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The Prospect of next-generation digital content industry: User acceptance of the realistic content technology

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Abstract

The Prospect of next-generation digital content industry: User acceptance of the realistic content technology

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We are now facing a new age in the digital content industry caused by diffusion of the wearable device. Realistic content, which consist of virtual reality (VR), augmented reality (AR) and hologram technologies. It had been predicted to be the prevalent future digital content technology by many institutions and researchers. There are very limited researchers, however who have tried to predict the possibility of realistic content by analyzing the user acceptance of such technologies.

To complete a definitive study of technology acceptance, an economic model was designed based on the literature reviews of several theories, including behavioral economic, theory of reasoned actions, flow theory and perceived risk theory.

Factors from three different perspectives – Content & Device characteristics and

Perceived risk – were integrated with technology acceptance model to improve the reliability and validity of the research and to ensure the results of analysis.

Survey were conducted by users in South Korea (N=429) who were aware of the existence of realistic content technology. Analysis was made based on structural equation modeling method.

The result of factor analysis showed that Flow and Spatiality have significant influence on the Perceived Usefulness of realistic content, Interaction and Display have significant influence on the Perceived Ease of use. Perceived Usefulness had more influences than Perceived Ease of use on the intention to use the realistic content. Meanwhile, users pointed out the privacy risk as the most significant reason that hesitate users may hesitate to use realistic content.

To invigorate next-generation digital content industry, realistic content technology should be focused on providing optimal experiences to the users. In addition, new digital devices with new display systems are vital to the easy use of realistic content. Moreover, danger of personal information infringement must be considered before the active diffusion of realistic content in the society.

Keywords: Realistic content, User acceptance, Structural equation modeling, Flow theory, Perceived risk, Future study

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1.1 Research Background

As time passes, the digital devices have developed consistently. And such a development of devices had caused the development of digital contents. We see these examples particularly in televisions and mobile phone; as the technology advanced, the digital contents has evolved, for example, from black-white to colors(TV), and from voice to video(mobile phone).

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

From 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 will lead the next-generation digital content industry and become the leader of the future digital content market.

For that answer, several institutions have already begun their research to determine the next-generation digital content technology. On June 2014, the Ministry of science, ICT and Future planning in South Korea (MSIP) identified nine strategic industries that have a high possibilities of being the next-generation economic growth

engine of the nation.[1] As one of nine strategic industries and the sole digital content industry, Realistic content was selected as the next-generation digital content technology.

This forecast is credible as many different institutions and enterprises had predicted the same result that realistic content will be the core technology of the next-generation digital content industry. Gartner announced the ten strategic technologies of 2016, noting that the ambient user experience is an important business factor in the future and realistic content would be the first technology to provide such experiences to the users.[2]

Major information technology (IT) companies are looking to expand in this area, including Facebook, which already spent $2 billion (USD) to acquire 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 made a new category in its Android application market called "Virtual reality" to diffuse the realistic content on the market and become the leading company of digital content industry.

Then, what is the realistic content? We can define realistic content within three big core technologies. As shown in Figure1, realistic content consist of Virtual reality, Augmented reality and Hologram.

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[1] MSIP 9 strategic industries (2014), “Smart car, 5G-network, Deep seafloor ocean-plant, Intelligence robot, Wearable smart device, Personalized wellness care system, Disaster safety management system, renewable hybrid energy system and realistic content”.

[2] Gartner symposium / IT expo (2015).

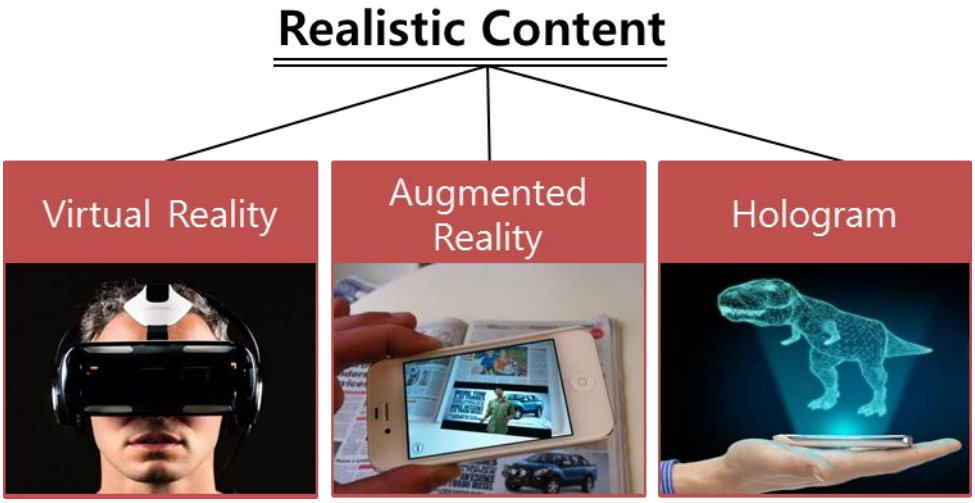

Figure 1. Realistic content's 3 core technologies

Each of these technologies has different characteristics, All of the virtual reality's contents will be shown inside of a virtual world, so that what you experience in virtual reality contents is all imaginary, no matter how real it appears. However, augmented reality and hologram contents can be seen in the real world, providing some virtual situations that users may want to experience. Differences between augmented reality and hologram are in the way they display their contents. Augmented reality shows content by integrating real world objects, while 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. The market report of the consulting firm KZERO, predicted that the realistic content market will grow to $2.8 billion US dollars by 2018.[3] Digieco also report a similar market prediction shown in Figure2 that realistic content will occupy the half of global media mar

[3] KZero (2014), "Virtual reality software revenue forecast 2014-2018", www.kzero.co.uk.

ket. [4]

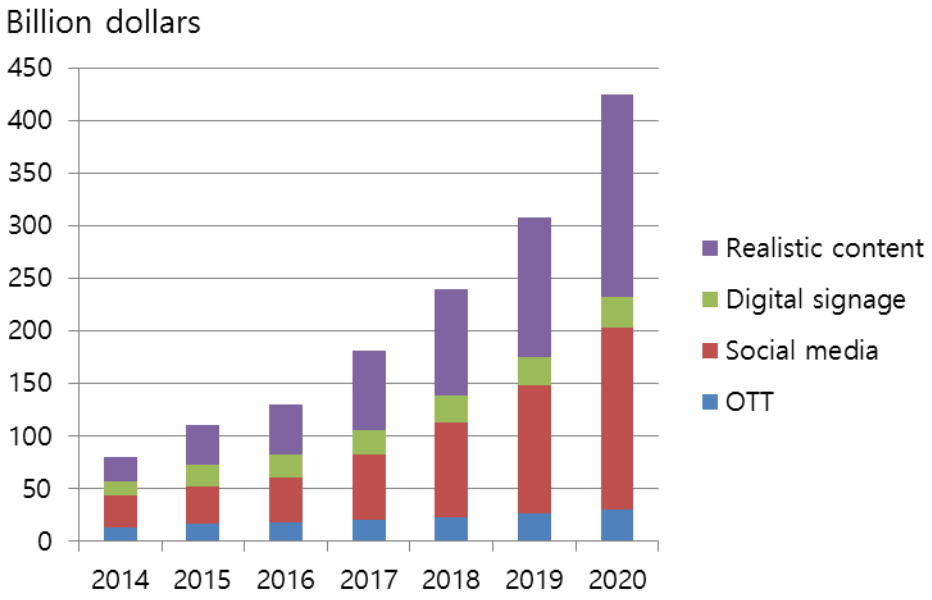

Figure 2. Global digital media market prospect

In light of these considerations, it's certain that realistic content will change the current ecosystem of the digital content industry. This implies being late to promote the realistic content industry, may cause lost competitive edge in the digital content market. Become a latecomer.

1.2 Purpose of the Research

Predicting the next-generation digital content industry isn't simple research, but by analyzing reasons why actual users will accept the realistic contents, we can understand how realistic content will be accepted by actual users, and what will in

[4] Son, H. (2015), "5G시대에 주목 받는 실감형 콘텐츠", DIGIECO report.

vigorate the realistic content technology in the digital content industry and market. So factors analysis of user acceptance is relevant research for predicting the next-generation digital content industry.

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

Chapter 2. Theoretical Background

To give a prospect of next-generation digital content industry and analyze the user acceptance of realistic content technology, literature reviews had been conducted. Several theories, like behavioral economic, innovation diffusion theory and theory of reasoned action, were found as meaningful to adopt in this research, but finally technolog y acceptance model (TAM) was selected based on the theory of reasoned action. And to enhance the validity and completeness of the TAM, content, device and risk ch aracteristics of realistic content are proposed based on the theories such as flow th eory and perceived risk theory.

2.1 Behavioral Economic

Behavioral economic is a branch of economic theory that try to figure out the change of economic by looking the consumer's behaviors in the view of psychological, social and physiological aspects. Hattwick, R.E. (1989) introduced the usefulness of behavioral economic theory in the research of the motivation, perception and decision-making of consumers.

Ho, T.H. Lim, N. and Camerer, C.F. (2006) showed how to adopt behavioral economic theory in the consumer's adoption model, and proved that it is effective to use behavioral economic in the empirical study of consumer's behaviors.

And Ulen, T.S.(2013) also mentioned the importance of behavior analysis that it is

crucial to find the consumer's intention in many different research areas like law, economic and science.

Therefore, behavioral economic theory can be adopted in the research of user's technology acceptance. Schiffer, M.B. (2004) studied the behavioral perspective of technology change and how user adopted them, and showed the importance of behavioral in the technology adoption.

2.2 Technology acceptance model

Davis, F.D. (1989) proposed technology acceptance model (TAM) to analyze the user's technology acceptance factors in adopting new information technologies.[5] T AM suggests a number of core factors that influence user to user a new technolo gy.

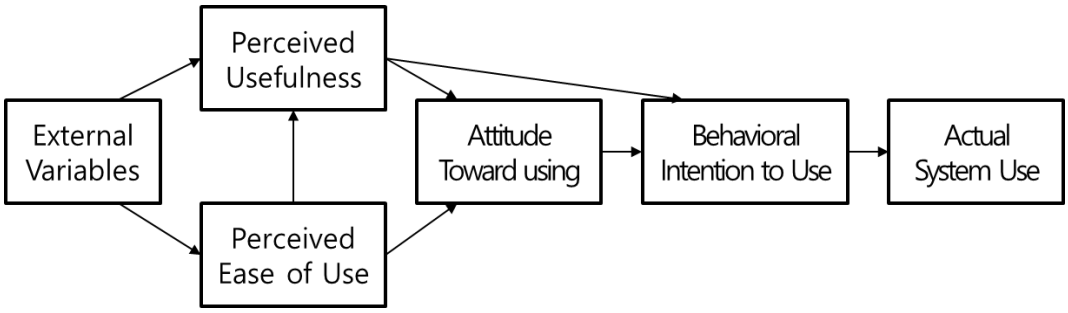

Figure 3. Technology acceptance Model (Davis, 1989)

Basically TAM has two main factors that affect all the acceptance of technolog

[5] Fred D. Davis (1989) "Perceived Usefulness, Perceived Ease of Use, and User acceptance of infor mation technology", MIS Quarterly 13: 319-340.

y, which are Perceived Usefulness and Perceived Ease of Use. The perceived usef ulness (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 a chieve their goals.

Importance of factors PU & PEU is also mentioned from the preceding researc h 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. [6]

Adams, D.A. Nelson, R.R. and Todd, P.A.(1992) found out the empirical evide nce between PU & PEU with user acceptance[7]. 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. [8]

However, perceived usefulness and perceived ease of use aren't enough to unde rstand the user acceptance of new technology. Legris P. Ingham J. Collerette P. (2 003) mentioned the higher validity of model by using external variables. [9] They ar gued technology acceptance model needs some other external variables from the re

[6] Tornatzky, L.G. et al (1982), "Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings", IEEE Transactions on Engineering management, EM-20: 28-45.
[7] Adams, D.A. et al (1992), "Perceived usefulness, ease of use, and usage of information technolog y: A replication", MIS Quarterly 16: 227-247.
[8] Hendrickson, A.R. et al (1993), "On the test-retest reliability of perceived usefulness and perceived ease of use scales", MIS Quarterly 17: 227-230.
[9] Legris P. et al (2003), "Why do people use information technology? A critical review of the techn ology acceptance model", Information & Management 40 (3): 191-204.

lated characteristics, such as factors from human, social change processes or innov ations.

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

2.3 Limitation of TAM to analyze the user acceptance of digital contents

Gallaugher J.M., Auger, P. and Barnir A. (2001) mentioned the information go ods need to be evaluated in different perspective than ordinary goods, and Yoon, K. (1999) remarked digital content is the intangible asset with characteristics of ex perience goods that it is hard to measure the economical utilities until users really use it. Additionally, Ruggiero, T.E. (2000) figured out the importance of custome r's satisfaction in user acceptance of digital contents. So it is limited to analyze t he user acceptance factors by using only TAM. There must be other external varia bles that can explain the realistic contents very well.

2.3.1 Needs of Content characteristic factors

Many preceding research have showed the perceived usefulness and perceived e

ase of use factors from TAM is significant in digital content's user acceptance res earch, but still there are needs of different factors related to characteristics of cont ent itself. (Yoo, 2006 [10], Oh, 2009[11], Lee, 2009[12])

So, to find the right factors for the digital content's user acceptance, preceding research used factors from various theories such as Uses and gratification theory (Katz et al, 1974), Social cognitive theory (Bandura, 1986) and Flow theory (Mih aly Csikszentmihalyi, 1990).

2.3.1.1 FLOW

Among the theories used by preceding research, Flow theory was proven to be effective theory to analyze the user acceptance of digital content. Flow theory is one of psychological theory proposed by Mihaly Csikszentmihalyi (1990) that opti mal experience gives user the feelings of concentration and deep enjoyment which brings continuous user intention for certain services or contents.

Ovcjack, B. Hericko, M. Polancic, G. (2015) showed the factor flow was used in technology acceptance model in the field of information, entertainment and cont ents industries. In addition, Yoo et al (2006), Oh et al (2009) used flow as the m

[10] Yoo, S. et al (2006), "Extended technology acceptance model of User in internet contents: on-line game contents", The Korean research association for the business 12: 121-137.
[11] Oh, E. et al (2009), "The Influence of the Characteristics of Digital contents on the Usage Intenti on: Focusing on the customer types", The Korean Academic Association of Business Administration 22 (1): 329-367.
[12] Lee, M. (2009), "Factors influencing the adoption of internet banking: An integration of TAM an d TPB with perceived risk and perceived benefit", Electronic commerce research and applications 8: 130-141.

ain factor to make their research about user acceptance of digital contents.

Therefore, flow could be a important factor as characteristic of digital contents and would give a clear view of user acceptance of realistic content technology.

2.3.1.2 Reality, Spatiality, Interaction

Since flow is the factor for common digital content's characteristic, we need to find the own characteristics of realistic contents. Han, J. (2015) proposed the some factors can be used to evaluate the new services related to the realistic content technology. [13]

Table 1. Realistic content features sheet (Han, 2015)

Areas	Variables
Technology Area	Interaction Immersion Spatiality Reality
Content Area	Convenience Efficiency Operability Satisfaction

[13] Han, J. (2015), "Features of Types and Content-design of Mixed reality based Devices", Journal of the Korea Institute of Spatial Design 10 (2): 63-72

Factors from content area which are convenience, efficiency, operability and satisfaction, are difficult to use in this research since the factors are a lot related to after-experienced feelings that this research is purposed to understand the acceptance of all possible users including non-experienced users.

However, factors from technology area, which are interaction, immersion, spatiality, reality, can be used as distinctive realistic content factors, since they have unique meanings for realistic content and very suitable for technology acceptance model.

In this research, Reality, Spatiality and Interaction are selected as the core characteristics of realistic content. Immersion is removed since flow has comprehensive meaning of immersion.

2.3.2 Needs of Device characteristic factors

To analyze the user acceptance of next-generation digital content, characteristics of device should be included in the research. Digital content could not be functioned without device. It implies users should have a device to run the digital content. Furthermore, diffusion of new digital contents has been highly related to diffusion of new devices. We can find these examples easily from the diffusion of smart-phone and its applications.

From these points of view, to prospect the next-generation digital content by analyzing the user acceptance, we need to point out the core characteristics of devi

ce. Concretely, realistic contents are functioned in the wearable devices. So pickin g up the main changes from wearable devices could be the core factors of device characteristics.

2.3.2.1 Display

Weng, D. Cheng, D. Wang, Y. (2012) mentioned the development of display sy stem would highly affect the usage of realistic contents.[14] It's easy to imagine rea listic content would give 3-dimentional experiences to the user that, current displa y systems would provide limited view to the users.

In addition, the reason why realistic contents seems to have a high possibility of commercialization is the diffusion of Head-mounted display (HMD) devices. Re port from Institute for information & communications technology promotion in Kor ea (2014) mentioned the current user interest of realistic content has been made b y development of HMD devices and the price of it is going down these days.

So, it is sure that display is the main characteristics of device to understand th e user acceptance of realistic content technology.

2.3.2.2 Interface

Roupe, M. Bosch-Sijtsema, P. Johansson, M. (2014) showed the importance of

[14] Weng at el (2012), "Display systems and registration methods for augmented reality applications", Optik 123: 769-774.

interface in realistic content services.[15] The majority interface system of current digital contents is based on computer and mobile phone devices. For example, mouse and keyboard from computers and haptic touch interface of mobile phone are effective interface system in 2-dimentional view of input & output.

However, it's hard to use realistic content with current interface systems. Since realistic content provide 3D environment and the wearable devices aren't likely to be compatible with current interface systems. So to make realistic content more useful and easier to use, new interface system should be designed.

Therefore, interface is the important factor of device characteristic, and should be consider in the research of user acceptance of realistic content technology.

2.3.3 Needs of Perceived risk factors

Beside, emergence of new media and contents could bring the new risks and problems to the society (Choi, 2009). It is hard to deny the fact that somehow the digital contents we used have brought some serious problems to the society, such as addiction of digital games, social media and smart-phone applications or the fraud cases in voice phishing and emails.

Cho, H. (2011) analyzed the risk features that digital media had brought to us.[16] He conducted the survey from smart-phone users to classify the different risks

[15] Roupe et al (2014), "Interactive navigation interface for virtual reality using the human body", Computers, Environment and Urban systems 43: 42-50.

[16] Cho, H. (2011), "Introduction of digital media and consequent new risk types – Focus on the Analysis of user risk perception and risk features of smart phones as convergence media", Journal of th

that users are afraid of. The details are on the table 2.

So, it is essential to involve the risk factors in the user acceptance research. H owever, there are very limited researches which indicate the importance of risk fac tors. They only care the positive factors from new technology that avoid negative factors after all.

Table 2. Risk types of new digital media and contents (Cho, 2011)

Division	Details	Features
Financial	1. Infringement of copyright 2. Burden of usage fee 3. Spam mails and SMS 4. Infection to digital virus 5. Voice phishing & Internet fraud	• Financial damages from the risk • All the damage comes instantly, and hard to avoid it. • Extra costs for prevention and action
Social-Culture	1. Cyber terror that attack a specific person 2. The digital divide 3. Diffusion of harmful contents (Gamble, Sex, Suicide etc.) 4. Destruction of language 5. Spread of false information	• Risks that can be happened from communication of society's structure • Literature and language perspective of risks • These risks can be grew to serious social problems
Personal	1. Watch personal life 2. Personal information extrusion 3. Communication severance & alienation 4. Addiction	• Invasion to personal information and privacy • Dangers from personal selection (Severance, Alienation, Addiction)
Pathological	1. Phobia of contents 2. Digital dementia 3. Threat of health and accident	• Physical hurts and injuries • Psychological damages and digital dependency

e Korea contents association 11 (8): 353-364.

To overcome such problems, Featherman, M.S. Pavlou, P. A. (2003) made a good example research that how user acceptance of digital services can be analyzed with perspective of negative features that services can bring to society. [17]

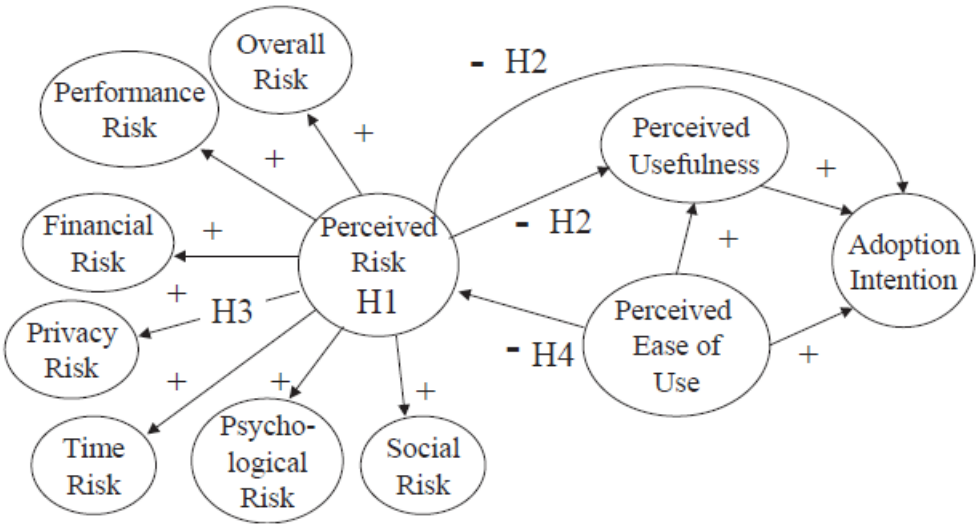

Figure 4. Perceived risk perspective research model (Featherman et al, 2003)

From many preceding researches that consider the risk features of the new technologies, perceived risk theory (Cunningham, 1967) has been selected as a good indicator that show how we can classify the dimension of risks that users aware of.

There are 6 dimensions of risks - Performance, Financial, Opportunity/Time, Safety, Social loss and Psychological loss. These features of risks are already proved

[17] Featherman M.S. et al (2003), "Predicting e-services adoption: a perceived risk facets perspective", Human-Computer studies 59: 451-474.

by Dowling, G.R. (1986), to be effective factors to use as a risk consider researc h.

However, usage of these factors was different between the topics of the researc h. Mitchell V.W. (1999) suggested slightly different risk factors from the consumer perspective, and user acceptance researches with perceived risk have showed the different risk factor selections in their researches. (Yang et al, 2015, Im et al, 200 8 and Martins et al, 2014)

So, Featherman et al (2003) suggested not to use safety factor in the user acce ptance research of digital services since they have less connection with physical sa fety, but proposed to use Privacy factor as a main risk factor of digital services.

Table 3. Description and definition of perceived risk facets

Perceived Risk Facet	Description - Definition
1. Performance risk	"The possibility of the product malfunctioning and performing as it was designed and advertised and therefore failing to deliver the desired benefits." (Grewal et al, 1994)
2. Financial risk	"The potential monetary outlay associated with the initial purchase price as well as the subsequent maintenance cost of the product." (Grewal et al, 1994), Expecting financial loss due to fraud.
3. Time risk	"Consumers may lose time when making a bad purchasing decision by wasting time researching and making the purchase, learning how to user a product or service only to have to replace it if it does not perform to expectations." (Featherman et al, 2003)
4. Psychological risk	"The risk that the selection or performance of the producer will have a negative effect on the consumer's peace of mind or self-perception."

	(Mitchell, 1992)
5. Social risk	"Potential loss of status in one's social group as a result of adopting a product or service, looking foolish or untrendy." (Featherman et al, 2003)
6. Privacy risk	"Potential loss of control over personal information, such as when information about you is used without your knowledge or permission. The extreme case is where a consumer is spoofed, meaning a criminal user their identity to perform fraudulent transactions." (Featherman et al, 2003)

After considering all the risk factors from Table2 and Table3, the factors that c an be selected as the perceived risks of the next-generation content technology wo uld be Financial risk, Psychological risk and Privacy risk.

2.4 Operational definition of variables and factors

On the basis of preceding researches, user acceptance of realistic content techn ology would be successfully done by three perspective approach with technology a cceptance model.

First to consider is the content characteristics (CC) factors. There are Flow, Re ality, Spatiality and Interaction for the realistic content characteristics.

Second, the device characteristics (DC) should be included in the research. The re were plenty of factors related to device, but finally Display and Interface are c hosen to be the core factors of device characteristic.

Third, the perceived risk perspective should be involved to understand the nega

tive effects of new digital contents. This factors would give us clear ideas of which risks should we consider to be regulated. The chosen factors for perceived risk are Financial risk, Psychological risk and Privacy risk.

Table 4 shows the total factors used in this research.

Table 4. Factors of Realistic content user acceptance research

Perspective	Factor	Description - Definition	Reference
Content Characteristic (CC)	Flow	Optimal experience that realistic content would give to users. Enjoyment, concentration and positive feeling of immersion.	Csikszentmihalyi, 1990 Yoo et al, 2006 Oh et al, 2009 Ovcjack et al, 2015 Han, 2015
	Reality	The degree of how similar the materials of realistic content compared to real world. The graphical superiority of realistic content.	
	Spatiality	The sense of spatial that makes users feels like they're located in different place. 3-Dimensional feeling of realistic content.	
	Interaction	The degree of how well realistic content would allow users to communicate with other users, search information and make social network.	
Device Characteristic (DC)	Display	The necessity of change in display system to use realistic content. And needs of different display device diffusion in the market.	Weng et al, 2012 Roupe et al, 2014 IITP, 2014
	Interface	The necessity of change in interface system to use realistic content. And the degree of limitation in current interface devices to use realistic content.	

Perceived Risk (PR)	Financial risk	Possible burden for usage fee of realistic content. And the fraud that can be cause by diffusion of realistic content	Cunningham, 1967 Grewal et al, 1994 Featherman et al, 2003 Choi, 2009 Cho, 2011
	Psychological risk	Risk of addiction to realistic content or digital dementia. Increase of expose to harmful digital contents.	
	Privacy risk	Invasion to personal information and personal life. Severance between realistic content users and non-users.	
Technology Acceptance Model (TAM)	Perceived Usefulness	The degree of usefulness that users feel realistic content is useful to achieve the user's goal or performance.	Davis, 1989 Adams et al, 1992 Hendrickson et al, 1993 Legris et al, 2003
	Perceived Ease of Use	The degree of convenience that users feel when they use realistic content. Whether it is easy to learn or not.	
	Intention to Use	Final intention of using realistic contents considering all the features of realistic contents.	

Chapter 3. Research model and Hypotheses

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.

3.1 Research Questions

This research is trying to figure out the three main research questions to predict the future digital content industry and analyze the user acceptance of realistic content technology.

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?

3.2 Design of Research model

From selected factors in Table 4, research model was designed to analyze the user acceptance of realistic contents.

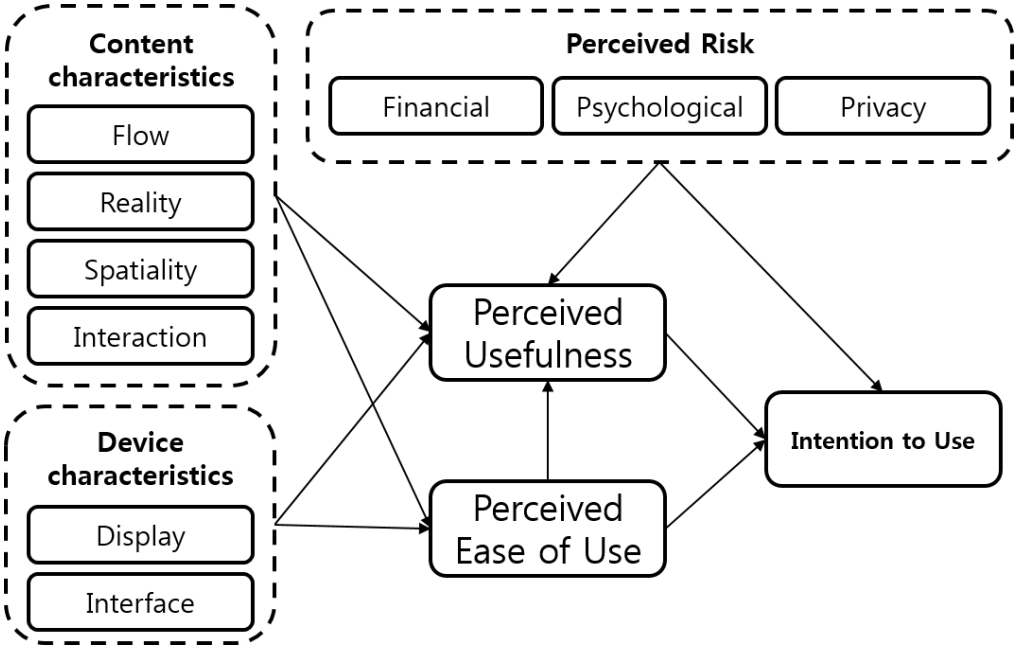

Figure 5. Research Model

Three perspective of realistic content's user acceptance factors were put as the external variables of the model, and the factors from technology acceptance model were used as internal variables of the model.

3.3 Research Hypotheses

From the designed model, expected results can be estimated. Hypotheses were made by these expected results and meaning of each factors that included in the model.

3.3.1 Content Characteristics

Each of content characteristic factors would give different influence to the mod el, so It is important to analyze the effect of each factor separately – Flow, Realit y, Spatiality and Interaction.

However, characteristics of content are expected to give positive effects to the acceptance of digital contents. Khang, H. Kim, J. Kim. Y. (2013) showed the flow affect motivation of use the digital contents positively. Park, N. Roman, R. Lee, S. Chung, J.E. (2009) proved the certain characteristic of digital service would giv e positive effect on the user acceptance.

H1: Flow is positively related to user perceived usefulness of next-generation c ontent.

H2: Flow is positively related to user perceived ease of use of next-generation content.

H3: Reality is positively related to user perceived usefulness of next-generation content.

H4: Reality is positively related to user perceived ease of use of next-generatio n content.

H5: Spatiality is positively related to user perceived usefulness of next-generati on content.

H6: Spatiality is positively related to user perceived ease of use of next-genera tion content.

H7: Interaction is positively related to user perceived ease of use of next-gener ation content.

H8: Interaction is positively related to user perceived ease of use of next-gener ation content.

3.3.2 Device Characteristics

Development of devices is sure to change the digital life, but it doesn't mean that the new devices would always give positive effect to accept the new technolo gy. Cannon, A.B. Strawderman, L. Burch, R. (2015) mentioned the change of user error types in the change of interface system that evolution of the system doesn't imply the elimination of user errors.

Therefore, characteristics of device will give meaningful influence to user accep tance, but doesn't really sure whether it will be positive or negative.

H9: Display will give significant effect to user perceived usefulness of next-ge

neration content.

H10: Display will give significant effect to user perceived ease of use of next-generation content.

H11: Interface will give significant effect to user perceived usefulness of next-generation content.

H12: Interface will give significant effect to user perceived ease of use of next -generation content.

3.3.3 Perceived Risks

Financial risk, Psychological risk and Privacy risk were selected as the importa nt risks of realistic content technology. Featherman et al (2003) mentioned the per ceived risk factors influence negative effects to the perceived usefulness and intent ion to use the technology, while they didn't give much significant influence to the perceived ease of use.

So, chosen 3 risks are expected to give negative effects on the perceived usefu lness of realistic content technology and intention to use it.

H13: Financial risk is negatively related to user perceived usefulness of next-ge neration content.

H14: Financial risk is negatively related to user intention to use next-generatio n content.

H15: Psychological risk is negatively related to user perceived usefulness of next-generation content.

H16: Psychological risk is negatively related to user intention to use next-generation content.

H17: Privacy risk is negatively related to user perceived usefulness of next-generation content.

H18: Privacy risk is negatively related to user intention to use next-generation content.

3.3.4 Technology acceptance model's factors

From technology acceptance model (Davis, 1989), perceived usefulness and perceived ease of use are highly expected to give positive influence to the intention to use realistic contents. In addition, perceived ease of use is expected to give significant effect to perceived usefulness of realistic content.

H19: User perceived ease of use is positively related to user perceived usefulness of next-generation content.

H20: User perceived ease of use is positively related to user intention to use next-generation content.

H21: User perceived usefulness is positively related to user intention to use next-generation content.

Table 5. Hypotheses assortment

Division	Hypothesis
H1, H3, H5, H7	Content characteristics of realistic content (Flow, Reality, Spatiality, Interaction) are positively related to user perceived usefulness (PU) of next-generation content.
H2, H4, H6, H8	Content characteristics of realistic content (Flow, Reality, Spatiality, Interaction) are positively related to user perceived ease of use (PEU) of next-generation content.
H9, H11	Device characteristics of realistic content (Display, Interface) will give significant effect to user perceived usefulness (PU) of next-generation content.
H10, H12	Device characteristics of realistic content (Display, Interface) will give significant effect to user perceived ease of use (PEU) of next-generation content.
H13, H15, H17	Perceived risks (Financial, Psychological, Privacy) are negatively related to user perceived usefulness (PU) of next-generation content.
H14, H16, H18	Perceived risks (Financial, Psychological, Privacy) are negatively related to user intention to use (IU) next-generation content.
H19	User perceived ease of use (PEU) is positively related to user perceived usefulness (PU) of next-generation content.
H20	User perceived ease of use (PEU) is positively related to user intention to use (IU) next-generation content.

H21	User perceive usefulness (PU) is positively related to user intention to use (IU) next-generation content.

3.4 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. 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 analyze 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 analyzed to show the user acceptance of realistic content technology.

Chapter 4. Results of Analysis

4.1 Basic statistics of survey participants

Online survey was conducted from September of 2015 to October of 2015. Mo st of participants haven't use realistic content before, but they aware of its existen ce. 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 10 9 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 undergrad uate students or already graduated. And the rest were under high-school students o r graduate school student. Participants' favorite digital content was digital game (1 19, 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. Mo st of participants (80%) were occasionally looking for new digital contents, and 2 15 of participants (50.1%) thought they're good at using digital contents.

Table 6. Demographic statistics of the Survey

Division		Frequency count (N=429)	Percentage (%)
Gender	Male	207	48.3
	Female	222	51.7
Age (Min=15, Max=49)	10's	109	25.4
	20's	111	25.8
	30's	103	24.1
	40's	106	24.7
Favorite Digital content	Digital game	119	27.7
	Web browsing & Searching	89	20.7
	Movie	86	20
	Music	84	19.6
	Else	51	11.9
Usage time of digital content per day	More than 2 hours	205	47.8
	1-2 hours	130	30.3
	30 mins – 1 hours	67	15.6
	Else	27	6.3
Competence in using digital content	Very good	58	13.5
	Good	215	50.1
	Common	138	32.2

	Bad	16	3.7
	Very bad	2	0.5
Education	Under high school graduated	95	22.1
	Junior college enroll l& graduated	48	11.2
	University enroll & graduated	239	55.7
	Graduate school enroll & graduated	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

4.2 Reliability & Validity

4.2.1 Internal Consistency check

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) [18] s hows a good indicator to measure the reliability of survey questions and the consi stency of answers. This method provide the value called Cronbach's Alpha, that th e 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 7. Internal Consistency of the Survey data

Factor	Initial Variables	Cronbach's α	Final Variables	Remarks
Flow	3	0.795	3	
Reality	3	0.557	3	Accept
Spatiality	3	0.723	3	
Interaction	3	0.725	3	
Display	4	0.666	3	
Interface	4	0.741	4	
Financial risk	3	0.499	0	Reject
Psychological risk	3	0.817	3	
Privacy risk	3	0.776	3	
Perceived Usefulness	4	0.720	3	
Perceived Ease of use	3	0.785	3	
Intention to use	4	0.819	3	

[18] Cronbach, L.J. (1951), "Coefficient Alpha and the internal structure of tests", Psychometrika 16 (3): 297-334.

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. There fore factor 'Financial risk' was removed from the research model, but kept the fac tor '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 conten t technology.

4.2.2 Confirmatory Factor analysis & Identification

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

In confirmatory factor analysis, there are several fit indices to check. Value of Chi-square (χ^2), P-value of Chi-square, Goodness-Fit-Index (GFI), Adjusted goodne ss-fit-index (AGFI), Root mean square residual (RMR), Normed fit index (NFI), C omparative-fix-index (CFI) and Root mean square error of approximation (RMSE A) are considered to be core indices to check the validity of the model.

Commonly, if the p-value of chi-square is under 0.05, it is judged as significa nt as statistics. But if the number of samples is large (n>200), the value of Chi-s quare becomes inaccurate since the value of chi-square is highly related to the nu mber of samples. So we judge the validity of model by chi-square / degree of fre

edom (χ^2/df) and other indicators that CFA gives us.[19] Usually, when the value of chi-square / degree of freedom is under 2.0 (χ^2/df < 2.0), we can called the model has good value of identification.

Goodness-fit-index (GFI) has a range 0 (poor fit) to 1.0 (perfect fit). GFI doesn't effect by the number of samples or multi-variate normal distribution that evaluate the validity of model very well. If the value of GFI is over 0.9 (GFI > 0.9) we called the model is significant, and over 0.8 (GFI > 0.8) is acceptable.[20]

Adjusted goodness-fit-index (AGFI) is the enhanced index of GFI that integrated the degree of freedom value. Index of AGFI is appropriate if the value is over 0.9 (AGFI > 0.9) but in case of large samples (n>200), over 0.85 (AGFI > 0.85) is also judged as acceptable index of AGFI.

Root mean square residual (RMR) is the standardized index from data and model. If the value is under 0.05 (RMR < 0.05), the model is significant and if the value is under 0.08 (RMR < 0.08), the model is acceptable.

Comparative fit index (CFI) has a value between 0 to 1, and as the value is high, validity of the model can be judged as good.

Root mean square error of Approximation (RMSEA) is the index from the value of chi-square modified with degree of freedom and number of samples. If the value of RMSEA is under 0.08, the model can be judged as significant.

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[19] Carmines, E.G. et al (1981), "Analyzing models with unobserved Variables: Analysis of covariance structures", Social Measurement: Current Issues 65-116.

[20] Chau, P.Y.K. (1996), "An empirical investigation on factors affecting the acceptance of CASE by system developers", Information and Management 30: 269-280.

In conclusion, it is difficult to gain all the fit indices as significant in structural equation modeling research and there aren't any absolute index limits that researchers must follow. However, it is important for research model to stay close to the significant value of fit indices (Jorekog et al, 1993, Gefen et al., 2000).

As to check the validity of this 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 fitindex 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.

Finally, fit index of research model is on the table 8. And the modified research model after the internal consistency check & confirmatory factor analysis is on figure 6.

Table 8. Fit indices of Research model

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

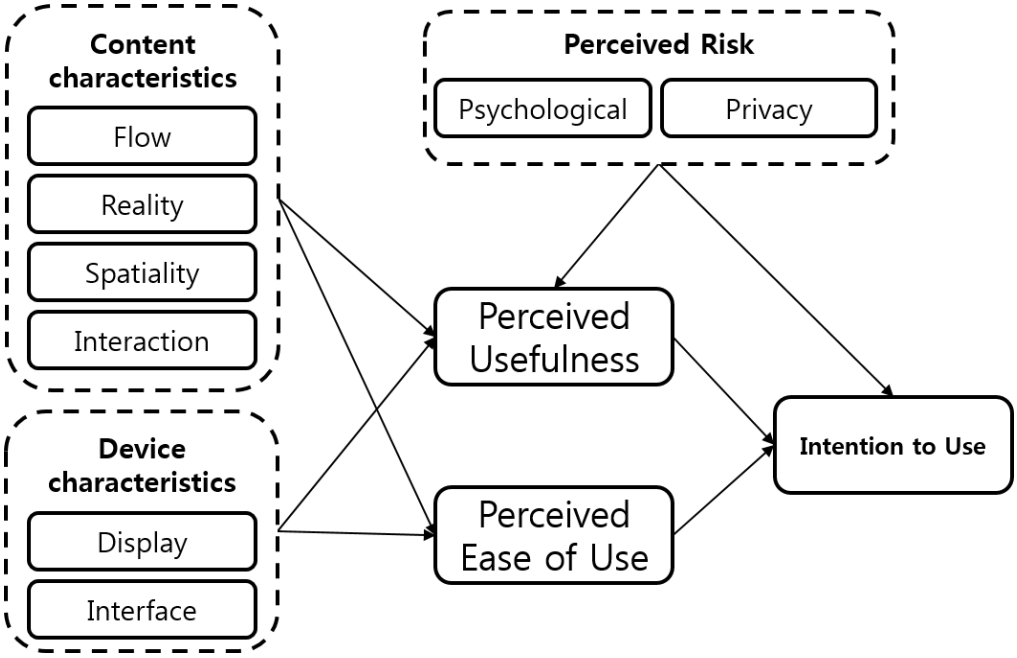

Figure 6. Modified research model

4.3 Hypothesis verification

4.3.1 Result of overall research model analysis

The research model is consist of 8 exogenous variables - Flow, Reality, Spatiality, Interaction, Display, Interface, Psychological risk and Privacy risk. And 3 endogenous variables – Perceived Usefulness, Perceived Ease of use and Intention to use.

The fit indices of overall research model is listed on the table 8. Chi-square=528.224 (d.f.=226, P=0.000), GFI=0.911, AGFI=0.882, RMR=0.082, NFI=0.874, CFI=0.923 and RMSEA=0.056 that few indices was less significant, but considering the overall fitness of indices, model seems enough to analyze.

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. Details on the figure 7.

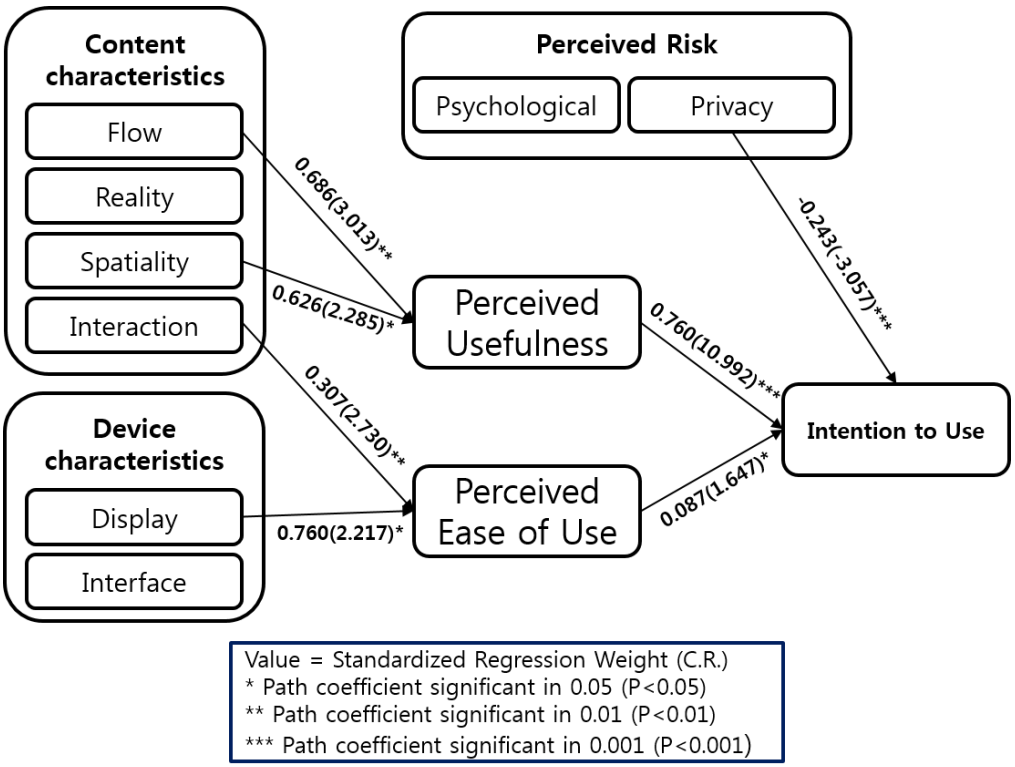

Figure 7. Path coefficient of research model

4.3.2 Content characteristics hypotheses verification

There were 4 content characteristics of realistic content, which were Flow, Reality, Spatiality and Interaction. Hypotheses were set as these characteristics of realistic content would have significant influence to the Perceived Usefulness and Perceived Ease of use.

The result of analysis showed that neither of factors had influence to Perceived usefulness and perceived ease of use both. Flow and Spatiality had significant influence to Perceived Usefulness but not in the Perceived ease of use. Interaction had significant influence to Perceived Ease of use but not in the Perceived usefulness. However, Reality hadn't any influences to both of perceived usefulness and perceived ease of use.

Table 9. Hypotheses verification of Content characteristics

Hypothesis & Path		Standardized Path coefficient	P-value	Result
H1	Flow → Perceived Usefulness	0.686	0.001**	Accept
H2	Flow → Perceived Ease of Use	-0.102	0.274	Reject
H3	Reality → Perceived Usefulness	-0.618	0.051	Reject
H4	Reality → Perceived Ease of Use	0.183	0.246	Reject
H5	Spatiality → Perceived Usefulness	0.626	0.011*	Accept
H6	Spatiality → Perceived Ease of Use	-0.118	0.287	Reject

H7	Interaction → Perceived Usefulness	0.097	0.205	Reject
H8	Interaction → Perceived Ease of Use	0.307	0.003**	Accept

4.3.3 Device characteristics hypotheses verification

Display and Interface were selected as the important factors of realistic content' s device perspective. Hypotheses of device characteristics were these factors would influence the perceived usefulness and perceived ease of use of realistic content s ignificantly.

But, only Display had significant influence to Perceived Ease of use. Interface had no influence to both of perceived usefulness and perceived ease of use.

Table 10. Hypotheses verification of Device characteristics

Hypothesis & Path		Standardized Path coefficient	P-value	Result
H9	Display → Perceived Usefulness	-1.146	0.170	Reject
H10	Display → Perceived Ease of Use	0.760	0.013*	Accept
H11	Interface → Perceived Usefulness	1.499	0.114	Reject
H12	Interface → Perceived Ease of Use	-0.215	0.248	Reject

4.3.4 Perceived risks hypotheses verification

From the preceding researches, Financial risk, Psychological risk and Privacy ri sk were estimated as the most influential risks of realistic content. So, hypotheses

of perceived risks were they would influence the perceived usefulness and intenti on to use the realistic content significantly.

However, Financial risk was erased in the research model after the check of in ternal consistency. So, the analysis was done with Psychological risk and Privacy risk. Both of risk factors hadn't any influence to perceived usefulness of the realis tic content, but Privacy risk showed the significant influence to intention to use th e realistic content negatively.

Table 11. Hypotheses verification of Perceived risks

Hypothesis & Path		Standardized Path coefficient	P-value	Result
H13	Financial risk → Perceived Usefulness	-	-	-
H14	Financial risk → Intention to Use	-	-	-
H15	Psychological risk → Perceived Usefulness	0.046	0.285	Reject
H16	Psychological risk → Intention to Use	0.031	0.352	Reject
H17	Privacy risk → Perceived Usefulness	0.119	0.063	Reject
H18	Privacy risk → Intention to Use	-0.243	0.001**	Accept

4.3.5 Technology acceptance model hypotheses verification

Perceived Usefulness, Perceived Ease of use and Intention to user were taken f rom David (1989)'s technology acceptance model. In addition, the directivity of ea ch factors was also referred from technology acceptance model.

But the connection from Perceived ease of use to Perceived usefulness was excluded since it influenced the validity of overall model negatively. So, the links from perceived usefulness to intention to use (PU → IU) and from perceived ease of use to intention to use (PEU → IU) were left to be analyzed.

The result showed that both of perceived usefulness and perceived ease of use had significant influence to the intention to use the realistic content. But the size of influence was different between both factor that perceived ease of use had only 0.087 standardized regression weights while perceived usefulness had 0.760 standardized regression weights.

Table 12. Hypotheses verification of TAM

Hypothesis & Path		Standardized Path coefficient	P-value	Result
H19	Perceived Ease of use → Perceived Usefulness	-	-	-
H20	Perceived Ease of use → Intention to use	0.087	0.049*	Accept
H21	Perceived Usefulness → Intention to use	0.760	***	Accept

In conclusion, H1, H5, H8 from content characteristics were accepted, H10 from device characteristics was accepted, H18 from perceived risks was accepted and H20, H21 from technology acceptance model were accepted based on the result of analysis.

Chapter 5. Conclusions

5.1 Summary of the research

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

Even though the realistic content is considered as the next-generation digital co ntent technology from many institutions and firms, there have been only limited re searches 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 tec hnology is useful and ease to use, the market will grow. So to the realistic conte nt technology. If we can analyze why users want realistic content and what are th e expectations that users feel about the realistic content, it will be very easy to a dopt them in the market. Which cause the growth of digital content industry.

There were some researchers who tried to analyze the user acceptance of virtu al reality or augmented reality technology. But they were focusing more on the di gital devices that allow realistic content to operate.

However, digital content has different characteristics then digital devices. It is e xperienced 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 perspective were integrated with te chnology acceptance model.

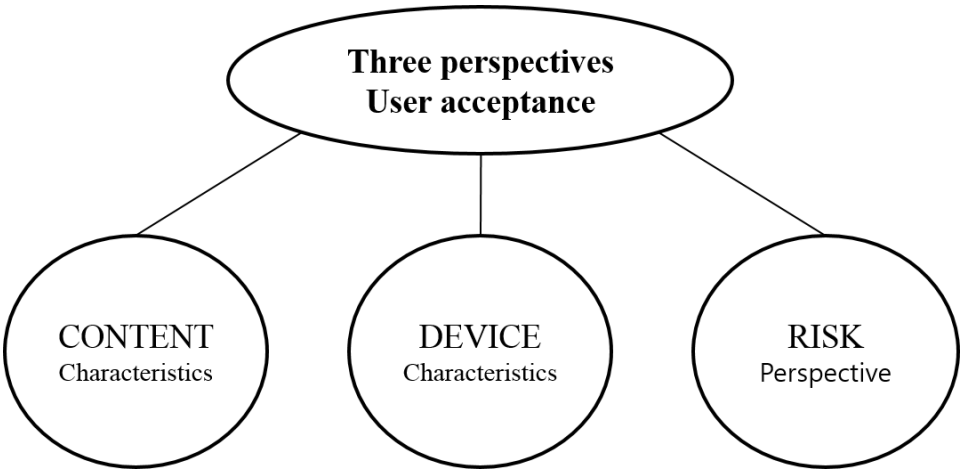

Figure 8. Three perspectives approach to the user acceptance

First, the characteristics of content perspective is composed of Flow, Reality, S patiality and Interaction factors. Second, the characteristics of device perspective w hich are the Display and Interface system that development of device would influe nce a lot to the user acceptance. Third, the perceived risks perspective. We know by experiences that emergence of new digital content didn't always give positive e ffects to the society. It has been turned out that many side effects, such as addicti

on, dementia and fraud, can be caused by diffusion of new media and contents. So based on the literature reviews, the financial risk, psychological risk and privacy risk were chosen to involve 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.

5.2 Research implications & limitations

5.2.1 Theoretical implications

First, this research is the first attempt to analyze the user acceptance of realistic content technology academically. So results of this research would provide major factors of the realistic content technology to the future realistic content researchers.

Second, flow theory (Csikszentmihalyi, 1990) is proven to be the effective theory to analyze the user acceptance of next-generation content industry. Flow has the highest influence among all the factors that offer a clue of intention to use the next-generation content. For example, in the Game industry, giving a feeling of fun to the users is the most important consideration, and Flow shows the direct influence to the fun from the many previous researches. So, it would be important for researchers to include Flow in user acceptance research of future digital content.

Third, from the empirical results, this research showed that perceived risks have clear negative influence to user acceptance of next-generation content. And among the all risks, Privacy risk is considered as the most threatening risk that hesitate users to use next-generation content.

Lastly, three categories of factors with content, device and perceived risk perspectives approach to analyze the technology acceptance model showed significant reliability and validity. Meaning that such approach to design the user acceptance model proved to be significant as a theory.

5.2.2 Practical implications

5.2.2.1 Users

Result of analysis showed that users think realistic content would be useful when it can provide optimal experiences that users want to experience virtually or spatial feelings and experiences make users to feel like they're located in different places.

Moreover, Users believe new display devices like HMD (Head-mounted-display) will provide easier environment to use the realistic content. This implies that display device diffusion will provide easy accessibility to the realistic contents. And such a easy accessibility is the key to diffuse the next-generation digital content in the industry.

Users also believe if the realistic content provide interactive functions that allow the communications between users to users, the difficulty of adopting realistic content would be decreased.

On the contrary, how graphically realistic content look isn't important issue for users, even though realistic content could provide the most similar environment of the real world. And users didn't want to adopt the new interface system since they believe current interface system (e.g. Touch in smartphone) has enough functionality to use realistic contents.

Such results imply that it is not important how the image is real as long as users can experience the overall immersive and optimal environment. Users want to

have the overall optimal experiences from the realistic content, not the detail sen se of reality.

Meanwhile, users think that invasion of privacy is the most harmful risk that r ealistic content might bring to them. They believe realistic content could expose t he personal information and personal life easily. On the other hand, many experts worried the psychological risks of digital content, such as content addiction or dig ital dementia, user didn't seriously recognize the danger of psychological risks that realistic content might bring to them. So it would be important to enlighten the users that they could face the psychological danger from realistic content use, eve n though this research showed users didn't consider psychological risk dangerously.

5.2.2.2 Industry

Digital content companies who are trying to make new businesses in the realist ic contents industry, they have to consider the most about what do users want to experience from their contents and services. So rather try to make content looks more likely to real world, they have to consider the user experiences like visiting unique places or making new digital communication with other users.

On the other hand, the digital device companies should consider to develop ne w display systems that could operate realistic content easily. Glasses and head-mou nted types of display (HMD) devices are highly demanded in the market as the re alistic content industry grows.

Meanwhile, companies have to be ready to secure the user's personal informat

ion from the possible invasions. Report from the IITP (2015) mentioned that realis tic content already shows the possibility of privacy invasion looks very similar to invasion from web & internet contents. For example, Open-sim (Open simulator) i s the open source virtual reality platform that already used in more than 300 virtu al reality contents, but current networks in Open-sim don't encrypt the information properly, just like the early version of internet. So, it is highly demanded to secu re the information from realistic contents from the early stage of diffusion by adding security functions like identification, content security and network packet encrypt s ystem.

As example of Open-sim has shown, the realistic content technology can some how invade the privacy of users, so well-constructed security system is necessary to keep business in the industry.

5.2.2.3 Policy

From the condition that realistic content is now a promising next-generation di gital industry, to invigorate the realistic content, policy makers have to promote no t only the major digital content businesses (e.g. Digital game, Entertainment), but also the business fields of the health, education, culture, travel, etc to satisfy the diverse desire of users.

To achieve such goals, diversifying the content experiences and diffusing new display devices are highly recommended from the result of this research. So polic y makers have to consider supporting various digital content developer and organiz

ing the realistic content's industrial ecosystem, since there are many start-up comp anies try to make new businesses in the realistic content industry.

In addition, this research showed that the majority survey participants who had high intention to user realistic content were young users. So realistic content will be diffused early to the young users first, and this implies that the realistic conte nt could intensify the digital divide, like a smartphone-literate, that information mi nority group could be increased. So, from the point of public utility service and o verall social welfare, government needs to supervise the additional digital literacy phenomenon caused by realistic content diffusion.

Also, side effects of realistic content invigoration have to be considered serious ly. This research showed the privacy risk is the most apprehensive risk from the users that hinders the user acceptance of realistic content. So, it is urgent to devel op the technology that secure the users in overall content diffusion processes, like search, maintenance, and distribution of realistic content. Therefore, government h as to push the policies not only the R&D of realistic content technology itself, bu t also the technologies and platforms that offer the safe distributions and managem ents of the realistic content.

5.2.3 Limitations of the research

From this research, several limitations were found in the empirical analysis and prediction of the next-generation content industry.

First, the survey was conducted only for the users in South Korea that the results of analysis would be more reliable if the survey was conducted globally.

Second, since the realistic content is the new technology and there are limited users who already had experiences of using it, the result was based on user's conception that might change if they had a real experiences. So, factors that didn't seem significant in this research would be meaningful after realistic contents are diffused widely to the users.

Third, factors analyzed from user acceptance would provide what is the major invigoration features of the realistic content, but limited view of how the factors would contribute to invigorate the digital content industry. So it would be difficult to discuss the stream of the next-generation content industry's growth.

5.3 Proposal of future research direction

Several future research directions are proposed based on the results of this research. First, study of next-generation digital content industrial ecosystem analysis could be conducted based on the significant factors in this research. Prospect of next-generation industry will be more reliable if the ecosystem of industry can be suggested. Like the well-used digital ecosystem structure, CPND – Content, Platform, Network, Device, New ecosystem structure can be suggested since the next-generation digital content industry will be a lot different than present.

Second, comparison analysis from difference in users' natures can be made. For example, compare the difference between realistic content experienced and non-experi enced users to show how experiences affect the acceptance of next-generation digital content. Comparison research between innovative and non-innovative users also can be conducted, since the user's final behavior toward then technology adoption is different by their motivations.

Finally, different theories can be adopted in the research of user acceptance, like behavioral economic theory, there are several well defined theories that can explain the users and consumers intention to use new technology. So it would be wise to try different theories perspective of the research and show the preciseness of the result of this research.

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Appendix : Survey sheet

1. 서문

안녕하십니까? 바쁘신 가운데에도 본 설문에 응답해 주셔서 감사의 말씀을 드립니다.

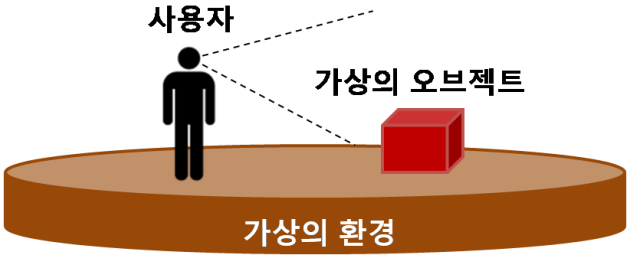
현재 전 세계적으로 웨어러블(eg. 스마트 시계)과 같은 새로운 디지털 디바이스가 시장에 그 비중을 점차 넓혀가는 가운데 이러한 새로운 디바이스의 확산에 발맞추어 **실감형 콘텐츠(Realistic contents)라는** 새로운 디지털 콘텐츠 분야가 자라나고 있습니다.

실감형 콘텐츠는 우리가 한번쯤 들어보았던 **가상현실(Virtual reality), 증강현실(Augmented Reality), 홀로그램(Hologram)**과 같은 3D형태의 미디어를 실제 세상이나 가상 세상에 구현하여 이용자들이 사용할 수 있는 기술을 보유한 콘텐츠를 의미합니다.

(1) 가상현실 콘텐츠

가상현실 콘텐츠는 컴퓨터나 각종 디지털 기기를 이용하여 인공적인 기술로 만들어낸 실제와 유사하지만 **실제가 아닌 가상의 환경에서 가상의 것들 체험**할 수 있는 콘텐츠를 의미합니다.

<가상현실>



이용자가 가상현실에서 보고, 듣고, 느끼고, 경험할 수 있는 모든 것은 현실에 매우 유사한 가상적인 장소, 상황, 사물 등이며 그것을 통해 가상적인 환경에 위치해 있다

고 느끼게 합니다.

<가상현실 콘텐츠>

가상현실 콘텐츠의 대표적인 예시로써 위 그림과 같이

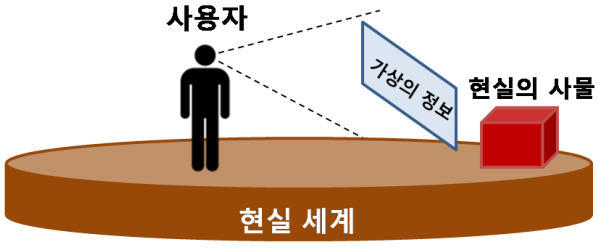
- **가상 시뮬레이션 교육**
- **현실과 유사하게 제작된 가상 환경의 체험 (여행, 레져 등)**

등 을 할 수 있는 콘텐츠가 존재합니다.

(2) 증강현실 콘텐츠

증강현실이란 **현실**에 존재하는 환경, 상황, 사물에 **가상**의 정보를 합성하여 원래 현실에 존재하는 듯이 보이게 하는 콘텐츠를 의미합니다.

<증강현실>



따라서 증강현실 콘텐츠는 모든 존재하는 현실의 장소, 상황, 사람, 사물들에서 이용자가 원하는 정보나 사물들에 대한 구체적인 이미지를 제공합니다.

<증강현실 콘텐츠>

이런 증강현실은

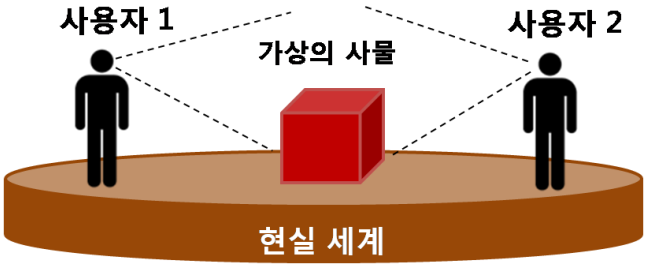
- 구글 글래스(Google glasses)와 같이 현실의 빈 공간에서 모니터 화면을 볼 수 있는 콘텐츠
- 자동차에서 운전자 앞의 유리를 통해 계기판을 확인할 수 있는 것과 같은 콘텐츠
- 현실의 사물을 인식하여 그것에 대한 정보를 찾아주는 콘텐츠

등이 존재합니다.

(3) 홀로그램

홀로그램은 현실의 환경에서 가상의 사물을 보여주는 것으로 개념자체는 증강현실과 유사하지만, 홀로그램으로 생겨난 **가상의 사물은 현실에 존재하는 모든 이용자들이** 특수한 디지털 장비의 소유 없이도 **같이 보고 들을 수 있다는 점**입니다.

<홀로그램>



특히 일반적인 컴퓨터 모니터와 2D 그래픽의 출력장치와는 **다르게 홀로그램은 3D의 입체적 정보를 현실에 보여줌**으로써 마치 해당 콘텐츠가 현실에 실제 존재하는 것과 같은 착각을 줄 수 있습니다.



<홀로그램 콘텐츠>

이런 홀로그램의 예시로는

- 최근 전시관등에서 사용하는 입체적 형태의 화면과 판매 제품 홍보 콘텐츠

- 컨퍼런스 및 회의에서 삼차원(입체적) 형태의 프레젠테이션을 보여주는 형태의 콘텐츠

등 이 존재합니다.

본 설문조사는 **"실감형 콘텐츠가 이용자 입장에서 어떻게 수용될 것인지 그리고 실감형 콘텐츠가 가지고 있는 위험요인은 무엇인지"**를 분석, 연구하여 향후 차세대 콘텐츠 산업 활성화를 위해 기여할 예정입니다.

이에 대해 설문해주시는 귀하의 정확한 의견을 구하고자 합니다. 차후 새로운 콘텐츠 산업 발전을 위해 정확한 응답을 부탁드리겠습니다.

설문에 응하여 주신 것에 대해 다시한번 감사의 말씀을 드립니다.

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2. 질문항

A. 다음은 실감형 콘텐츠의 몰입성(Flow)에 관한 설문입니다. 각 항목에 대해 귀하의 견해와 가장 일치하는 번호에 체크를 해주시기 바랍니다. (H1,H2)

1. 나는 실감형 콘텐츠가 기존의 디지털 콘텐츠 보다 깊은 몰입감을 줄 것이라 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠를 사용하는데 있어서 느껴지는 몰입감이 콘텐츠를 지속적으로 사용하게 만드는 주요 원인이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠에 더 쉽게 몰입한다는 감각을 느낄 수 있을 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

B. 다음은 실감형 콘텐츠가 가지고 있는 현실성(Reality), 공간성(Spatiality), 상호작용성(Interactivity)에 관한 설문입니다. 각 항목에 관하여 귀하의 견해와 가장 일치하는 번호에 체크해 주십시오. (H3 ~ H8)

(현실성 - Reality)
1. 나는 실감형 콘텐츠가 매우 사실적 느낌의 사용 경험을 제공할 것으로 기대한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 현실적으로 느껴지는 콘텐츠라는 것이 오감(시각, 청각, 후각 등)을 만족하는 콘텐츠라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그

렇다

3. 나는 실감형 콘텐츠가 현실적일수록 콘텐츠를 쉽고 간단하게 사용할 수 있을 것 같다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

(공간성 - Spatiality)
1. 나는 실감형 콘텐츠가 새로운 공간에 위치한 것과 같은 감각을 제공할 것으로 기대한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠가 현실의 공간을 더 폭 넓게 활용할 수 있을 것 같다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠로부터 받을 수 있는 현실적 공간에 위치한다는 느낌 덕분에 콘텐츠 사용방법을 쉽게 익힐 수 있을 것이라 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

(상호작용성 - Interactivity)
1. 나는 실감형 콘텐츠의 사용이 다른 사용자와 정보와 메시지를 주고 받는데 있어서 더 개방적이고 편한 환경을 제공할 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠을 통해 다른 사람들과 좀 더 다양하고 많은 경험을 공유할 수 있을 것이라 생각한다..
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠가 개인이 원하는 정보를 요청하고 습득하기에 편리하다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

C. 다음은 실감형 콘텐츠을 사용하기 위한 디지털 디바이스(Digital device)의 디스플레이(Display)와 인터페이스(Interface)에 관한 설문입니다. 각 항목에 관하여 귀하의 견해와 일치하는 번호에 체크해 주십시오. (H9 ~ H12)

(디스플레이 - Display)
1. 나는 스마트폰과 같은 기존의 평면형 화면으로도 실감형 콘텐츠를 활용하기에 충분하다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠를 사용하기 위해서는 안경형 장비(eg. 구글 글래스)와 같은 새로운 형식의 디스플레이 장비가 필요하다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 사람들이 새로운 디스플레이를 탑재한 디바이스를 많이 사용해야 실감형 콘텐츠도 많이 사용 될 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

4. 나는 안경형 장비와 같은 새로운 디스플레이 장비에 적응하는 것이 쉬울 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

(인터페이스 - Interface)

1. 나는 컴퓨터 마우스 형태의 클릭(Click)이나 스마트폰의 터치(Touch)와 같은 기존의 인터페이스가 아닌 새로운 인터페이스 장비가 존재해야 실감형 콘텐츠를 유용하게 사용할 수 있다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 착용형 장비(eg. 웨어러블)가 새로운 형태의 콘텐츠 조작 방법을 제공해줄 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠의 인터페이스는 삼차원적인 움직임을 인식할 수 있어야 한다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

4. 나는 삼차원 형태의 움직임을 인식 할 수 있는 새로운 인터페이스가 실감형 콘텐츠의 사용을 쉽게 만들 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

D. 다음은 실감형 콘텐츠의 활성화로 발생할 수 있는 금전/경제적 위험(Financial risk), 심리적인 위험(Psychological risk), 사생활 침해의 위험(Privacy risk)에 관한 설문입니다. 각 항목에 관하여 귀하의 견해와 일치하는 번호에 체크해 주십시오. (H13 ~ H18)

(금전/경제적 위험 - Financial risk)
1. 나는 실감형 콘텐츠가 기존의 콘텐츠의 이용료보다 다소 높을 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠 사용을 통해 바이러스 감염, 보이스 피싱과 같은 디지털 사기 행위에 피해를 입을 것 같다.

① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠를 사용하기 위해서 새로운 디지털 디바이스를 구매해야 할 것 같다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

(심리적인 위험 - Psychological risk)
1. 나는 실감형 콘텐츠를 사용함으로써 스마트폰 중독과 같은 새로운 디지털 중독 현상에 빠져들 것 같다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠를 사용함으로써 디지털 치매, 의존증과 같은 정신적 병리현상에 걸릴 수 있다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠로 유해 콘텐츠(도박, 자살, 음란물 등)에 더 많이 노출 될 것이라 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

(사생활 침해의 위험 - Privacy risk)
1. 나는 실감형 콘텐츠 사용이 내 개인정보를 쉽게 유출 시킬 것 같다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠를 통해 나의 사생활이 쉽게 침범 당할 우려가 있다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠 사용자와 비사용자간의 커뮤니케이션 단절 및 소외현상이 일어날 것으로 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

E. 다음은 실감형 콘텐츠에 대한 지각된 사용 유용성(Perceived Usefulness), 지각된 사용 용이성(Perceived Ease of use)에 관한 설문입니다. 각 항목에 관하여 귀하의 견해와 일치하는 번호에 체크해 주십시오. (H19 ~H21)

(지각된 사용 유용성 - Perceived Usefulness)
1. 실감형 콘텐츠 사용을 통해 느낄 수 있는 새로운 감각과 활용 범위의 증가는 콘텐츠를 유용하게 사용할 수 있게 해준다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 실감형 콘텐츠 이용을 위해 개발된 새로운 형태의 디바이스(eg. 웨어러블)들은 콘텐츠의 실용성을 높여줄 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 실감형 콘텐츠의 사용이 불러 일으킬 수 있는 여러 위험과 문제점들은 콘텐츠의 유용성을 감소시킬 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

4. 실감형 콘텐츠를 통해서 얻고자 하는 사용목적을 달성하기 위해서는 콘텐츠의 사용방법이 쉬워야 한다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

(지각된 사용 용이성 - Perceived ease of use)

1. 실감형 콘텐츠는 기존의 콘텐츠에 비하여 사용하기 쉬울 것으로 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 실감형 콘텐츠가 보유하고 있는 특성들은 콘텐츠를 사용하기 쉽게 만들 것으로 생각한다. (특성 : 몰입성, 현실성, 공간성, 상호작용성)
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 실감형 콘텐츠를 이용할 수 있게 하는 새로운 디바이스의 사용방법은 배우기 쉬울 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

F. 다음은 실감형 콘텐츠의 대한 콘텐츠 사용의도(Intention to use realistic contents)와 실제 사용의사(Actual use)에 관한 설문조사입니다. 각 항목에 관하여 귀하의 견해와 일치하는 번호에 체크해 주십시오.

(콘텐츠 사용의도 - Intention to use)
1. 나는 실감형 콘텐츠가 유용하다고 생각되면 사용해볼 의사가 있다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠의 사용방법이 쉽다면 사용해 볼 의사가 있다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠가 여러 위험성과 문제점을 내포하고 있더라도 사용해볼 의사가 있다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

4. 나는 실감형 콘텐츠를 실제 사용해볼 것이다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

<기초 통계 질문항>
1. 귀하의 성별은?
① 남 ② 녀
2. 귀하의 연령은?
① 만 20세 미만 ② 만 20~29세 ③ 만 30~39세 ④ 만 40~49세
3. 귀하의 최종 교육 정도는?
① 고졸 이하 ② 전문대 재학 또는 졸업 ③ 대학 재학 또는 졸업 ④ 대학원 재학 또는 졸업 이상 ⑤ 기타
4. 귀하가 제일 자주 사용하는 디지털 콘텐츠 분야는?
① 영화 ② 음악 ③ 게임 ④ 출판(e-book) ⑥ 교육(e-learning) ⑦ 방송 ⑧ 캐릭터/애니메이션 ⑨ 지식정보(포탈, 검색)
5. 귀하의 디지털 콘텐츠 사용 년수는?
① 1년 미만 ② 1~3년 미만 ③ 3~6년 미만 ④ 6~9년 미만 ⑤ 9년 이상
6. 귀하의 하루 평균 디지털 콘텐츠 사용 시간은?
① 15분 미만 ② 15분~30분 미만 ③ 30분~1시간 미만 ④ 1시간~2시간 미만 ⑤ 2시간 이상
7. 귀하는 얼마나 자주 새로운 디지털 콘텐츠를 찾아봅니까?
① 거의 찾아보지 않음 ② 가끔 찾아 봄 ③ 자주 찾아 봄 ④ 매우 자주 찾아 봄
8. 귀하의 디지털 콘텐츠 활용 능력 정도는?
① 아주 못함 ② 조금 못함 ③ 보통 ④ 조금 잘함 ⑤ 아주 잘함

Abstract (Korean)

실감형 콘텐츠(Realistic Content)는 웨어러블 디바이스 확산으로 차세대 디지털 콘텐츠 산업을 열 수 있는 핵심 기술로 평가 받고 있다. 이러한 실감형 콘텐츠는 가상 현실 (VR), 증강 현실 (AR), 홀로그램 기술로 구성되어 있으며 이 기술의 산업적, 시장적 가치는 시간이 흐를수록 기하급수적으로 증가하고 있는 추세이다. 따라서 실감형 콘텐츠가 실제 이용자들에게 수용될 요인이 무엇인지 알아보는 것이 중요한데, 아직까지 관련 연구가 부족한 실정이다.

분석의 신뢰성과 타당성을 올리고 올바른 분석결과를 만들어내기 위하여 콘텐츠 속성, 디바이스 속성, 인지된 위험이라는 세가지 측면의 요인들을 선정하여 기술수용모델(TAM)에 융합하여 이용자 수용요인을 분석해 보았다.

데이터 수집을 위해 한국에 거주하는 디지털 콘텐츠 이용자들을 대상으로 설문이 실시되었다 (N=429). 설문은 실감형 콘텐츠의 존재를 알고 있는 이용자들을 대상으로 실시되었으며, 실감형 콘텐츠를 실제 사용해본 경험이 있는지 여부는 고려되지 않았다.

구조방정식 모델을 통해 분석을 실시했으며, 분석 결과 몰입성과 공간성은 실감형 콘텐츠의 인지된 유용성에 유의미한 영향력을 미쳤으며, 상호작용성과 디스플레이 속성은 실감형 콘텐츠의 인지된 사용 용이성에 유의미한 영향력을 미쳤다. 인지된 유용성과 사용 용이성 중 실감형 콘텐츠 사용의사에 더 큰 영향력을 미치는 것은 인지된 유용성이었다. 반면 사생활 침해 위험은 실

감형 콘텐츠가 불러올 수 있는 가장 위험한 요인으로 고려되었다.

분석 결과를 토대로 차세대 콘텐츠 활성화를 위한 방안을 예측해보자면 다음과 같다. 첫째, 실감형 콘텐츠는 이용자들이 요구하는 가장 적절한 사용 경험을 제공할 수 있도록 진흥되어야 한다. 둘째, 실감형 콘텐츠를 쉽게 사용하기 위해서는 새로운 디스플레이 시스템을 탑재한 디바이스의 시장 확산이 필요하다. 셋째, 실감형 콘텐츠가 불어올 수 있는 사생활 침해와 같은 위협들을 사전에 예방하기 위한 규제가 필요하다.

주요어 : 실감형 콘텐츠, 기술수용모델, 구조방정식, 몰입 이론, 인지된 위험 이론, 미래 연구
학 번 : 2014-20613

M.S. Dissertation in Economics

The Prospect of next-generation digital content industry: User acceptance of the realistic content technology

차세대 콘텐츠 산업의 전망
: 실감형 콘텐츠 기술의 이용자 수용의도 분석

December 2015

Graduate School of Seoul National University

Technology Management, Economics, and Policy Program

Hyungjin Park

The Prospect of next-generation digital content industry: User acceptance of the realistic content technology

지도교수 황준석

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박형진

박형진의 경제학석사학위 논문을 인준함
2015 년 12 월

위 원 장 _____(인)

부위원장 _____(인)

위 원 _____(인)

Abstract

The Prospect of next-generation digital content industry: User acceptance of the realistic content technology

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Seoul National University

We are now facing a new age in the digital content industry caused by diffusion of the wearable device. Realistic content, which consist of virtual reality (VR), augmented reality (AR) and hologram technologies. It had been predicted to be the prevalent future digital content technology by many institutions and researchers. There are very limited researchers, however who have tried to predict the possibility of realistic content by analyzing the user acceptance of such technologies.

To complete a definitive study of technology acceptance, an economic model was designed based on the literature reviews of several theories, including behavioral economic, theory of reasoned actions, flow theory and perceived risk theory.

Factors from three different perspectives – Content & Device characteristics and

Perceived risk – were integrated with technology acceptance model to improve the reliability and validity of the research and to ensure the results of analysis.

Survey were conducted by users in South Korea (N=429) who were aware of the existence of realistic content technology. Analysis was made based on structural equation modeling method.

The result of factor analysis showed that Flow and Spatiality have significant influence on the Perceived Usefulness of realistic content, Interaction and Display have significant influence on the Perceived Ease of use. Perceived Usefulness had more influences than Perceived Ease of use on the intention to use the realistic content. Meanwhile, users pointed out the privacy risk as the most significant reason that hesitate users may hesitate to use realistic content.

To invigorate next-generation digital content industry, realistic content technology should be focused on providing optimal experiences to the users. In addition, new digital devices with new display systems are vital to the easy use of realistic content. Moreover, danger of personal information infringement must be considered before the active diffusion of realistic content in the society.

Keywords: Realistic content, User acceptance, Structural equation modeling, Flow theory, Perceived risk, Future study

Student Number: 2014-20613

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Chapter 1. Introduction

1.1 Research Background

As time passes, the digital devices have developed consistently. And such a development of devices had caused the development of digital contents. We see these examples particularly in televisions and mobile phone; as the technology advanced, the digital contents has evolved, for example, from black-white to colors(TV), and from voice to video(mobile phone).

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

From 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 will lead the next-generation digital content industry and become the leader of the future digital content market.

For that answer, several institutions have already begun their research to determine the next-generation digital content technology. On June 2014, the Ministry of science, ICT and Future planning in South Korea (MSIP) identified nine strategic industries that have a high possibilities of being the next-generation economic growth

engine of the nation.[1] As one of nine strategic industries and the sole digital content industry, Realistic content was selected as the next-generation digital content technology.

This forecast is credible as many different institutions and enterprises had predicted the same result that realistic content will be the core technology of the next-generation digital content industry. Gartner announced the ten strategic technologies of 2016, noting that the ambient user experience is an important business factor in the future and realistic content would be the first technology to provide such experiences to the users.[2]

Major information technology (IT) companies are looking to expand in this area, including Facebook, which already spent $2 billion (USD) to acquire 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 made a new category in its Android application market called "Virtual reality" to diffuse the realistic content on the market and become the leading company of digital content industry.

Then, what is the realistic content? We can define realistic content within three big core technologies. As shown in Figure1, realistic content consist of Virtual reality, Augmented reality and Hologram.

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[1] MSIP 9 strategic industries (2014), “Smart car, 5G-network, Deep seafloor ocean-plant, Intelligence robot, Wearable smart device, Personalized wellness care system, Disaster safety management system, renewable hybrid energy system and realistic content”.

[2] Gartner symposium / IT expo (2015).

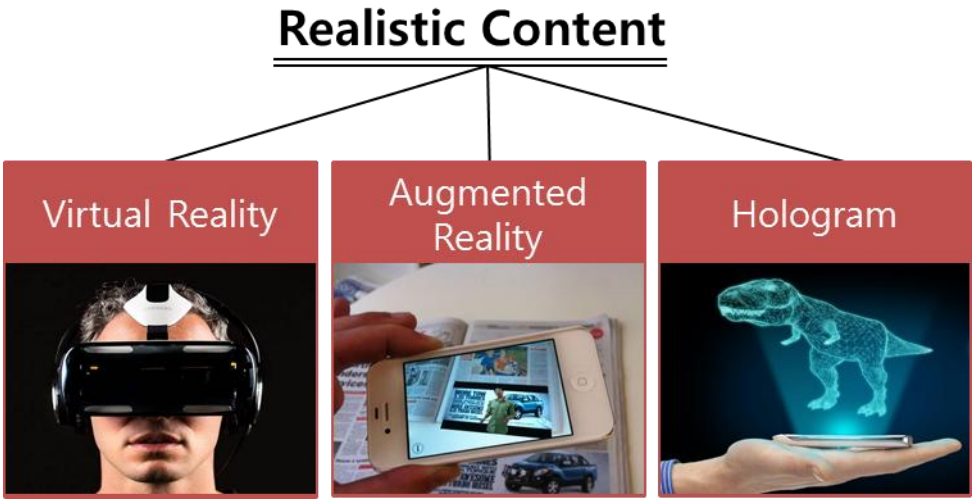

Figure 1. Realistic content's 3 core technologies

Each of these technologies has different characteristics, All of the virtual reality's contents will be shown inside of a virtual world, so that what you experience in virtual reality contents is all imaginary, no matter how real it appears. However, augmented reality and hologram contents can be seen in the real world, providing some virtual situations that users may want to experience. Differences between augmented reality and hologram are in the way they display their contents. Augmented reality shows content by integrating real world objects, while 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. The market report of the consulting firm KZERO, predicted that the realistic content market will grow to $2.8 billion US dollars by 2018.[3] Digieco also report a similar market prediction shown in Figure2 that realistic content will occupy the half of global media mar

[3] KZero (2014), "Virtual reality software revenue forecast 2014-2018", www.kzero.co.uk.

ket. [4]

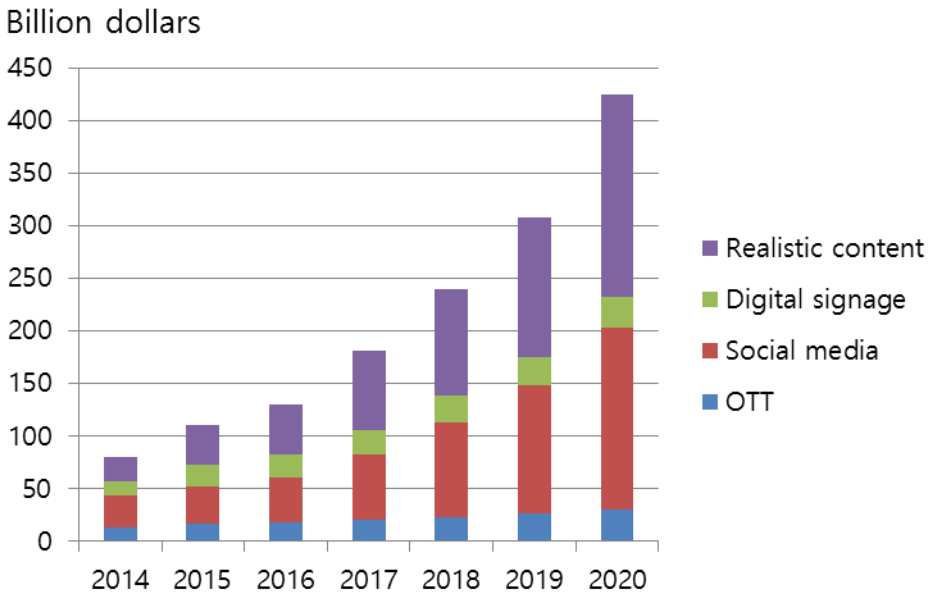

Figure 2. Global digital media market prospect

In light of these considerations, it's certain that realistic content will change the current ecosystem of the digital content industry. This implies being late to promote the realistic content industry, may cause lost competitive edge in the digital content market. Become a latecomer.

1.2 Purpose of the Research

Predicting the next-generation digital content industry isn't simple research, but by analyzing reasons why actual users will accept the realistic contents, we can understand how realistic content will be accepted by actual users, and what will in

[4] Son, H. (2015), "5G시대에 주목 받는 실감형 콘텐츠", DIGIECO report.

vigorate the realistic content technology in the digital content industry and market. So factors analysis of user acceptance is relevant research for predicting the next-generation digital content industry.

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

Chapter 2. Theoretical Background

To give a prospect of next-generation digital content industry and analyze the user acceptance of realistic content technology, literature reviews had been conducted. Several theories, like behavioral economic, innovation diffusion theory and theory of reasoned action, were found as meaningful to adopt in this research, but finally technolog y acceptance model (TAM) was selected based on the theory of reasoned action. And to enhance the validity and completeness of the TAM, content, device and risk ch aracteristics of realistic content are proposed based on the theories such as flow th eory and perceived risk theory.

2.1 Behavioral Economic

Behavioral economic is a branch of economic theory that try to figure out the change of economic by looking the consumer's behaviors in the view of psychological, social and physiological aspects. Hattwick, R.E. (1989) introduced the usefulness of behavioral economic theory in the research of the motivation, perception and decision-making of consumers.

Ho, T.H. Lim, N. and Camerer, C.F. (2006) showed how to adopt behavioral economic theory in the consumer's adoption model, and proved that it is effective to use behavioral economic in the empirical study of consumer's behaviors.

And Ulen, T.S.(2013) also mentioned the importance of behavior analysis that it is

crucial to find the consumer's intention in many different research areas like law, economic and science.

Therefore, behavioral economic theory can be adopted in the research of user's technology acceptance. Schiffer, M.B. (2004) studied the behavioral perspective of technology change and how user adopted them, and showed the importance of behavioral in the technology adoption.

2.2 Technology acceptance model

Davis, F.D. (1989) proposed technology acceptance model (TAM) to analyze the user's technology acceptance factors in adopting new information technologies.[5] T AM suggests a number of core factors that influence user to user a new technolo gy.

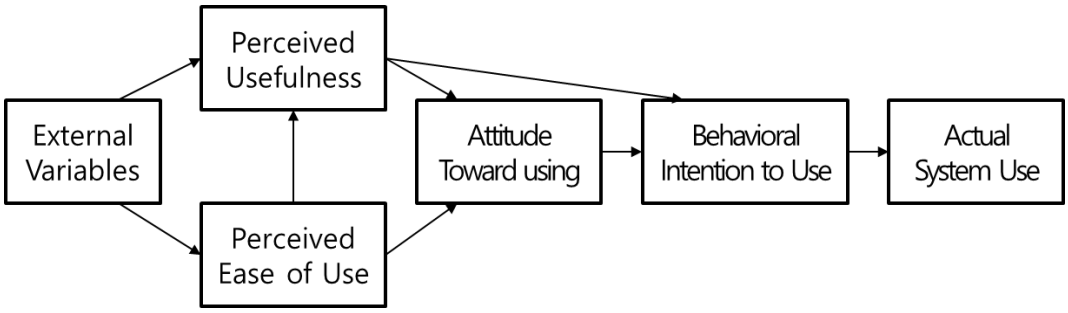

Figure 3. Technology acceptance Model (Davis, 1989)

Basically TAM has two main factors that affect all the acceptance of technolog

[5] Fred D. Davis (1989) "Perceived Usefulness, Perceived Ease of Use, and User acceptance of infor mation technology", MIS Quarterly 13: 319-340.

y, which are Perceived Usefulness and Perceived Ease of Use. The perceived usef ulness (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 a chieve their goals.

Importance of factors PU & PEU is also mentioned from the preceding researc h 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. [6]

Adams, D.A. Nelson, R.R. and Todd, P.A.(1992) found out the empirical evide nce between PU & PEU with user acceptance[7]. 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. [8]

However, perceived usefulness and perceived ease of use aren't enough to unde rstand the user acceptance of new technology. Legris P. Ingham J. Collerette P. (2 003) mentioned the higher validity of model by using external variables. [9] They ar gued technology acceptance model needs some other external variables from the re

[6] Tornatzky, L.G. et al (1982), "Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings", IEEE Transactions on Engineering management, EM-20: 28-45.
[7] Adams, D.A. et al (1992), "Perceived usefulness, ease of use, and usage of information technolog y: A replication", MIS Quarterly 16: 227-247.
[8] Hendrickson, A.R. et al (1993), "On the test-retest reliability of perceived usefulness and perceived ease of use scales", MIS Quarterly 17: 227-230.
[9] Legris P. et al (2003), "Why do people use information technology? A critical review of the techn ology acceptance model", Information & Management 40 (3): 191-204.

lated characteristics, such as factors from human, social change processes or innov ations.

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

2.3 Limitation of TAM to analyze the user acceptance of digital contents

Gallaugher J.M., Auger, P. and Barnir A. (2001) mentioned the information go ods need to be evaluated in different perspective than ordinary goods, and Yoon, K. (1999) remarked digital content is the intangible asset with characteristics of ex perience goods that it is hard to measure the economical utilities until users really use it. Additionally, Ruggiero, T.E. (2000) figured out the importance of custome r's satisfaction in user acceptance of digital contents. So it is limited to analyze t he user acceptance factors by using only TAM. There must be other external varia bles that can explain the realistic contents very well.

2.3.1 Needs of Content characteristic factors

Many preceding research have showed the perceived usefulness and perceived e

ase of use factors from TAM is significant in digital content's user acceptance res earch, but still there are needs of different factors related to characteristics of cont ent itself. (Yoo, 2006 [10], Oh, 2009[11], Lee, 2009[12])

So, to find the right factors for the digital content's user acceptance, preceding research used factors from various theories such as Uses and gratification theory (Katz et al, 1974), Social cognitive theory (Bandura, 1986) and Flow theory (Mih aly Csikszentmihalyi, 1990).

2.3.1.1 FLOW

Among the theories used by preceding research, Flow theory was proven to be effective theory to analyze the user acceptance of digital content. Flow theory is one of psychological theory proposed by Mihaly Csikszentmihalyi (1990) that opti mal experience gives user the feelings of concentration and deep enjoyment which brings continuous user intention for certain services or contents.

Ovcjack, B. Hericko, M. Polancic, G. (2015) showed the factor flow was used in technology acceptance model in the field of information, entertainment and cont ents industries. In addition, Yoo et al (2006), Oh et al (2009) used flow as the m

[10] Yoo, S. et al (2006), "Extended technology acceptance model of User in internet contents: on-line game contents", The Korean research association for the business 12: 121-137.
[11] Oh, E. et al (2009), "The Influence of the Characteristics of Digital contents on the Usage Intenti on: Focusing on the customer types", The Korean Academic Association of Business Administration 22 (1): 329-367.
[12] Lee, M. (2009), "Factors influencing the adoption of internet banking: An integration of TAM an d TPB with perceived risk and perceived benefit", Electronic commerce research and applications 8: 130-141.

ain factor to make their research about user acceptance of digital contents.

Therefore, flow could be a important factor as characteristic of digital contents and would give a clear view of user acceptance of realistic content technology.

2.3.1.2 Reality, Spatiality, Interaction

Since flow is the factor for common digital content's characteristic, we need to find the own characteristics of realistic contents. Han, J. (2015) proposed the some factors can be used to evaluate the new services related to the realistic content technology. [13]

Table 1. Realistic content features sheet (Han, 2015)

Areas	Variables
Technology Area	Interaction Immersion Spatiality Reality
Content Area	Convenience Efficiency Operability Satisfaction

[13] Han, J. (2015), "Features of Types and Content-design of Mixed reality based Devices", Journal of the Korea Institute of Spatial Design 10 (2): 63-72

Factors from content area which are convenience, efficiency, operability and satisfaction, are difficult to use in this research since the factors are a lot related to after-experienced feelings that this research is purposed to understand the acceptance of all possible users including non-experienced users.

However, factors from technology area, which are interaction, immersion, spatiality, reality, can be used as distinctive realistic content factors, since they have unique meanings for realistic content and very suitable for technology acceptance model.

In this research, Reality, Spatiality and Interaction are selected as the core characteristics of realistic content. Immersion is removed since flow has comprehensive meaning of immersion.

2.3.2 Needs of Device characteristic factors

To analyze the user acceptance of next-generation digital content, characteristics of device should be included in the research. Digital content could not be functioned without device. It implies users should have a device to run the digital content. Furthermore, diffusion of new digital contents has been highly related to diffusion of new devices. We can find these examples easily from the diffusion of smart-phone and its applications.

From these points of view, to prospect the next-generation digital content by analyzing the user acceptance, we need to point out the core characteristics of devi

ce. Concretely, realistic contents are functioned in the wearable devices. So pickin g up the main changes from wearable devices could be the core factors of device characteristics.

2.3.2.1 Display

Weng, D. Cheng, D. Wang, Y. (2012) mentioned the development of display sy stem would highly affect the usage of realistic contents.[14] It's easy to imagine rea listic content would give 3-dimentional experiences to the user that, current displa y systems would provide limited view to the users.

In addition, the reason why realistic contents seems to have a high possibility of commercialization is the diffusion of Head-mounted display (HMD) devices. Re port from Institute for information & communications technology promotion in Kor ea (2014) mentioned the current user interest of realistic content has been made b y development of HMD devices and the price of it is going down these days.

So, it is sure that display is the main characteristics of device to understand th e user acceptance of realistic content technology.

2.3.2.2 Interface

Roupe, M. Bosch-Sijtsema, P. Johansson, M. (2014) showed the importance of

[14] Weng at el (2012), "Display systems and registration methods for augmented reality applications", Optik 123: 769-774.

interface in realistic content services.[15] The majority interface system of current digital contents is based on computer and mobile phone devices. For example, mouse and keyboard from computers and haptic touch interface of mobile phone are effective interface system in 2-dimentional view of input & output.

However, it's hard to use realistic content with current interface systems. Since realistic content provide 3D environment and the wearable devices aren't likely to be compatible with current interface systems. So to make realistic content more useful and easier to use, new interface system should be designed.

Therefore, interface is the important factor of device characteristic, and should be consider in the research of user acceptance of realistic content technology.

2.3.3 Needs of Perceived risk factors

Beside, emergence of new media and contents could bring the new risks and problems to the society (Choi, 2009). It is hard to deny the fact that somehow the digital contents we used have brought some serious problems to the society, such as addiction of digital games, social media and smart-phone applications or the fraud cases in voice phishing and emails.

Cho, H. (2011) analyzed the risk features that digital media had brought to us.[16] He conducted the survey from smart-phone users to classify the different risks

[15] Roupe et al (2014), "Interactive navigation interface for virtual reality using the human body", Computers, Environment and Urban systems 43: 42-50.

[16] Cho, H. (2011), "Introduction of digital media and consequent new risk types – Focus on the Analysis of user risk perception and risk features of smart phones as convergence media", Journal of th

that users are afraid of. The details are on the table 2.

So, it is essential to involve the risk factors in the user acceptance research. H owever, there are very limited researches which indicate the importance of risk fac tors. They only care the positive factors from new technology that avoid negative factors after all.

Table 2. Risk types of new digital media and contents (Cho, 2011)

Division	Details	Features
Financial	1. Infringement of copyright 2. Burden of usage fee 3. Spam mails and SMS 4. Infection to digital virus 5. Voice phishing & Internet fraud	• Financial damages from the risk • All the damage comes instantly, and hard to avoid it. • Extra costs for prevention and action
Social-Culture	1. Cyber terror that attack a specific person 2. The digital divide 3. Diffusion of harmful contents (Gamble, Sex, Suicide etc.) 4. Destruction of language 5. Spread of false information	• Risks that can be happened from communication of society's structure • Literature and language perspective of risks • These risks can be grew to serious social problems
Personal	1. Watch personal life 2. Personal information extrusion 3. Communication severance & alienation 4. Addiction	• Invasion to personal information and privacy • Dangers from personal selection (Severance, Alienation, Addiction)
Pathological	1. Phobia of contents 2. Digital dementia 3. Threat of health and accident	• Physical hurts and injuries • Psychological damages and digital dependency

e Korea contents association 11 (8): 353-364.

To overcome such problems, Featherman, M.S. Pavlou, P. A. (2003) made a good example research that how user acceptance of digital services can be analyzed with perspective of negative features that services can bring to society. [17]

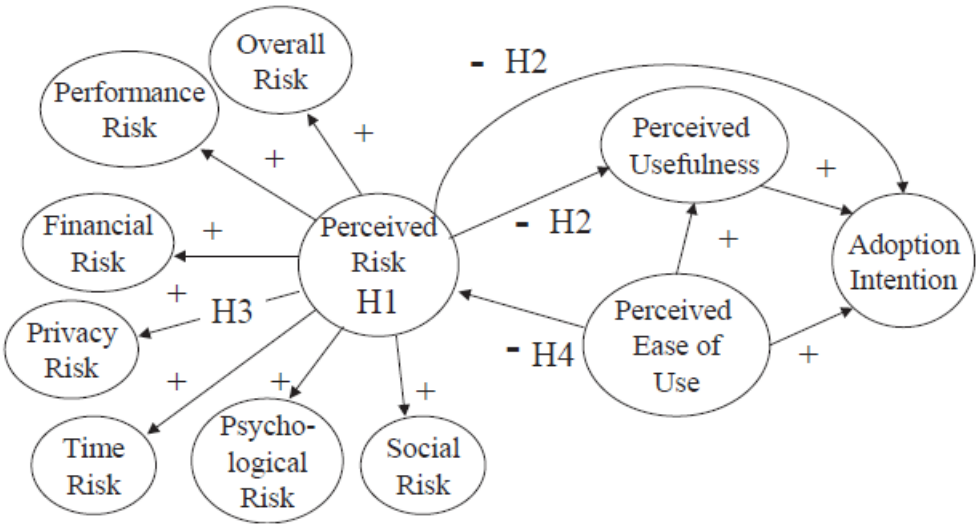

Figure 4. Perceived risk perspective research model (Featherman et al, 2003)

From many preceding researches that consider the risk features of the new technologies, perceived risk theory (Cunningham, 1967) has been selected as a good indicator that show how we can classify the dimension of risks that users aware of.

There are 6 dimensions of risks - Performance, Financial, Opportunity/Time, Safety, Social loss and Psychological loss. These features of risks are already proved

[17] Featherman M.S. et al (2003), "Predicting e-services adoption: a perceived risk facets perspective", Human-Computer studies 59: 451-474.

by Dowling, G.R. (1986), to be effective factors to use as a risk consider researc h.

However, usage of these factors was different between the topics of the researc h. Mitchell V.W. (1999) suggested slightly different risk factors from the consumer perspective, and user acceptance researches with perceived risk have showed the different risk factor selections in their researches. (Yang et al, 2015, Im et al, 200 8 and Martins et al, 2014)

So, Featherman et al (2003) suggested not to use safety factor in the user acce ptance research of digital services since they have less connection with physical sa fety, but proposed to use Privacy factor as a main risk factor of digital services.

Table 3. Description and definition of perceived risk facets

Perceived Risk Facet	Description - Definition
1. Performance risk	"The possibility of the product malfunctioning and performing as it was designed and advertised and therefore failing to deliver the desired benefits." (Grewal et al, 1994)
2. Financial risk	"The potential monetary outlay associated with the initial purchase price as well as the subsequent maintenance cost of the product." (Grewal et al, 1994), Expecting financial loss due to fraud.
3. Time risk	"Consumers may lose time when making a bad purchasing decision by wasting time researching and making the purchase, learning how to user a product or service only to have to replace it if it does not perform to expectations." (Featherman et al, 2003)
4. Psychological risk	"The risk that the selection or performance of the producer will have a negative effect on the consumer's peace of mind or self-perception."

	(Mitchell, 1992)
5. Social risk	"Potential loss of status in one's social group as a result of adopting a product or service, looking foolish or untrendy." (Featherman et al, 2003)
6. Privacy risk	"Potential loss of control over personal information, such as when information about you is used without your knowledge or permission. The extreme case is where a consumer is spoofed, meaning a criminal user their identity to perform fraudulent transactions." (Featherman et al, 2003)

After considering all the risk factors from Table2 and Table3, the factors that c an be selected as the perceived risks of the next-generation content technology wo uld be Financial risk, Psychological risk and Privacy risk.

2.4 Operational definition of variables and factors

On the basis of preceding researches, user acceptance of realistic content techn ology would be successfully done by three perspective approach with technology a cceptance model.

First to consider is the content characteristics (CC) factors. There are Flow, Re ality, Spatiality and Interaction for the realistic content characteristics.

Second, the device characteristics (DC) should be included in the research. The re were plenty of factors related to device, but finally Display and Interface are c hosen to be the core factors of device characteristic.

Third, the perceived risk perspective should be involved to understand the nega

tive effects of new digital contents. This factors would give us clear ideas of which risks should we consider to be regulated. The chosen factors for perceived risk are Financial risk, Psychological risk and Privacy risk.

Table 4 shows the total factors used in this research.

Table 4. Factors of Realistic content user acceptance research

Perspective	Factor	Description - Definition	Reference
Content Characteristic (CC)	Flow	Optimal experience that realistic content would give to users. Enjoyment, concentration and positive feeling of immersion.	Csikszentmihalyi, 1990 Yoo et al, 2006 Oh et al, 2009 Ovcjack et al, 2015 Han, 2015
	Reality	The degree of how similar the materials of realistic content compared to real world. The graphical superiority of realistic content.	
	Spatiality	The sense of spatial that makes users feels like they're located in different place. 3-Dimensional feeling of realistic content.	
	Interaction	The degree of how well realistic content would allow users to communicate with other users, search information and make social network.	
Device Characteristic (DC)	Display	The necessity of change in display system to use realistic content. And needs of different display device diffusion in the market.	Weng et al, 2012 Roupe et al, 2014 IITP, 2014
	Interface	The necessity of change in interface system to use realistic content. And the degree of limitation in current interface devices to use realistic content.	

Perceived Risk (PR)	Financial risk	Possible burden for usage fee of realistic content. And the fraud that can be cause by diffusion of realistic content	Cunningham, 1967 Grewal et al, 1994 Featherman et al, 2003 Choi, 2009 Cho, 2011
	Psychological risk	Risk of addiction to realistic content or digital dementia. Increase of expose to harmful digital contents.	
	Privacy risk	Invasion to personal information and personal life. Severance between realistic content users and non-users.	
Technology Acceptance Model (TAM)	Perceived Usefulness	The degree of usefulness that users feel realistic content is useful to achieve the user's goal or performance.	Davis, 1989 Adams et al, 1992 Hendrickson et al, 1993 Legris et al, 2003
	Perceived Ease of Use	The degree of convenience that users feel when they use realistic content. Whether it is easy to learn or not.	
	Intention to Use	Final intention of using realistic contents considering all the features of realistic contents.	

Chapter 3. Research model and Hypotheses

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.

3.1 Research Questions

This research is trying to figure out the three main research questions to predict the future digital content industry and analyze the user acceptance of realistic content technology.

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?

3.2 Design of Research model

From selected factors in Table 4, research model was designed to analyze the user acceptance of realistic contents.

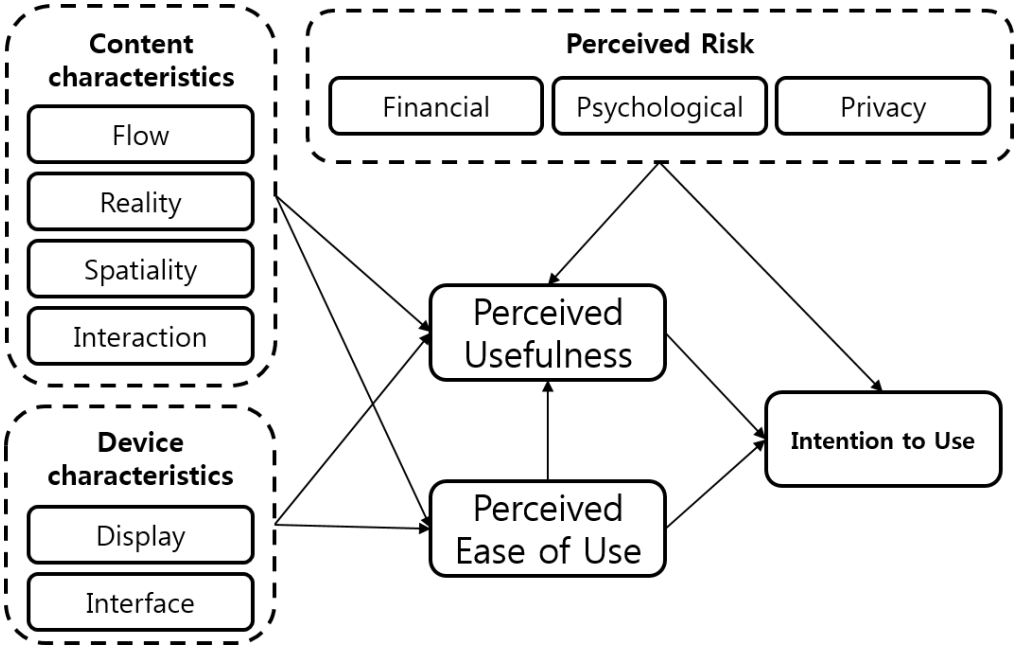

Figure 5. Research Model

Three perspective of realistic content's user acceptance factors were put as the external variables of the model, and the factors from technology acceptance model were used as internal variables of the model.

3.3 Research Hypotheses

From the designed model, expected results can be estimated. Hypotheses were made by these expected results and meaning of each factors that included in the model.

3.3.1 Content Characteristics

Each of content characteristic factors would give different influence to the mod el, so It is important to analyze the effect of each factor separately – Flow, Realit y, Spatiality and Interaction.

However, characteristics of content are expected to give positive effects to the acceptance of digital contents. Khang, H. Kim, J. Kim. Y. (2013) showed the flow affect motivation of use the digital contents positively. Park, N. Roman, R. Lee, S. Chung, J.E. (2009) proved the certain characteristic of digital service would giv e positive effect on the user acceptance.

H1: Flow is positively related to user perceived usefulness of next-generation c ontent.

H2: Flow is positively related to user perceived ease of use of next-generation content.

H3: Reality is positively related to user perceived usefulness of next-generation content.

H4: Reality is positively related to user perceived ease of use of next-generatio n content.

H5: Spatiality is positively related to user perceived usefulness of next-generati on content.

H6: Spatiality is positively related to user perceived ease of use of next-genera tion content.

H7: Interaction is positively related to user perceived ease of use of next-gener ation content.

H8: Interaction is positively related to user perceived ease of use of next-gener ation content.

3.3.2 Device Characteristics

Development of devices is sure to change the digital life, but it doesn't mean that the new devices would always give positive effect to accept the new technolo gy. Cannon, A.B. Strawderman, L. Burch, R. (2015) mentioned the change of user error types in the change of interface system that evolution of the system doesn't imply the elimination of user errors.

Therefore, characteristics of device will give meaningful influence to user accep tance, but doesn't really sure whether it will be positive or negative.

H9: Display will give significant effect to user perceived usefulness of next-ge

neration content.

H10: Display will give significant effect to user perceived ease of use of next-generation content.

H11: Interface will give significant effect to user perceived usefulness of next-generation content.

H12: Interface will give significant effect to user perceived ease of use of next -generation content.

3.3.3 Perceived Risks

Financial risk, Psychological risk and Privacy risk were selected as the importa nt risks of realistic content technology. Featherman et al (2003) mentioned the per ceived risk factors influence negative effects to the perceived usefulness and intent ion to use the technology, while they didn't give much significant influence to the perceived ease of use.

So, chosen 3 risks are expected to give negative effects on the perceived usefu lness of realistic content technology and intention to use it.

H13: Financial risk is negatively related to user perceived usefulness of next-ge neration content.

H14: Financial risk is negatively related to user intention to use next-generatio n content.

H15: Psychological risk is negatively related to user perceived usefulness of next-generation content.

H16: Psychological risk is negatively related to user intention to use next-generation content.

H17: Privacy risk is negatively related to user perceived usefulness of next-generation content.

H18: Privacy risk is negatively related to user intention to use next-generation content.

3.3.4 Technology acceptance model's factors

From technology acceptance model (Davis, 1989), perceived usefulness and perceived ease of use are highly expected to give positive influence to the intention to use realistic contents. In addition, perceived ease of use is expected to give significant effect to perceived usefulness of realistic content.

H19: User perceived ease of use is positively related to user perceived usefulness of next-generation content.

H20: User perceived ease of use is positively related to user intention to use next-generation content.

H21: User perceived usefulness is positively related to user intention to use next-generation content.

Table 5. Hypotheses assortment

Division	Hypothesis
H1, H3, H5, H7	Content characteristics of realistic content (Flow, Reality, Spatiality, Interaction) are positively related to user perceived usefulness (PU) of next-generation content.
H2, H4, H6, H8	Content characteristics of realistic content (Flow, Reality, Spatiality, Interaction) are positively related to user perceived ease of use (PEU) of next-generation content.
H9, H11	Device characteristics of realistic content (Display, Interface) will give significant effect to user perceived usefulness (PU) of next-generation content.
H10, H12	Device characteristics of realistic content (Display, Interface) will give significant effect to user perceived ease of use (PEU) of next-generation content.
H13, H15, H17	Perceived risks (Financial, Psychological, Privacy) are negatively related to user perceived usefulness (PU) of next-generation content.
H14, H16, H18	Perceived risks (Financial, Psychological, Privacy) are negatively related to user intention to use (IU) next-generation content.
H19	User perceived ease of use (PEU) is positively related to user perceived usefulness (PU) of next-generation content.
H20	User perceived ease of use (PEU) is positively related to user intention to use (IU) next-generation content.

H21	User perceive usefulness (PU) is positively related to user intention to use (IU) next-generation content.

3.4 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. 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 analyze 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 analyzed to show the user acceptance of realistic content technology.

Chapter 4. Results of Analysis

4.1 Basic statistics of survey participants

Online survey was conducted from September of 2015 to October of 2015. Mo st of participants haven't use realistic content before, but they aware of its existen ce. 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 10 9 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 undergrad uate students or already graduated. And the rest were under high-school students o r graduate school student. Participants' favorite digital content was digital game (1 19, 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. Mo st of participants (80%) were occasionally looking for new digital contents, and 2 15 of participants (50.1%) thought they're good at using digital contents.

Table 6. Demographic statistics of the Survey

Division		Frequency count (N=429)	Percentage (%)
Gender	Male	207	48.3
	Female	222	51.7
Age (Min=15, Max=49)	10's	109	25.4
	20's	111	25.8
	30's	103	24.1
	40's	106	24.7
Favorite Digital content	Digital game	119	27.7
	Web browsing & Searching	89	20.7
	Movie	86	20
	Music	84	19.6
	Else	51	11.9
Usage time of digital content per day	More than 2 hours	205	47.8
	1-2 hours	130	30.3
	30 mins – 1 hours	67	15.6
	Else	27	6.3
Competence in using digital content	Very good	58	13.5
	Good	215	50.1
	Common	138	32.2

	Bad	16	3.7
	Very bad	2	0.5
Education	Under high school graduated	95	22.1
	Junior college enroll l& graduated	48	11.2
	University enroll & graduated	239	55.7
	Graduate school enroll & graduated	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

4.2 Reliability & Validity

4.2.1 Internal Consistency check

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) [18] s hows a good indicator to measure the reliability of survey questions and the consi stency of answers. This method provide the value called Cronbach's Alpha, that th e 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 7. Internal Consistency of the Survey data

Factor	Initial Variables	Cronbach's α	Final Variables	Remarks
Flow	3	0.795	3	
Reality	3	0.557	3	Accept
Spatiality	3	0.723	3	
Interaction	3	0.725	3	
Display	4	0.666	3	
Interface	4	0.741	4	
Financial risk	3	0.499	0	Reject
Psychological risk	3	0.817	3	
Privacy risk	3	0.776	3	
Perceived Usefulness	4	0.720	3	
Perceived Ease of use	3	0.785	3	
Intention to use	4	0.819	3	

[18] Cronbach, L.J. (1951), "Coefficient Alpha and the internal structure of tests", Psychometrika 16 (3): 297-334.

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. There fore factor 'Financial risk' was removed from the research model, but kept the fac tor '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 conten t technology.

4.2.2 Confirmatory Factor analysis & Identification

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

In confirmatory factor analysis, there are several fit indices to check. Value of Chi-square (χ^2), P-value of Chi-square, Goodness-Fit-Index (GFI), Adjusted goodne ss-fit-index (AGFI), Root mean square residual (RMR), Normed fit index (NFI), C omparative-fix-index (CFI) and Root mean square error of approximation (RMSE A) are considered to be core indices to check the validity of the model.

Commonly, if the p-value of chi-square is under 0.05, it is judged as significa nt as statistics. But if the number of samples is large (n>200), the value of Chi-s quare becomes inaccurate since the value of chi-square is highly related to the nu mber of samples. So we judge the validity of model by chi-square / degree of fre

edom (χ^2/df) and other indicators that CFA gives us.[19] Usually, when the value of chi-square / degree of freedom is under 2.0 (χ^2/df < 2.0), we can called the model has good value of identification.

Goodness-fit-index (GFI) has a range 0 (poor fit) to 1.0 (perfect fit). GFI doesn't effect by the number of samples or multi-variate normal distribution that evaluate the validity of model very well. If the value of GFI is over 0.9 (GFI > 0.9) we called the model is significant, and over 0.8 (GFI > 0.8) is acceptable.[20]

Adjusted goodness-fit-index (AGFI) is the enhanced index of GFI that integrated the degree of freedom value. Index of AGFI is appropriate if the value is over 0.9 (AGFI > 0.9) but in case of large samples (n>200), over 0.85 (AGFI > 0.85) is also judged as acceptable index of AGFI.

Root mean square residual (RMR) is the standardized index from data and model. If the value is under 0.05 (RMR < 0.05), the model is significant and if the value is under 0.08 (RMR < 0.08), the model is acceptable.

Comparative fit index (CFI) has a value between 0 to 1, and as the value is high, validity of the model can be judged as good.

Root mean square error of Approximation (RMSEA) is the index from the value of chi-square modified with degree of freedom and number of samples. If the value of RMSEA is under 0.08, the model can be judged as significant.

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[19] Carmines, E.G. et al (1981), "Analyzing models with unobserved Variables: Analysis of covariance structures", Social Measurement: Current Issues 65-116.

[20] Chau, P.Y.K. (1996), "An empirical investigation on factors affecting the acceptance of CASE by system developers", Information and Management 30: 269-280.

In conclusion, it is difficult to gain all the fit indices as significant in structural equation modeling research and there aren't any absolute index limits that researchers must follow. However, it is important for research model to stay close to the significant value of fit indices (Jorekog et al, 1993, Gefen et al., 2000).

As to check the validity of this 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 fitindex 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.

Finally, fit index of research model is on the table 8. And the modified research model after the internal consistency check & confirmatory factor analysis is on figure 6.

Table 8. Fit indices of Research model

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

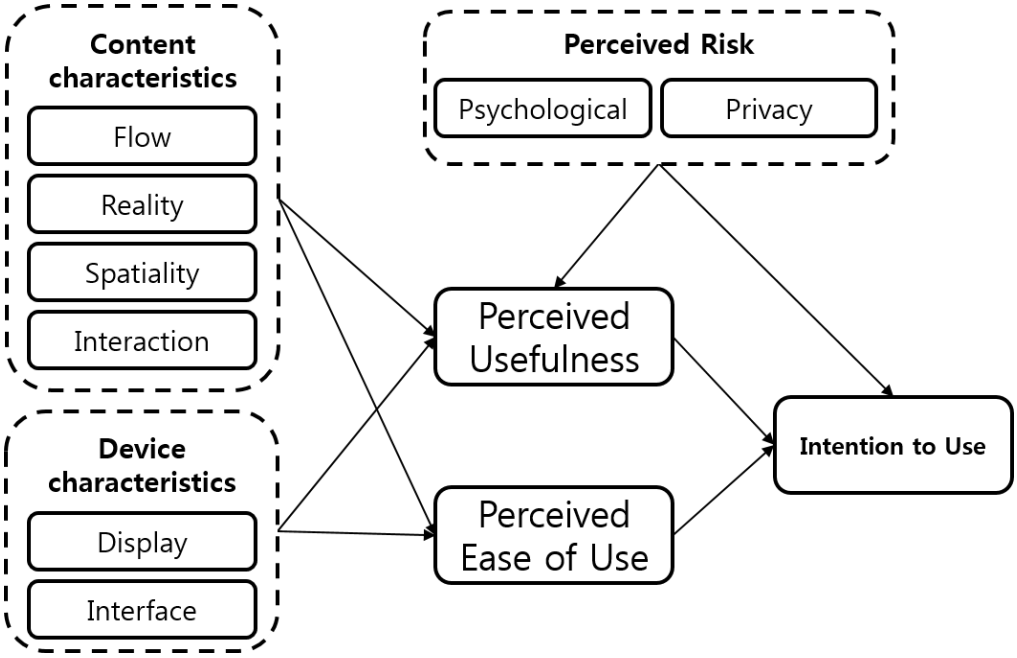

Figure 6. Modified research model

4.3 Hypothesis verification

4.3.1 Result of overall research model analysis

The research model is consist of 8 exogenous variables - Flow, Reality, Spatiality, Interaction, Display, Interface, Psychological risk and Privacy risk. And 3 endogenous variables – Perceived Usefulness, Perceived Ease of use and Intention to use.

The fit indices of overall research model is listed on the table 8. Chi-square=528.224 (d.f.=226, P=0.000), GFI=0.911, AGFI=0.882, RMR=0.082, NFI=0.874, CFI=0.923 and RMSEA=0.056 that few indices was less significant, but considering the overall fitness of indices, model seems enough to analyze.

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. Details on the figure 7.

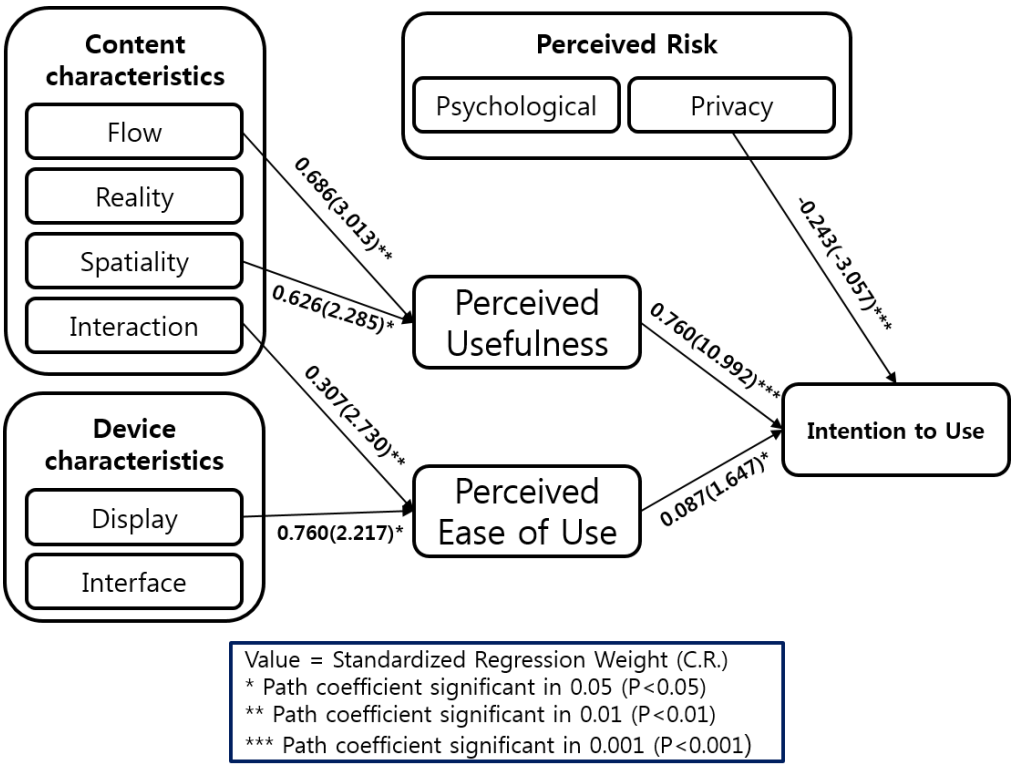

Figure 7. Path coefficient of research model

4.3.2 Content characteristics hypotheses verification

There were 4 content characteristics of realistic content, which were Flow, Reality, Spatiality and Interaction. Hypotheses were set as these characteristics of realistic content would have significant influence to the Perceived Usefulness and Perceived Ease of use.

The result of analysis showed that neither of factors had influence to Perceived usefulness and perceived ease of use both. Flow and Spatiality had significant influence to Perceived Usefulness but not in the Perceived ease of use. Interaction had significant influence to Perceived Ease of use but not in the Perceived usefulness. However, Reality hadn't any influences to both of perceived usefulness and perceived ease of use.

Table 9. Hypotheses verification of Content characteristics

Hypothesis & Path		Standardized Path coefficient	P-value	Result
H1	Flow → Perceived Usefulness	0.686	0.001**	Accept
H2	Flow → Perceived Ease of Use	-0.102	0.274	Reject
H3	Reality → Perceived Usefulness	-0.618	0.051	Reject
H4	Reality → Perceived Ease of Use	0.183	0.246	Reject
H5	Spatiality → Perceived Usefulness	0.626	0.011*	Accept
H6	Spatiality → Perceived Ease of Use	-0.118	0.287	Reject

H7	Interaction → Perceived Usefulness	0.097	0.205	Reject
H8	Interaction → Perceived Ease of Use	0.307	0.003**	Accept

4.3.3 Device characteristics hypotheses verification

Display and Interface were selected as the important factors of realistic content' s device perspective. Hypotheses of device characteristics were these factors would influence the perceived usefulness and perceived ease of use of realistic content s ignificantly.

But, only Display had significant influence to Perceived Ease of use. Interface had no influence to both of perceived usefulness and perceived ease of use.

Table 10. Hypotheses verification of Device characteristics

Hypothesis & Path		Standardized Path coefficient	P-value	Result
H9	Display → Perceived Usefulness	-1.146	0.170	Reject
H10	Display → Perceived Ease of Use	0.760	0.013*	Accept
H11	Interface → Perceived Usefulness	1.499	0.114	Reject
H12	Interface → Perceived Ease of Use	-0.215	0.248	Reject

4.3.4 Perceived risks hypotheses verification

From the preceding researches, Financial risk, Psychological risk and Privacy ri sk were estimated as the most influential risks of realistic content. So, hypotheses

of perceived risks were they would influence the perceived usefulness and intenti on to use the realistic content significantly.

However, Financial risk was erased in the research model after the check of in ternal consistency. So, the analysis was done with Psychological risk and Privacy risk. Both of risk factors hadn't any influence to perceived usefulness of the realis tic content, but Privacy risk showed the significant influence to intention to use th e realistic content negatively.

Table 11. Hypotheses verification of Perceived risks

Hypothesis & Path		Standardized Path coefficient	P-value	Result
H13	Financial risk → Perceived Usefulness	-	-	-
H14	Financial risk → Intention to Use	-	-	-
H15	Psychological risk → Perceived Usefulness	0.046	0.285	Reject
H16	Psychological risk → Intention to Use	0.031	0.352	Reject
H17	Privacy risk → Perceived Usefulness	0.119	0.063	Reject
H18	Privacy risk → Intention to Use	-0.243	0.001**	Accept

4.3.5 Technology acceptance model hypotheses verification

Perceived Usefulness, Perceived Ease of use and Intention to user were taken f rom David (1989)'s technology acceptance model. In addition, the directivity of ea ch factors was also referred from technology acceptance model.

But the connection from Perceived ease of use to Perceived usefulness was excluded since it influenced the validity of overall model negatively. So, the links from perceived usefulness to intention to use (PU → IU) and from perceived ease of use to intention to use (PEU → IU) were left to be analyzed.

The result showed that both of perceived usefulness and perceived ease of use had significant influence to the intention to use the realistic content. But the size of influence was different between both factor that perceived ease of use had only 0.087 standardized regression weights while perceived usefulness had 0.760 standardized regression weights.

Table 12. Hypotheses verification of TAM

Hypothesis & Path		Standardized Path coefficient	P-value	Result
H19	Perceived Ease of use → Perceived Usefulness	-	-	-
H20	Perceived Ease of use → Intention to use	0.087	0.049*	Accept
H21	Perceived Usefulness → Intention to use	0.760	***	Accept

In conclusion, H1, H5, H8 from content characteristics were accepted, H10 from device characteristics was accepted, H18 from perceived risks was accepted and H20, H21 from technology acceptance model were accepted based on the result of analysis.

Chapter 5. Conclusions

5.1 Summary of the research

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

Even though the realistic content is considered as the next-generation digital co ntent technology from many institutions and firms, there have been only limited re searches 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 tec hnology is useful and ease to use, the market will grow. So to the realistic conte nt technology. If we can analyze why users want realistic content and what are th e expectations that users feel about the realistic content, it will be very easy to a dopt them in the market. Which cause the growth of digital content industry.

There were some researchers who tried to analyze the user acceptance of virtu al reality or augmented reality technology. But they were focusing more on the di gital devices that allow realistic content to operate.

However, digital content has different characteristics then digital devices. It is e xperienced 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 perspective were integrated with te chnology acceptance model.

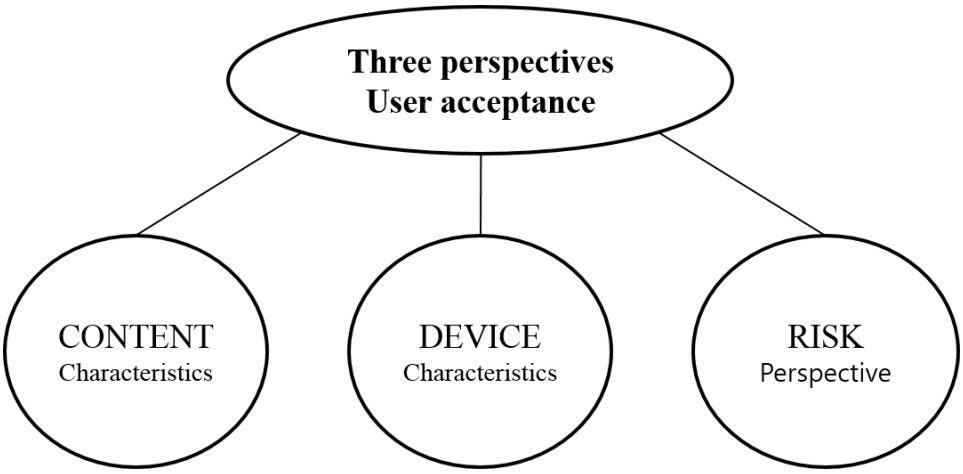

Figure 8. Three perspectives approach to the user acceptance

First, the characteristics of content perspective is composed of Flow, Reality, S patiality and Interaction factors. Second, the characteristics of device perspective w hich are the Display and Interface system that development of device would influe nce a lot to the user acceptance. Third, the perceived risks perspective. We know by experiences that emergence of new digital content didn't always give positive e ffects to the society. It has been turned out that many side effects, such as addicti

on, dementia and fraud, can be caused by diffusion of new media and contents. So based on the literature reviews, the financial risk, psychological risk and privacy risk were chosen to involve 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.

5.2 Research implications & limitations

5.2.1 Theoretical implications

First, this research is the first attempt to analyze the user acceptance of realistic content technology academically. So results of this research would provide major factors of the realistic content technology to the future realistic content researchers.

Second, flow theory (Csikszentmihalyi, 1990) is proven to be the effective theory to analyze the user acceptance of next-generation content industry. Flow has the highest influence among all the factors that offer a clue of intention to use the next-generation content. For example, in the Game industry, giving a feeling of fun to the users is the most important consideration, and Flow shows the direct influence to the fun from the many previous researches. So, it would be important for researchers to include Flow in user acceptance research of future digital content.

Third, from the empirical results, this research showed that perceived risks have clear negative influence to user acceptance of next-generation content. And among the all risks, Privacy risk is considered as the most threatening risk that hesitate users to use next-generation content.

Lastly, three categories of factors with content, device and perceived risk perspectives approach to analyze the technology acceptance model showed significant reliability and validity. Meaning that such approach to design the user acceptance model proved to be significant as a theory.

5.2.2 Practical implications

5.2.2.1 Users

Result of analysis showed that users think realistic content would be useful when it can provide optimal experiences that users want to experience virtually or spatial feelings and experiences make users to feel like they're located in different places.

Moreover, Users believe new display devices like HMD (Head-mounted-display) will provide easier environment to use the realistic content. This implies that display device diffusion will provide easy accessibility to the realistic contents. And such a easy accessibility is the key to diffuse the next-generation digital content in the industry.

Users also believe if the realistic content provide interactive functions that allow the communications between users to users, the difficulty of adopting realistic content would be decreased.

On the contrary, how graphically realistic content look isn't important issue for users, even though realistic content could provide the most similar environment of the real world. And users didn't want to adopt the new interface system since they believe current interface system (e.g. Touch in smartphone) has enough functionality to use realistic contents.

Such results imply that it is not important how the image is real as long as users can experience the overall immersive and optimal environment. Users want to

have the overall optimal experiences from the realistic content, not the detail sen se of reality.

Meanwhile, users think that invasion of privacy is the most harmful risk that r ealistic content might bring to them. They believe realistic content could expose t he personal information and personal life easily. On the other hand, many experts worried the psychological risks of digital content, such as content addiction or dig ital dementia, user didn't seriously recognize the danger of psychological risks that realistic content might bring to them. So it would be important to enlighten the users that they could face the psychological danger from realistic content use, eve n though this research showed users didn't consider psychological risk dangerously.

5.2.2.2 Industry

Digital content companies who are trying to make new businesses in the realist ic contents industry, they have to consider the most about what do users want to experience from their contents and services. So rather try to make content looks more likely to real world, they have to consider the user experiences like visiting unique places or making new digital communication with other users.

On the other hand, the digital device companies should consider to develop ne w display systems that could operate realistic content easily. Glasses and head-mou nted types of display (HMD) devices are highly demanded in the market as the re alistic content industry grows.

Meanwhile, companies have to be ready to secure the user's personal informat

ion from the possible invasions. Report from the IITP (2015) mentioned that realis tic content already shows the possibility of privacy invasion looks very similar to invasion from web & internet contents. For example, Open-sim (Open simulator) i s the open source virtual reality platform that already used in more than 300 virtu al reality contents, but current networks in Open-sim don't encrypt the information properly, just like the early version of internet. So, it is highly demanded to secu re the information from realistic contents from the early stage of diffusion by adding security functions like identification, content security and network packet encrypt s ystem.

As example of Open-sim has shown, the realistic content technology can some how invade the privacy of users, so well-constructed security system is necessary to keep business in the industry.

5.2.2.3 Policy

From the condition that realistic content is now a promising next-generation di gital industry, to invigorate the realistic content, policy makers have to promote no t only the major digital content businesses (e.g. Digital game, Entertainment), but also the business fields of the health, education, culture, travel, etc to satisfy the diverse desire of users.

To achieve such goals, diversifying the content experiences and diffusing new display devices are highly recommended from the result of this research. So polic y makers have to consider supporting various digital content developer and organiz

ing the realistic content's industrial ecosystem, since there are many start-up comp anies try to make new businesses in the realistic content industry.

In addition, this research showed that the majority survey participants who had high intention to user realistic content were young users. So realistic content will be diffused early to the young users first, and this implies that the realistic conte nt could intensify the digital divide, like a smartphone-literate, that information mi nority group could be increased. So, from the point of public utility service and o verall social welfare, government needs to supervise the additional digital literacy phenomenon caused by realistic content diffusion.

Also, side effects of realistic content invigoration have to be considered serious ly. This research showed the privacy risk is the most apprehensive risk from the users that hinders the user acceptance of realistic content. So, it is urgent to devel op the technology that secure the users in overall content diffusion processes, like search, maintenance, and distribution of realistic content. Therefore, government h as to push the policies not only the R&D of realistic content technology itself, bu t also the technologies and platforms that offer the safe distributions and managem ents of the realistic content.

5.2.3 Limitations of the research

From this research, several limitations were found in the empirical analysis and prediction of the next-generation content industry.

First, the survey was conducted only for the users in South Korea that the results of analysis would be more reliable if the survey was conducted globally.

Second, since the realistic content is the new technology and there are limited users who already had experiences of using it, the result was based on user's conception that might change if they had a real experiences. So, factors that didn't seem significant in this research would be meaningful after realistic contents are diffused widely to the users.

Third, factors analyzed from user acceptance would provide what is the major invigoration features of the realistic content, but limited view of how the factors would contribute to invigorate the digital content industry. So it would be difficult to discuss the stream of the next-generation content industry's growth.

5.3 Proposal of future research direction

Several future research directions are proposed based on the results of this research. First, study of next-generation digital content industrial ecosystem analysis could be conducted based on the significant factors in this research. Prospect of next-generation industry will be more reliable if the ecosystem of industry can be suggested. Like the well-used digital ecosystem structure, CPND – Content, Platform, Network, Device, New ecosystem structure can be suggested since the next-generation digital content industry will be a lot different than present.

Second, comparison analysis from difference in users' natures can be made. For example, compare the difference between realistic content experienced and non-experi enced users to show how experiences affect the acceptance of next-generation digital content. Comparison research between innovative and non-innovative users also can be conducted, since the user's final behavior toward then technology adoption is different by their motivations.

Finally, different theories can be adopted in the research of user acceptance, like behavioral economic theory, there are several well defined theories that can explain the users and consumers intention to use new technology. So it would be wise to try different theories perspective of the research and show the preciseness of the result of this research.

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Appendix : Survey sheet

1. 서문

안녕하십니까? 바쁘신 가운데에도 본 설문에 응답해 주셔서 감사의 말씀을 드립니다.

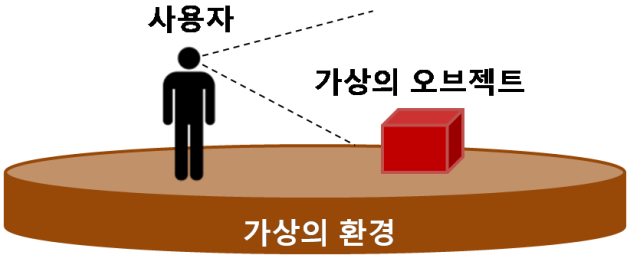
현재 전 세계적으로 웨어러블(eg. 스마트 시계)과 같은 새로운 디지털 디바이스가 시장에 그 비중을 점차 넓혀가는 가운데 이러한 새로운 디바이스의 확산에 발맞추어 **실감형 콘텐츠(Realistic contents)라는** 새로운 디지털 콘텐츠 분야가 자라나고 있습니다.

실감형 콘텐츠는 우리가 한번쯤 들어보았던 **가상현실(Virtual reality), 증강현실(Augmented Reality), 홀로그램(Hologram)**과 같은 3D형태의 미디어를 실제 세상이나 가상 세상에 구현하여 이용자들이 사용할 수 있는 기술을 보유한 콘텐츠를 의미합니다.

(1) 가상현실 콘텐츠

가상현실 콘텐츠는 컴퓨터나 각종 디지털 기기를 이용하여 인공적인 기술로 만들어낸 실제와 유사하지만 **실제가 아닌 가상의 환경에서 가상의 것들 체험**할 수 있는 콘텐츠를 의미합니다.

<가상현실>



이용자가 가상현실에서 보고, 듣고, 느끼고, 경험할 수 있는 모든 것은 현실에 매우 유사한 가상적인 장소, 상황, 사물 등이며 그것을 통해 가상적인 환경에 위치해 있다

고 느끼게 합니다.

<가상현실 콘텐츠>

가상현실 콘텐츠의 대표적인 예시로써 위 그림과 같이

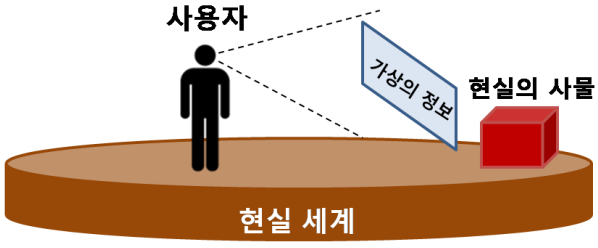
- **가상 시뮬레이션 교육**
- **현실과 유사하게 제작된 가상 환경의 체험 (여행, 레져 등)**

등 을 할 수 있는 콘텐츠가 존재합니다.

(2) 증강현실 콘텐츠

증강현실이란 **현실**에 존재하는 환경, 상황, 사물에 **가상**의 정보를 합성하여 원래 현실에 존재하는 듯이 보이게 하는 콘텐츠를 의미합니다.

<증강현실>



따라서 증강현실 콘텐츠는 모든 존재하는 현실의 장소, 상황, 사람, 사물들에서 이용자가 원하는 정보나 사물들에 대한 구체적인 이미지를 제공합니다.

<증강현실 콘텐츠>

이런 증강현실은

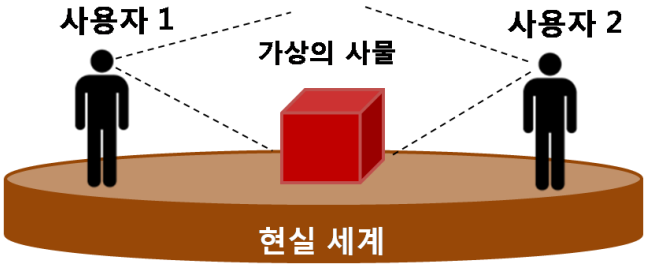
- 구글 글래스(Google glasses)와 같이 현실의 빈 공간에서 모니터 화면을 볼 수 있는 콘텐츠
- 자동차에서 운전자 앞의 유리를 통해 계기판을 확인할 수 있는 것과 같은 콘텐츠
- 현실의 사물을 인식하여 그것에 대한 정보를 찾아주는 콘텐츠

등이 존재합니다.

(3) 홀로그램

홀로그램은 현실의 환경에서 가상의 사물을 보여주는 것으로 개념자체는 증강현실과 유사하지만, 홀로그램으로 생겨난 **가상의 사물은 현실에 존재하는 모든 이용자들이** 특수한 디지털 장비의 소유 없이도 **같이 보고 들을 수 있다는 점**입니다.

<홀로그램>



특히 일반적인 컴퓨터 모니터와 2D 그래픽의 출력장치와는 **다르게 홀로그램은 3D의 입체적 정보를 현실에 보여줌**으로써 마치 해당 콘텐츠가 현실에 실제 존재하는 것과 같은 착각을 줄 수 있습니다.



<홀로그램 콘텐츠>

이런 홀로그램의 예시로는

- 최근 전시관등에서 사용하는 입체적 형태의 화면과 판매 제품 홍보 콘텐츠

- 컨퍼런스 및 회의에서 삼차원(입체적) 형태의 프레젠테이션을 보여주는 형태의 콘텐츠

등 이 존재합니다.

본 설문조사는 **"실감형 콘텐츠가 이용자 입장에서 어떻게 수용될 것인지 그리고 실감형 콘텐츠가 가지고 있는 위험요인은 무엇인지"**를 분석, 연구하여 향후 차세대 콘텐츠 산업 활성화를 위해 기여할 예정입니다.

이에 대해 설문해주시는 귀하의 정확한 의견을 구하고자 합니다. 차후 새로운 콘텐츠 산업 발전을 위해 정확한 응답을 부탁드리겠습니다.

설문에 응하여 주신 것에 대해 다시한번 감사의 말씀을 드립니다.

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2. 질문항

A. 다음은 실감형 콘텐츠의 몰입성(Flow)에 관한 설문입니다. 각 항목에 대해 귀하의 견해와 가장 일치하는 번호에 체크를 해주시기 바랍니다. (H1,H2)

1. 나는 실감형 콘텐츠가 기존의 디지털 콘텐츠 보다 깊은 몰입감을 줄 것이라 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠를 사용하는데 있어서 느껴지는 몰입감이 콘텐츠를 지속적으로 사용하게 만드는 주요 원인이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠에 더 쉽게 몰입한다는 감각을 느낄 수 있을 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

B. 다음은 실감형 콘텐츠가 가지고 있는 현실성(Reality), 공간성(Spatiality), 상호작용성(Interactivity)에 관한 설문입니다. 각 항목에 관하여 귀하의 견해와 가장 일치하는 번호에 체크해 주십시오. (H3 ~ H8)

(현실성 - Reality)
1. 나는 실감형 콘텐츠가 매우 사실적 느낌의 사용 경험을 제공할 것으로 기대한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 현실적으로 느껴지는 콘텐츠라는 것이 오감(시각, 청각, 후각 등)을 만족하는 콘텐츠라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그

렇다

3. 나는 실감형 콘텐츠가 현실적일수록 콘텐츠를 쉽고 간단하게 사용할 수 있을 것 같다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

(공간성 - Spatiality)
1. 나는 실감형 콘텐츠가 새로운 공간에 위치한 것과 같은 감각을 제공할 것으로 기대한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠가 현실의 공간을 더 폭 넓게 활용할 수 있을 것 같다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠로부터 받을 수 있는 현실적 공간에 위치한다는 느낌 덕분에 콘텐츠 사용방법을 쉽게 익힐 수 있을 것이라 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

(상호작용성 - Interactivity)
1. 나는 실감형 콘텐츠의 사용이 다른 사용자와 정보와 메시지를 주고 받는데 있어서 더 개방적이고 편한 환경을 제공할 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠을 통해 다른 사람들과 좀 더 다양하고 많은 경험을 공유할 수 있을 것이라 생각한다..
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠가 개인이 원하는 정보를 요청하고 습득하기에 편리하다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

C. 다음은 실감형 콘텐츠을 사용하기 위한 디지털 디바이스(Digital device)의 디스플레이(Display)와 인터페이스(Interface)에 관한 설문입니다. 각 항목에 관하여 귀하의 견해와 일치하는 번호에 체크해 주십시오. (H9 ~ H12)

(디스플레이 - Display)
1. 나는 스마트폰과 같은 기존의 평면형 화면으로도 실감형 콘텐츠를 활용하기에 충분하다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠를 사용하기 위해서는 안경형 장비(eg. 구글 글래스)와 같은 새로운 형식의 디스플레이 장비가 필요하다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 사람들이 새로운 디스플레이를 탑재한 디바이스를 많이 사용해야 실감형 콘텐츠도 많이 사용 될 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

4. 나는 안경형 장비와 같은 새로운 디스플레이 장비에 적응하는 것이 쉬울 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

(인터페이스 - Interface)

1. 나는 컴퓨터 마우스 형태의 클릭(Click)이나 스마트폰의 터치(Touch)와 같은 기존의 인터페이스가 아닌 새로운 인터페이스 장비가 존재해야 실감형 콘텐츠를 유용하게 사용할 수 있다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 착용형 장비(eg. 웨어러블)가 새로운 형태의 콘텐츠 조작 방법을 제공해줄 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠의 인터페이스는 삼차원적인 움직임을 인식할 수 있어야 한다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

4. 나는 삼차원 형태의 움직임을 인식 할 수 있는 새로운 인터페이스가 실감형 콘텐츠의 사용을 쉽게 만들 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

D. 다음은 실감형 콘텐츠의 활성화로 발생할 수 있는 금전/경제적 위험(Financial risk), 심리적인 위험(Psychological risk), 사생활 침해의 위험(Privacy risk)에 관한 설문입니다. 각 항목에 관하여 귀하의 견해와 일치하는 번호에 체크해 주십시오. (H13 ~ H18)

(금전/경제적 위험 - Financial risk)
1. 나는 실감형 콘텐츠가 기존의 콘텐츠의 이용료보다 다소 높을 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠 사용을 통해 바이러스 감염, 보이스 피싱과 같은 디지털 사기 행위에 피해를 입을 것 같다.

① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠를 사용하기 위해서 새로운 디지털 디바이스를 구매해야 할 것 같다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

(심리적인 위험 - Psychological risk)
1. 나는 실감형 콘텐츠를 사용함으로써 스마트폰 중독과 같은 새로운 디지털 중독 현상에 빠져들 것 같다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠를 사용함으로써 디지털 치매, 의존증과 같은 정신적 병리현상에 걸릴 수 있다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠로 유해 콘텐츠(도박, 자살, 음란물 등)에 더 많이 노출 될 것이라 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

(사생활 침해의 위험 - Privacy risk)
1. 나는 실감형 콘텐츠 사용이 내 개인정보를 쉽게 유출 시킬 것 같다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠를 통해 나의 사생활이 쉽게 침범 당할 우려가 있다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠 사용자와 비사용자간의 커뮤니케이션 단절 및 소외현상이 일어날 것으로 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

E. 다음은 실감형 콘텐츠에 대한 지각된 사용 유용성(Perceived Usefulness), 지각된 사용 용이성(Perceived Ease of use)에 관한 설문입니다. 각 항목에 관하여 귀하의 견해와 일치하는 번호에 체크해 주십시오. (H19 ~H21)

(지각된 사용 유용성 - Perceived Usefulness)
1. 실감형 콘텐츠 사용을 통해 느낄 수 있는 새로운 감각과 활용 범위의 증가는 콘텐츠를 유용하게 사용할 수 있게 해준다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 실감형 콘텐츠 이용을 위해 개발된 새로운 형태의 디바이스(eg. 웨어러블)들은 콘텐츠의 실용성을 높여줄 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 실감형 콘텐츠의 사용이 불러 일으킬 수 있는 여러 위험과 문제점들은 콘텐츠의 유용성을 감소시킬 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

4. 실감형 콘텐츠를 통해서 얻고자 하는 사용목적을 달성하기 위해서는 콘텐츠의 사용방법이 쉬워야 한다고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

(지각된 사용 용이성 - Perceived ease of use)

1. 실감형 콘텐츠는 기존의 콘텐츠에 비하여 사용하기 쉬울 것으로 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 실감형 콘텐츠가 보유하고 있는 특성들은 콘텐츠를 사용하기 쉽게 만들 것으로 생각한다. (특성 : 몰입성, 현실성, 공간성, 상호작용성)
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 실감형 콘텐츠를 이용할 수 있게 하는 새로운 디바이스의 사용방법은 배우기 쉬울 것이라고 생각한다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

F. 다음은 실감형 콘텐츠의 대한 콘텐츠 사용의도(Intention to use realistic contents)와 실제 사용의사(Actual use)에 관한 설문조사입니다. 각 항목에 관하여 귀하의 견해와 일치하는 번호에 체크해 주십시오.

(콘텐츠 사용의도 - Intention to use)
1. 나는 실감형 콘텐츠가 유용하다고 생각되면 사용해볼 의사가 있다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

2. 나는 실감형 콘텐츠의 사용방법이 쉽다면 사용해 볼 의사가 있다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

3. 나는 실감형 콘텐츠가 여러 위험성과 문제점을 내포하고 있더라도 사용해볼 의사가 있다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

4. 나는 실감형 콘텐츠를 실제 사용해볼 것이다.
① 매우 그렇지 않다 ② 대체로 그렇지 않다 ③ 보통 ④ 대체로 그렇다 ⑤ 매우 그렇다

<기초 통계 질문항>
1. 귀하의 성별은?
① 남 ② 녀
2. 귀하의 연령은?
① 만 20세 미만 ② 만 20~29세 ③ 만 30~39세 ④ 만 40~49세
3. 귀하의 최종 교육 정도는?
① 고졸 이하 ② 전문대 재학 또는 졸업 ③ 대학 재학 또는 졸업 ④ 대학원 재학 또는 졸업 이상 ⑤ 기타
4. 귀하가 제일 자주 사용하는 디지털 콘텐츠 분야는?
① 영화 ② 음악 ③ 게임 ④ 출판(e-book) ⑥ 교육(e-learning) ⑦ 방송 ⑧ 캐릭터/애니메이션 ⑨ 지식정보(포탈, 검색)
5. 귀하의 디지털 콘텐츠 사용 년수는?
① 1년 미만 ② 1~3년 미만 ③ 3~6년 미만 ④ 6~9년 미만 ⑤ 9년 이상
6. 귀하의 하루 평균 디지털 콘텐츠 사용 시간은?
① 15분 미만 ② 15분~30분 미만 ③ 30분~1시간 미만 ④ 1시간~2시간 미만 ⑤ 2시간 이상
7. 귀하는 얼마나 자주 새로운 디지털 콘텐츠를 찾아봅니까?
① 거의 찾아보지 않음 ② 가끔 찾아 봄 ③ 자주 찾아 봄 ④ 매우 자주 찾아 봄
8. 귀하의 디지털 콘텐츠 활용 능력 정도는?
① 아주 못함 ② 조금 못함 ③ 보통 ④ 조금 잘함 ⑤ 아주 잘함

Abstract (Korean)

실감형 콘텐츠(Realistic Content)는 웨어러블 디바이스 확산으로 차세대 디지털 콘텐츠 산업을 열 수 있는 핵심 기술로 평가 받고 있다. 이러한 실감형 콘텐츠는 가상 현실 (VR), 증강 현실 (AR), 홀로그램 기술로 구성되어 있으며 이 기술의 산업적, 시장적 가치는 시간이 흐를수록 기하급수적으로 증가하고 있는 추세이다. 따라서 실감형 콘텐츠가 실제 이용자들에게 수용될 요인이 무엇인지 알아보는 것이 중요한데, 아직까지 관련 연구가 부족한 실정이다.

분석의 신뢰성과 타당성을 올리고 올바른 분석결과를 만들어내기 위하여 콘텐츠 속성, 디바이스 속성, 인지된 위험이라는 세가지 측면의 요인들을 선정하여 기술수용모델(TAM)에 융합하여 이용자 수용요인을 분석해 보았다.

데이터 수집을 위해 한국에 거주하는 디지털 콘텐츠 이용자들을 대상으로 설문이 실시되었다 (N=429). 설문은 실감형 콘텐츠의 존재를 알고 있는 이용자들을 대상으로 실시되었으며, 실감형 콘텐츠를 실제 사용해본 경험이 있는지 여부는 고려되지 않았다.

구조방정식 모델을 통해 분석을 실시했으며, 분석 결과 몰입성과 공간성은 실감형 콘텐츠의 인지된 유용성에 유의미한 영향력을 미쳤으며, 상호작용성과 디스플레이 속성은 실감형 콘텐츠의 인지된 사용 용이성에 유의미한 영향력을 미쳤다. 인지된 유용성과 사용 용이성 중 실감형 콘텐츠 사용의사에 더 큰 영향력을 미치는 것은 인지된 유용성이었다. 반면 사생활 침해 위험은 실

감형 콘텐츠가 불러올 수 있는 가장 위험한 요인으로 고려되었다.

분석 결과를 토대로 차세대 콘텐츠 활성화를 위한 방안을 예측해보자면 다음과 같다. 첫째, 실감형 콘텐츠는 이용자들이 요구하는 가장 적절한 사용 경험을 제공할 수 있도록 진흥되어야 한다. 둘째, 실감형 콘텐츠를 쉽게 사용하기 위해서는 새로운 디스플레이 시스템을 탑재한 디바이스의 시장 확산이 필요하다. 셋째, 실감형 콘텐츠가 불어올 수 있는 사생활 침해와 같은 위협들을 사전에 예방하기 위한 규제가 필요하다.

주요어 : 실감형 콘텐츠, 기술수용모델, 구조방정식, 몰입 이론, 인지된 위험 이론, 미래 연구
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