experience of products and services that the users consume through VR device can increase. Advertisement using VR can provide high immersion level effect to the consumers by completely blocking out the users' stories in the surrounding[8]. Through this, it is possible to optimize product storytelling and to produce powerful advertisement attitude and brand recognition effect. This phenomenon signifies that the VR has immense potential as an advertisement platform. VR can help increase companies' profit immensely since it is possible to strength indirect product experience by grafting together with the online or mobile advertisement. However, unlike the favorable forecast regarding VR advertisement industry growth and potential, researches for the advertisement effect are still limited. Thus, researches that verify the effect on the VR advertisement and that provide working level implications are urgently called for.

When previous VR researches are examined, [1] was the first scholar from the overseas to publish the research results from the technological aspect regarding the concept of VR. Later, diverse areas started to pay attention including the study of the genre following animation timing[9], VR/AR game technology trend[10], research on the case study for the development of curriculum for the VR technology based converged education[11], use of the VR•AR's medical issue and health medicine area[12]and others. In case of the advertisement area, researches on the contents analysis of the VR advertisement's technology method and advertisement case take up the majority[13]. Later, effect of fashion advertisement promotional activity on the distribution channel and event case through 3D VR[14], effect of Pocket Monster's move and strengthened VR game on the parents and children[15], brand storytelling research using VR and other advertisement contents research related to the VR researches began to emerge as well[16].

When the above mentioned researches are examined, although VR advertisement researches are underway, the reality is such that the advertisement effect verification researches are very limited. Meanwhile, study of the research methods and analysis of contents take up the majority. Accordingly, purposes of this study are to identify VR advertisement components and to identify the effect on the

perceived usefulness and easiness, and advertisement attitude in order to present the standard for increasing effect of VR advertisement that is growing rapidly due to the IT technology advancement.

Research Question 1: How are the VR advertisement Characteristic Components comprised?

Research Question 2: How do the VR advertisement characteristics affect perceived usefulness?

Research Question 3: How do the VR advertisement characteristics affect perceived easiness?

Research Question 4: How do the VR advertisement characteristics affect advertisement attitude?

II. MATERIALS AND METHODS

First and foremost, this study re-configured adequate subordinate concepts after identifying the VR advertisement characteristic components presented in the existing lecture. Moreover, this study sought to verify how VR advertisement characteristic components affect information technology accommodation model's perceived usefulness and easiness, and advertisement attitude. Technology accommodation model's usefulness and easiness are the subjective degree of conviction that increase motivation for use when users utilize information technology. This serves as the theoretical foundation of the model that seeks to explain utilization behavior or advertisement attitude. Accordingly, perceived usefulness and easiness, and advertisement attitude are judged to be important variables for examining effect of VR advertisement characteristics' factors.

2.1. Survey subject and data collection

This study is meaningful in the sense that it used the VR device in actuality, and that it collected data targeting the actual users of the VR advertisement. As for the survey process, orientation on the use of VR device was carried out. Then, respondents wearing HMD saw average of five to six VR advertisements selected randomly. As for the selection of VR advertisements, advertisements that are not known to the participants were selected and used to control the product intervention degree and the brand recognition level. Moreover, same mobile device was used at one location, controlling exogenous variables so that the users can watch VR advertisements in the same environment.

As for the survey method utilized by this study, data was collected using self-recording survey method. Prior to the survey, respondents who expressed their will to participate in the VR advertisement survey were asked to draft survey after experiencing VR advertisement.



They watched VR advertisements from 10 to 15 minutes on average, and the mentors explained about the method for using device and helped them to wear the HMD.

This study carried out survey targeting the university students of the University N and University H. A total of 355 students participated in the survey. A total of 353 survey questionnaires were utilized for the analysis excluding unreliable and no answers. As for the respondents' gender distribution, there were 183 male students (51.8%) and 170 female students (48.2%), and thus share of the male students was high.

2.2. Operational definition and measurement tools

2.2.1. Graphic characteristics: Perspective, three-dimensional effect

Object's form in the VR advertisement environment realized in the Web is made with 3D modeling, and presence such as color, texture and light of the external appearance ensured sense of reality[11]. In this study, graphic characteristics refers to the 'diverse virtual form such as diagram, figure, photo and others or all the relevant works'. Moreover, this study classified into perspective and three-dimensional effect as graphic characteristics' sub elements to modify the questions, and re-configured to suit research characteristics. Research questions will measure the graphic characteristics' factors based on the [2, 3]'s research. Categories that ask these questions were measured using a total of eight questions.

2.2.2. Presence characteristics: Spatiality, temporality, dynamics

Presence characteristic can be cited as the most important element for the VR advertisement. This is the degree for perceiving the state that exists amidst the virtual environment that is realized on the Web. In this study, presence characteristics refer to the 'degree of intervention and immersion for the existence in the particular space in actuality'. Moreover, this study classified into spatiality, temporality and dynamics as the presence characteristics' sub elements, and questions were modified to re-configure to suit the research characteristics. Research questions will measure the presence characteristics' factors based on the previous researches conducted by [2,4] and others. Among the categories that ask this, a total of 15 questions were utilized to measure.

2.2.3. Entertainment characteristics: Amusement, interest

Entertainment characteristics in case of VR advertisement refer to the joyful feeling that is manifested in the emotional characteristics due to the stimulant that makes recipients feel good. In this study, entertainment characteristics refer to the 'property that enables enjoying as entertainment'. Moreover, this study classified into amusement and interest as entertainment characteristics' sub elements, questions were modified to re-configure to suit research characteristics. As for the research questions, entertainment characteristics' factors will be measured based on the previous researches such as enjoyment scale developed by [17]. Among the categories that ask this, a total of 8 questions were utilized to measure.

2.2.4. Perceived usefulness and easiness, and advertisement attitude

This study selected perceived usefulness and easiness, and advertisement attitude as the dependent variables for the advertisement effect verification. Perceived usefulness refers to the degree in which the value that new technology delivers to the latent users is perceived as more outstanding than the existing technology. Perceived easiness refers to the degree of expectation when it comes to the use of new technology without requiring significant effort by the latent users. Accordingly, these two variables help to understand whether respondents perceive utilization value as high when experiencing VR advertisement and whether VR advertisement can be used conveniently and easily. Moreover, advertisement attitude used most often for the advertisement effect verification was set as the dependent variable[18]. Among the categories that ask this, a total of 12 questions were utilized to measure. All the questions will measure with 5 point scale (Point 1: not at all ~ Point 5: very much so).

2.3. Data analysis

The statistical package SPSS / PC + Windows 21.0 program was used to analyze the data collected in this study. For the analysis method, the first, descriptive statistics and frequency analysis were conducted to identify general characteristics of the subjects. The second, exploratory factor analysis was conducted to confirm the construct validity of the measurement variables used in the study. Factor analysis was performed using principal component analysis and factor rotation was analyzed using VARIMAX rotation method. The third, Cronbach alpha coefficient was used for reliability of each scale. Finally, the validity of the research problem was analyzed using multiple regression analysis.

III. RESULTS AND DISCUSSION

3.1. Verification of validity and reliability of measurement tools

To verify Research Question 1, it was verified whether each question satisfies the conditions of the normal distribution for the variables for the viability verification and measurement questions. As for the descriptive statistics for verifying this, average, standard deviation, skewness and kurtosis for the questions were examined. When the result of the preliminary questions' descriptive statistics analysis is examined, questions' average is distributed among 3.43~4.66 while standard deviation is distributed within the .513~.925 range. Likewise, it was verified that the level is satisfactory. It was verified that each preliminary question' skewness and kurtosis satisfy the normal distribution conditions (skewness<2, kurtosis<4).

To verify the 31 preliminary questions' components for the VR advertisement characteristics, exploratory factor analysis was carried out. First, Kaiser-Meyer-Olkin measurement and Bartlett's Chi-square were verified to find out whether adequate for the analysis on primary factor. As a result, KMO measurement manifested high value with .909 (at least .6 for significance level), and it was also verified based on the Bartlett's Chi-square result of $\chi^2=3705.396$ (df=265, p<.001) that is significant.



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As a result of the analysis on primary factor, seven factors were identified according to the standard of at least one characteristic value, and it was shown that 79.57% of whole dispersion is explained. As for the identified factors, category that comprises each factor was comprised of at least three above mentioned categories as mentioned in the Hair et al. (2010) research. Specifically, it was determined that the 4 questions regarding perspective, 4 questions regarding three-dimensional effect are adequate for the graphic

characteristics. As for the presence characteristics, 5 questions regarding spatiality, 5 questions on the temporality and 5 questions regarding dynamics were considered adequate. As for the entertainment characteristics, 4 questions on the amusement and 4 questions on the interest were considered adequate. All the questions were considered adequate for the VR advertisement characteristics' subordinate concept[See Table 1].

Table 1: Validity and reliability of measured variables

Item	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7
Perspective 1	.891						
Perspective 2	.891						
Perspective 3	.887						
Perspective 4	.852						
3D effect 1		.484					
3D effect 2		.799					
3D effect 3		.760					
3D effect 4		.861					
Spatiality 1			.842				
Spatiality 2			.854				
Spatiality 3			.754				
Spatiality 4			.850				
Spatiality 5			.821				
Temporality 1				.779			
Temporality 2				.776			
Temporality 3				.810			
Temporality 4				.781			
Temporality 5				.808			
Dynamics 1					.786		
Dynamics 2					.743		
Dynamics 3					.792		
Dynamics 4					.671		
Dynamics 5					.755		
Amusement 1						.830	
Amusement 2						.720	
Amusement 3						.849	
Amusement 4						.728	
Interest 1							.781
Interest 2							.781
Interest 3							.780
Interest 4							.770
Eigen value	2.196	1.168	12.769	2.943	2.515	1.538	1.465
Explanation Amount (%)	7.083	3.769	41.192	9.484	8.112	4.961	4.976
Accumulated Explanation Amount (%)	7.083	10.852	52.044	61.528	69.640	74.601	79.577
Cronbach α	.924	.860	.950	.939	.920	.900	.857
KMO(Kaiser-Meyer-Olkin) =.909, Bartlett test $\chi^2=3705.396(df=265, p<.001)$							

3.2. Verification results for research question 2

In case of Research Question 2, multiple regression analysis was carried out to identify the effect of VR advertisement characteristic components on the perceived

usefulness. Prior to the result, existence of multi-collinearity among dependent variables' auto-correlation and independent variables was verified. As for



the dependent variables' auto-correlation, Durbin-Watson index was used. After verifying the value, it came out to be 1.794. Thus, independence was verified devoid of auto-correlation[19]. Moreover, Variance Inflation Factor (VIF) and tolerance limit index were utilized for the multi-collinearity among independent variables. As a result of verifying the value, VIF index was 1.474 ~ 2.085, which was lower than 10. As for the tolerance limit, it ranged between 0.480 ~ 0.835, resulting higher than 0.1. Likewise, it was verified that there is no problem for the multi-collinearity as

well[19].

As shown in table 2, result of the analysis showed that three-dimensional effect ($t=3.239$, $p=.001$), spatiality ($t=3.316$, $p=.001$), temporality ($t=5.009$, $p=.000$), dynamics ($t=4.354$, $p=.000$), interest ($t=3.073$, $p=.002$) exerted positive (+) effect on the usefulness. Meanwhile, perspective and amusement were not significant. Moreover, explanation power of these variables for explaining dependent variables usefulness was 54.3% ($adj R^2=.543$).

Table 2: results for the effect of VR advertisement Characteristic Components on perceived usefulness

model	B	S.E	β	t	Tolerance	VIF
invariable	-.858	.352		-2.438		
Perspective	.035	.047	.029	.736	.835	1.197
3D effect	.195	.060	.152	3.239**	.586	1.707
Spatiality	.187	.056	.165	3.316**	.526	1.901
Temporality	.274	.055	.261	5.009***	.480	2.085
Dynamics	.283	.065	.236	4.354***	.441	2.269
Amusement	-.042	.079	-.025	-.536	.610	1.640
Interest	.224	.073	.134	3.073**	.678	1.474
Durbin-Watson'sd=1.794 R=.743, R ² =.552,adj R ² =.543,F=60.750($p<.001$), *** $p<.001$, ** $p<.01$						

3.3. Verification results for research question 3

In case of Research Question 3, multiple regression analysis was carried to identify the effect of VR advertisement characteristic component on the perceived easiness. First, Durbin-Watson index was used. After verifying the value, it came out to be 1.871. Moreover, Variance Inflation Factor (VIF) and tolerance limit index were utilized for the multi-collinearity among independent variables. As a result of verifying the value, VIF index was 1.474 ~ 2.085, which was lower than 10. As for the tolerance limit, it ranged between

0.480 ~ 0.835, resulting higher than 0.1. Likewise, it was verified that there is no problem for the multi-collinearity as well[19].

As shown in table 3, result of the analysis showed that spatiality ($t=7.226$, $p=.001$), temporality ($t=4.458$, $p=.001$), dynamics ($t=2.254$, $p=.021$), perspective ($t=2.757$, $p=.001$), amusement ($t=2.823$, $p=.017$) exerted positive (+) effect on the easiness. Meanwhile, 3D effect and interest were not significant. Moreover, explanation power of these variables for explaining dependent variables usefulness was 58.9% ($adj R^2=.589$).

Table 3: results for the effect of VR advertisement Characteristic Components on perceived easiness

model	B	S.E	β	t	Tolerance	VIF
invariable	.045	.264		.168		
Perspective	.098	.035	.103	2.757**	.835	1.197
3D effect	.062	.045	.062	1.382	.586	1.707
Spatiality	.305	.042	.340	7.226***	.526	1.901
Temporality	.183	.041	.220	4.458***	.480	2.085
Dynamics	.110	.049	.116	2.254*	.441	2.269
Amusement	.166	.059	.124	2.823*	.610	1.640
Interest	.080	.055	.061	1.464	.678	1.474
Durbin-Watson'sd=1.817 R=.773, R ² =.597,adj R ² =.589,F=73.039($p<.001$), *** $p<.001$, ** $p<.01$, * $p<.05$						

3.4. Verification results for research question 4

In case of Research Question 4, multiple regression analysis was carried out to identify the effect of VR advertisement characteristic component on the advertisement attitude. First, Durbin-Watson index was used. After verifying the value, it came out to be 2.095. Moreover, Variance Inflation Factor (VIF) and tolerance limit index were utilized for the multi-collinearity among independent variables. As a

result of verifying the value, VIF index was 1.474 ~ 2.085, which was lower than 10. As for the tolerance limit, it ranged between 0.480 ~ 0.835, resulting higher than 0.1. Likewise, it was verified that there is no problem for the multi-collinearity as well[19].



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As shown in table 4, result of the analysis showed that it was proven that the perspective ($t=2.858$, $p=.005$), spatiality ($t=2.093$, $p=.037$), dynamics ($t=3.321$, $p=.001$), amusement ($t=5.380$, $p=.000$), interest ($t=3.122$, $p=.002$) exerted positive (+) effect on the advertisement attitude. Meanwhile,

three-dimensional effect and temporality were not significant. Moreover, explanation power of these variables for explaining dependent variables' advertisement attitude was 47.6% ($\text{adj } R^2=.476$).

Table 4: results for the effect of VR advertisement Characteristic Components on advertisement attitude

model	B	S.E	β	t	Tolerance	VIF
invariable	.846	.236		3.583		
Perspective	.090	.032	.121	2.858**	.835	1.197
3D effect	.070	.040	.087	1.726	.586	1.707
Spatiality	.079	.038	.111	2.093*	.526	1.901
Temporality	.028	.037	.043	.769	.480	2.085
Dynamics	.145	.044	.193	3.321**	.441	2.269
Amusement	.283	.053	.266	5.380***	.610	1.640
Interest	.153	.049	.146	3.122**	.678	1.474

Durbin-Watson'sd=2.095
 $R=.698$, $R^2=.487$, $\text{adj } R^2=.476$, $F=46.742$ ($p<.001$), *** $p<.001$, ** $p<.01$, * $p<.05$

IV. CONCLUSION

VR advertisement is creating value-add in the VOD contents, Artificial Intelligence and VR areas. Along with the growth of the mobile VOD advertisement market, advertisement industry is also getting recognized as an industry that can benefit from the use of VR. However, diverse supports and interests are needed for this VR advertisement sector to grow.

As a result of the research, this study classified presence characteristics that show the degree of mediating the real and virtual worlds as VR advertisement characteristics' construct as the foremost factor. Along with this, components of the VR advertisement's graphic characteristics and entertainment characteristics were classified. Moreover, classification into spatiality, temporality and dynamics took place in case of the presence characteristics as for the subordinate concept regarding this component. As for the graphic characteristics, amusement and interest were classified as measurement categories with perspective and three-dimensional effect as entertainment characteristics. Moreover, advertisement effect for each measurement category was verified, which demonstrated that the perceived usefulness and easiness, and advertisement attitude exerted positive effect in most cases. Thus, it is judged that the research questions presented in this study are verified.

Research's implications are as follows. First, this study is meaningful since it attempted advertisement effect verification to vitalize the VR advertisement that is at the starting phase in the advertisement area currently. Whereas VR related advertisement market is growing in size, empirical research on the VR advertisements carried out at the advertisement area is limited compared to other contents since advertisement contents utilizing VR is just getting started. In fact, the reality is that the researches that identify the characteristics of the advertisement related to the VR such as AR and VR and that measure the effect are difficult to find regardless of whether in Korea or overseas. However,

significant effect will be exerted in the advertisement industry area as well a few years later, according to the VR device's popularization. Thus, there is a need to carry out increasingly in-depth research on this subject. Now if the time for the industry and academic communities to focus on the VR to develop strategy to advertise VR advertisement more effectively. Second, although research on the VR advertisements is also at the initial stage, result of this study will present new ideas for the advancement of the future researches, and to contribute to the advancement of the advertisement research by using new technology. Moreover, this study can present measures for the advertisement industry to survive amidst new type advertisement among the demand and expectation of the era based on the effect verification research regarding VR advertisement.

Lastly, this study's limitations and recommendations for the future researches can be summarized as follows. First, variables such as brand's intervention, familiarity and desirability were not controlled effectively by commercializing specific VR advertisements instead of using experiment object produced for the research. Second, external environment and consumers' psychological characteristics for studying VR advertisement were not addressed in a comprehensive manner.

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