

Prospect of the Next-generation digital content industry: Three perspective approach to the User acceptance of the Realistic content technology

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Abstract— We are now facing a new age of digital content industry caused by diffusion of wearable device. The Realistic content, which consists of virtual reality, augmented reality and hologram technologies. It had been predicted as the future digital content technology by many institutions and researchers. However, there were very limited researchers who tried to predict the possibility of realistic content by analysing the user acceptance of realistic content technology.

To analyse the intention of user acceptance, factors from three different perspectives were integrated with technology acceptance model to improve the reliability and validity of the research model and to give better results of analysis. Survey had been conducted by users in South Korea(N=429) who aware the existence of realistic content technology. Analysis was made based on structural equation modeling(SEM) method.

The result of factor analysis showed that Flow and Spatiality have significant influence to Perceived usefulness. Interaction and Display have significant influence to the Perceived ease of use. Meanwhile users pointed out the Privacy risk as the most significant risk that avoid users to use the realistic content.

Keywords— Realistic content, User acceptance, Structural equation modelling, Future study

I. INTRODUCTION

As the ages passed by, the digital devices have developed consistently. And such a development of devices had caused the development of digital contents. We can find these examples easily in TV and Mobile phone that as the technology advanced, the digital contents have evolved like black-white to colors(TV), voice to video(Mobile phone).

We are now facing a new age of digital device, which is the wearable. Wearable device can be defined as a portable digital device that shapes like clothes, accessories, vehicles or ordinary digital devices integrated with various sensors to function as computer, phone or analog equipment. The good examples of wearable device would be Apple-watch, Google-glasses and Mi-fit.

From the past experiences, we can easily predict that the diffusion of wearable device certainly caused the emergence of new digital content industry. So it is important to forecast which digital content technology would lead the next-generation digital content industry to become a leader of future digital content market.

For that answer, there are several institutions already made their research to determine the next-generation digital content technology. On June 2014, Ministry of science, ICT and Future planning in South Korea (MSIP) chose the 9 strategical industries that have high possibilities to be the next-generation growth engine of the nation. As one of nine strategic industries and the sole digital content industry, Realistic content was chosen to be next-generation digital content technology.

This prediction is credible since many different institutions and enterprises had predicted the same result that the realistic content will be the core technology of next-generation digital content industry. Gartner announced the 10 strategical technologies of 2016, that the ambient user experience is important business factor in the future and realistic content would be the first technology to provide such experiences to the users.

Major IT companies, such as Facebook, already spent 2 billion dollars to take over the Oculus VR, the well-known virtual reality device manufacturer, knowing that realistic content is the crucial business of the future. Google also produce google-card-board and make a new category in its Android application market called Virtual reality to diffuse the realistic content on the market and become the leader company of digital content industry.

Then, what is the realistic content? We can define realistic content within 3 big core technologies inside. As shown in figure1, realistic content consist of Virtual reality, Augmented reality and Hologram.

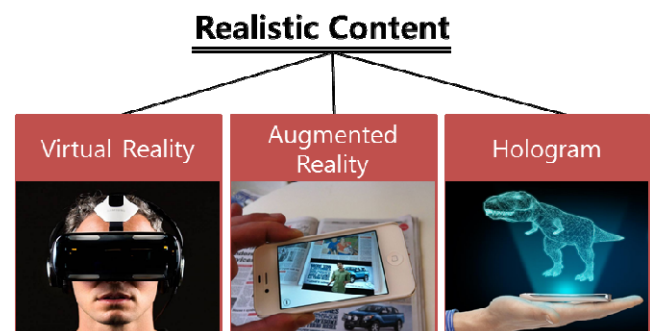


Figure 1. Realistic content's 3 core technologies

Each of technologies have different characteristics, All the virtual reality's contents will be showed inside of virtual world, so that what you experience in virtual reality contents are all imaginary, whether how real it is. However, augmented reality and hologram's contents can be seen in the real world, providing some virtual objects that users want to experience. Differences between augmented reality and hologram are the way of showing their contents. Augmented reality shows content by integrating with real world objects, but hologram uses the recording of a light field to make virtual objects in the real world.

The future market of realistic content is also bright. From the market report of KZERO, the consulting firm, announced that realistic content's market will grow to 2.8 billion dollars until 2018. [1] Digieco also report similar market prediction shown in the figure2 that realistic content will occupy the half of global media market. [2]

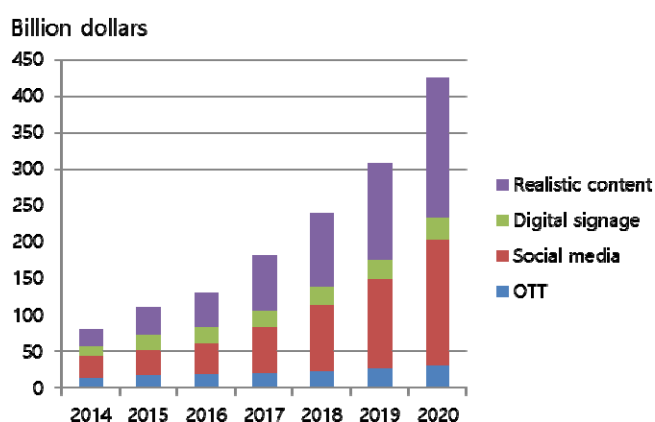


Figure 2. Global digital media market prospect (DIGIECO, 2015)

From all these considerations, it's sure that realistic content would change the current ecosystem of digital content industry. This implies being late to promote the realistic content industry, would cause the gaining lesser competitiveness in the digital content market. Become a latecomer.

Predicting the next-generation digital content industry isn't easy research to be done, but by analyzing the reason why actual users will accept the realistic contents, we can understand how realistic content will be accepted by actual users, and what will invigorate the realistic content technology in the digital content industry and market. So factors analysis of user acceptance would be a good research approach to predict the next-generation digital content industry.

In addition, factor analysis can help the policy makers to determine which characteristics of realistic contents would be promoted or regulated. Since appearance of new digital content not only generates positive effect to the society but also incurs social problems such as digital addiction, privacy invasion, security leak and so on.

II. THEORETICAL BACKGROUND

To give a prospect of next-generation digital content industry and analyse the user acceptance of realistic content technology, technology acceptance model (TAM) is used. And to enhance the validity and completeness of the TAM, content, device and risk characteristics of realistic content are proposed based on the theories such as flow theory and perceived risk theory.

A. Technology Acceptance Model (TAM)

Davis (1989) proposed technology acceptance model (TAM) to analyse the user's technology acceptance factors in adopting new information technologies. TAM suggests a number of core factors that influence user to user a new technology. [3]

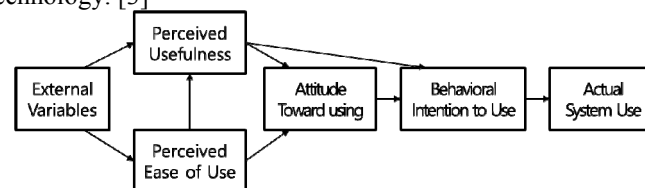


Figure 3. Technology Acceptance model (Davis, 1989)

Basically TAM has two main factors that affect all the acceptance of technology, which are Perceived Usefulness and Perceived Ease of Use. The perceived usefulness (PU) defines as a person's belief that the new technology would contribute to enhance the user's performance. And the perceived ease of use (PEU) defines as a person's belief that new technology would make user to put less effort to achieve their goals.

Importance of factors PU & PEU is also mentioned from the preceding research of user acceptance. Tornatzky, L.G. and Klein, R.J.(1982) analyzed the important factors in diffusion of innovation that perceived ease of use has critical effects to determine the usage of new technologies. [4]

Adams, D.A. Nelson, R.R. and Todd, P.A.(1992) found out the empirical evidence between PU & PEU with user acceptance. [5] And Hendrickson A.R, Massey P.D, Cronan T.P. (1993) also proved the importance of PU and PEU factors by test-retest their model of user acceptance. [6]

However, perceived usefulness and perceived ease of use aren't enough to understand the user acceptance of new technology. Legris P. Ingham J. Collette P. (2003) mentioned the higher validity of model by using external variables. They argued technology acceptance model needs some other external variables from the related characteristics, such as factors from human, social change processes or innovations. [7]

Therefore, many user acceptance researches integrate their own external variables in their model to raise the completeness of the research. Shih, H. (2004) suggested using information behavior model with TAM to study about internet users, [8] and Sanchez, R.A. Hueros, A.D. (2010) put motivational factors in their technology acceptance model to understand the user acceptance of virtual teaching platforms. [9]

B. Limitation of TAM to analyse the user acceptance of digital content technology.

Gallaugher J.M., Auger, P. and Barnir A. (2001) mentioned the information goods need to be evaluated in different perspective than ordinary goods, [10] and Yoon, K. (1999) remarked digital content is the intangible asset with characteristics of experience goods that it is hard to measure the economical utilities until users really use it. [11] Additionally, Ruggiero, T.E. (2000) figured out the importance of customer's satisfaction in user acceptance of digital contents. [12] So it is limited to analyse the user acceptance factors by using only TAM. There must be other external variables that can explain the realistic contents very well.

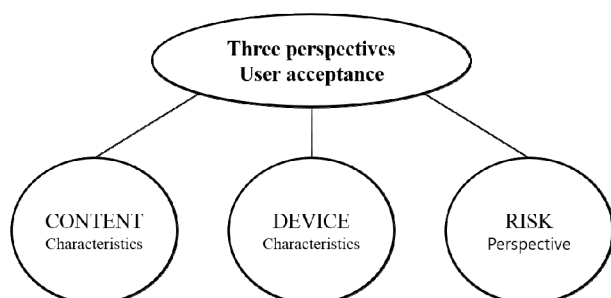


Figure 4. Three perspectives approach to the user acceptance

So to improve the reliability and validity of the user acceptance model, three perspectives were integrated with technology acceptance model giving some clear factors that could explain the user acceptance of the realistic content easily.

First, the content characteristics perspective is composed of Flow, Reality, Spatiality and Interaction factors based on the flow theory (Mihaly Csikszentmihalyi, 1990) [13] and Han, J.(2015)'s research results. [14]

Second, the characteristics of device perspective were included in the model because the development of digital device would influence a lot to the diffusion of new digital content. Display and Interface are selected as the core factor of the device characteristics because Weng, D. Cheng, D. and Wang, Y. (2013) mentioned the importance of display system in realistic content [15] and Roupe, M. Bosch-Sijtsema, P. Johansson, M. (2014) showed the meaningful influence of the interface system in realistic content services. [16]

Third, the risks perspective was integrated. We know by experiences that emergence of new digital content didn't always give positive effects to the society. It has been turned out that many side effects, such as addiction, dementia and fraud, can be caused by diffusion of new media and contents. So based on the Cho, H.(2011) [17] and Featherman, M.S. Pavlou, P.A.(2003)'s research, [18] Perceived risk theory (Cunningham, 1967) [19] was selected as to explain the risk perspective of realistic content and the financial risk, psychological risk and privacy risk were chosen factors to involve in the research model.

TABLE 1. THREE PERSPECTIVE FACTORS OF THE RESEARCH

Perspective	Factors	References
Content characteristics	Flow	[13], [14]
	Reality	
	Spatiality	
	Interaction	
Device Characteristics	Display	[15], [16]
	Interface	
Perceived risk	Financial risk	[17]-[19]
	Psychological risk	
	Privacy risk	
Technology Acceptance Model	Perceived usefulness	[3]
	Perceived Ease of use	
	Intention to use	

III. RESEARCH MODEL AND RESULTS

From the preceding researches and selection of realistic content's factors, research model and hypotheses were designed to solve the research questions. Research questions were made based on the purpose of the research and model was designed based on the preceding research and expected influence to the realistic content's user acceptance.

RQ1. Which characteristics of content will be considered as the core factor to prospect the next-generation digital content industry?

RQ2. Which device characteristics are important in terms of accepting the next-generation digital content technology?

RQ3. How perceived risks affect the user acceptance of next-generation digital content technology?

A. Research model

From the selected factors in Table 1, research model was designed to analyse the user acceptance of the realistic content technology.

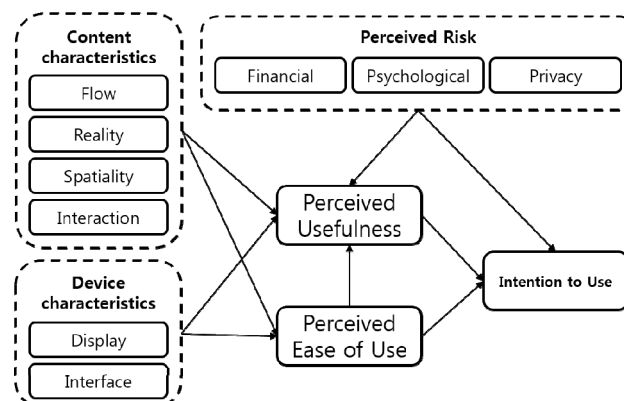


Figure 5. Research model

B. Survey & Method of analysis

Applying the features of realistic contents and its factors, survey sheet had created to verify the validity of research model and hypotheses.

Likert, R. (1932)'s five-point scale was used. [20] Total 51 questions were asked to 429 participants (N=429) from September 2015 to October 2015.

Considering the fact that realistic content hasn't diffuse a lot in the market, survey was given by Korean users under 49 years old who aware of realistic content, without restrictions of gender, experience of realistic contents, education or other backgrounds.

To analyse the data from survey, IBM SPSS statistics 23 and IBM SPSS Amos 23 were used. At first, internal consistency check was made to prove the reliability of the survey data. Second, confirmatory factor analysis (CFA) was done to show the validity and identification of the research model. Finally by using structural equation modeling (SEM), the influences between factors were estimated and analysed to show the user acceptance of realistic content technology.

C. Basic statistics of survey participants

Online survey was conducted from September of 2015 to October of 2015. Most of participants haven't use realistic content before, but they aware of its existence. Total 429 samples (N=429) were used for analysis.

The features of demography were listed in the table 6. Gender was consist of 207 men (48.3%) and 222 women (51.75) that seems to be balanced. Age was 109 of teenagers (25.4), 111 of twenties (25.8%), 103 of thirties (24.1%) and 106 of forties (24.7%) that it also showed balanced. More than half of participants were living in Seoul or Kyung-ki province (60.4%), and all the participant noticed the existence of realistic content. 287 of participants were junior college or undergraduate students or already graduated. And the rest were under high-school students or graduate school student. Participants' favorite digital content was digital game (119, 27.7%), Web-browsing & searching (89, 20.7%), Movie (86, 20%) and Music (84, 19.6%). 205 of participants (47.8%) were using digital contents more than 2 hours per day, and 130 of participants (30.3%) were using 1-2 hours per day. Most of participants (80%) were occasionally looking for new digital contents, and 215 of participants (50.1%) thought they're good at using digital contents.

TABLE 2. DEMOGRAPHIC STATISTICS OF THE SURVEY

Division		Counts (N=429)
Gender	Male	207 (48.3%)
	Female	222 (51.7%)
Age	10's	109 (25.4%)
	20's	111 (25.8%)
	30's	103 (24.1%)

	40's	106 (24.7%)
Education	Under High school	95 (22.1%)
	Under Junior college	48 (11.2%)
	Under University	239 (55.7%)
	Under Graduate school	42 (9.8%)
	Else	5 (1.2%)
Period of using digital content	Under 1 year	14 (3.3%)
	1-3 years	45 (10.5%)
	3-6 years	78 (18.2%)
	6-9 years	67 (15.6%)
	Over 9 years	225 (52.4%)

D. Internal consistency of the Survey data

It is very important to check the reliability of the data, since we have to know whether the participants answered the questions consistently. If the reliability of the data is high, it implies the less measurement and observation errors that difference between observed score and true score are low.

There are several methods to check reliability, which are test-retest reliability estimation, multiple form technique, split-half method and internal consistency check. Among them, internal consistency check suggested by Cronbach, L. J. (1951) shows a good indicator to measure the reliability of survey questions and the consistency of answers. [21] This method provide the value called Cronbach's Alpha, that the value is over 0.8 ($\alpha > 0.8$) the reliability of data is significant, and the value is under 0.8 to over 0.6 ($0.8 > \alpha > 0.6$) the reliability of data is acceptable.

TABLE 3. INTERNAL CONSISTENCY CHECK

Factor	Initial number of variables	Final number of variables	Cronbach's alpha	Remarks
Flow	3	3	0.795	
Reality	3	3	0.557	Accepted
Spatiality	3	3	0.723	
Interaction	3	3	0.725	
Display	4	3	0.666	
Interface	4	4	0.741	
Financial risk	3	0	0.499	Rejected
Psychological risk	3	3	0.817	
Privacy risk	3	3	0.776	
Perceived usefulness	4	3	0.720	

Perceived ease of use	3	3	0.785	
Intention to use	4	3	0.819	

Most of factors showed the acceptable value of Cronbach's alpha, but factor 'Reality' and 'Financial risk' showed under 0.6 value of internal consistency. Therefore factor 'Financial risk' was removed from the research model, but kept the factor 'Reality' even though the value of Cronbach's Alpha was slightly less than 0.6 because Reality was believed to be the important characteristic of realistic content technology.

E. Confirmatory factor analysis & Model fit

To show the validity and the identification of the research model, confirmatory factor analysis was conducted. Brown T. A. (2015) mentioned the effectiveness of confirmatory factor analysis in structural equation modeling research that the test provides the good indicators to check the fit indices of the research model. [22]

TABLE 4. FIT INDICES OF RESEARCH MODEL

Indices	Value
Chi-Square (DF)	528.224 (226)
P	0.000
GFI	0.911
AFGI	0.882
RMR	0.082
NFI	0.874
CFI	0.923
RMSEA	0.056

As to check the fitness of the research model, modifications had made based on the modification indices (MI) of analysis results. From the modification indices, connection from perceived ease of use to perceived usefulness (PEU→PU) was making a harmful influence to the fit index of total model. So, the connection from perceived ease of use to perceived usefulness (PEU→PU) was eliminated to raise the fit of the research model.

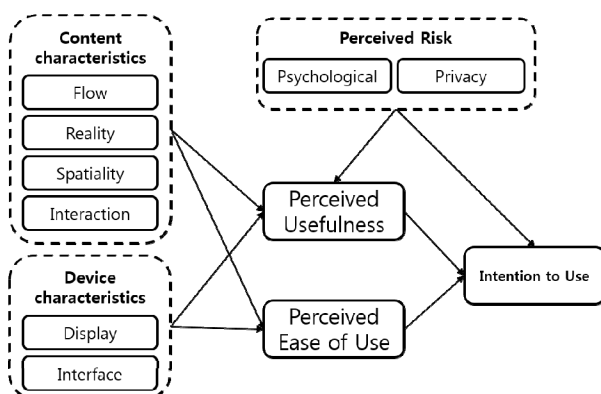


Figure 6. Modified Research model

F. Analysis results

The result of research model analysis showed that Flow and Spatiality had significant influence to the perceived usefulness. Interaction and Display had significant influence to the perceived ease of use. Privacy risk had significant influence to the intention to use. But, Reality, Interface and Psychological risk had no significant influence to endogenous variables.

TABLE 5. RESULT OF ANALYSIS

Perspective	Path	Standardized Path coefficient	P-value
Content	Flow→PU	0.686	0.001**
	Spatiality→PU	0.626	0.011*
	Interaction→PEU	0.307	0.003**
Device	Display→PEU	0.760	0.013*
Perceived risk	Privacy risk→IU	-0.243	0.001**
Technology Acceptance model	PEU→IU	0.087	0.049*
	PU→IU	0.760	***

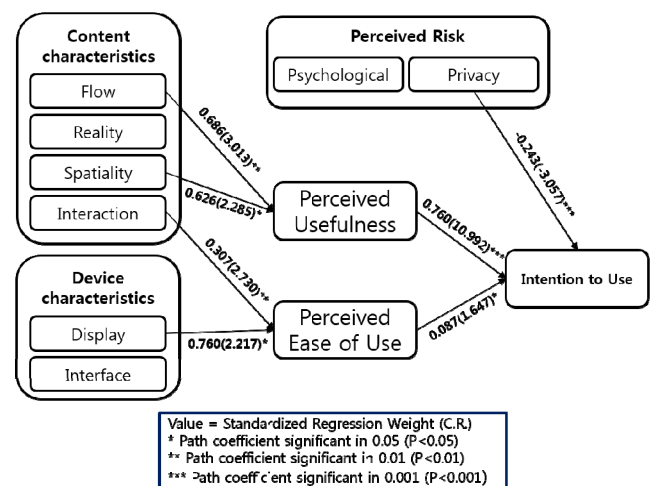


Figure 7. Path coefficient of research model

IV. CONCLUSIONS

This research was conducted to understand the user acceptance of realistic content technology to gain the ideas of next-generation digital content industry's prospect.

Even though the realistic content is considered as the next-generation digital content technology from many institutions and firms, there have been only limited researches which try to predict the possibility of realistic content technology by its size of market or advanced rate of technology.

User acceptance is the most important factor for the successful diffusion of the new technologies and services. And it's sure that if the users feel the certain technology is useful and ease to use, the market will grow.

So if we can analyse why users want realistic content and what are the expectations, it will be very easy to adopt them in the market. Which cause the growth of digital content industry.

There were some researchers who tried to analyse the user acceptance of virtual reality or augmented reality technology. But they were focusing more on the digital devices that allow realistic content to operate.

However, digital content has different characteristics than digital devices. It is experienced goods and intangible assets. Usage of digital content is related more to the psychological feelings from users that there isn't any physical appearance of it. So, it is sure characteristic of content would influence more to the acceptance of realistic content.

In this research, factors from three different perspectives were integrated with technology acceptance model.

First, the content characteristics perspective is composed of Flow, Reality, Spatiality and Interaction factors. Second, the characteristics of device perspective which are the Display and Interface system that development of device would influence a lot to the user acceptance. Lastly, the perceived risks perspective that financial risk, psychological risk and privacy risk were selected as to add in the research model.

From the results of analysis, this research showed two content characteristics, Flow and Spatiality, give significant influence to the perceived usefulness of realistic content. In addition, one content characteristic and one device characteristic, Interaction and Display, showed the significant effects to the perceived ease of use of realistic content. On the other hand, Privacy risk had significant negative influence to the intention to use the realistic content.

Once more, factors from technology acceptance model, Perceived Usefulness and Perceived Ease of use, were proved to give significant effects to the intention to use the realistic content.

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