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# A Study on Interaction Factors Influencing Use Intention of Interactive Video Service: Focusing on Media Synchronicity

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## ABSTRACT

Interactive Video Services (IVS) are a new type of media service that enables users to cast and watch videos as well as exchange messages with others. Three factors that influence IVS usage, which are technology factor, communication factor, and contents factor, were derived from the theory of interactivity. Dimensions of each factor were identified through qualitative study. We constructed a structural model of use intentions of IVS, followed by a survey conducted to statistically verify the structural model. The model reflects one of the key traits of IVS, media synchronicity, as a moderating variable. Our findings presented that each factor has a significant effect on use intentions of IVS and that the degree of effect is moderated by media synchronicity according to the differences between real-time and non-real-time IVS.

## Keywords

Interactive Video Service (IVS), media synchronicity, interactivity, use intention

## INTRODUCTION

Video media services are dramatically developing through the Internet. YouTube accounted over 3 billion videos viewed online in the U.S. in March 2008.

There are many reasons for such diffusion in video media services, and one of the main reasons is the successful introduction of ‘interactivity’ to the broadcasting and watching of contents. The television only has one-way information transmission while many Internet video media services allow users to take a role in the transmission process. Also, the Internet encourages users to participate in the process by providing various features that enable them to interact with other users.

This study defines this kind of service as ‘Interactive Video Services (IVS)’. As mentioned above, video

contents services of different Internet portal sites, video communities, video UCC (User Created Contents) services, and new types of TV broadcasting services like IPTV (Internet Protocol Television) are examples of IVS. IVS allow users to interact with others as well as directly participate in the broadcasting and watching process.

This trait of IVS – enhanced interactivity – influences users’ behaviors. Main use intentions of TV users had been merely ‘watching’. However, not only can users in an IVS environment passively watch video contents but also cast and communicate with others. This means usage behavior within the IVS environment is far more diverse as users cast, watch, and send messages.

IVS are divided into two categories; real-time IVS, with simultaneous casting and watching conditions, and non-real-time IVS, which has separated casting and watching conditions. IVS can be explained by the theoretical basis of ‘media synchronicity’, which refers to the extent to which the capabilities of a medium allow individuals to perform the same activity at the same time (Dennis and Valacich, 1999, Dennis et al., 2008). This concept is characterized as an influential factor in using a system (McMillan and Downes, 2000). Therefore, we tried to derive interactivity factors that influence use intentions of a system and examined the influences of those factors according to the media synchronicity of the system.

## RELATED WORKS

### Interactivity

IVS are a new media that emphasize communicative features of a medium. Interactivity is one of the substantial concepts that lead the change of concept of communication through media (Kiousis, 2002).

Interactivity is generally classified into the categories of ‘human-to-human’, ‘human-to-computer’, and ‘human-to-contents’ interaction according to the subjects of it

(Jensen, 1998, McMillan, 2005). Kioussis (2002) tried to integrate viewpoints of extant research that investigated the concept of interactivity. The study took various dimensions of interaction explained in former research into consideration and finally drew out three dimensions of interaction: 'structure of technology', 'communication context', and 'user perception'.

Structure of technology refers to the physical and technical properties of a system. It contains factors which can be found in human-to-computer interaction. It indicates how much stability and usability are provided in a computing environment. The term used to indicate this sort of interactivity factor is the 'technology factor'.

Communication context involves various aspects of communication during the process of using a system. That is, it is also observable in human-to-human interaction. Wherever interpersonal communication takes place, this kind of communication is generated. The term that is used to indicate this sort of interactivity factor is the 'communication factor'.

User perception contains factors which need to be considered in the process of interaction between user and contents such as cognitive valuation. It appears in human-to-contents interaction. It also means how users manage or consume their contents. The term used to indicate this sort of interactivity factor is the 'contents factor'.

This study examined the use intentions of IVS based on this theoretical framework. As IVS are one of the newest modes of media being introduced, there is insufficient amount of research on how users use these services. In this context, exploratory research is necessary to diagnose how these three factors appear in the IVS environment.

### Media Synchronicity

Prior studies on media use emphasize the importance of the concept of 'media synchronicity' (Dennis and Valacich, 1999). By providing high synchronicity, users can interact together at the same time (Dennis and Valacich, 1999, Dennis et al., 1998). Those studies concentrate on the influence of media synchronicity on individuals' communication processes and media use.

IVS are classified into real-time IVS (R-IVS) and non-real-time IVS (N-IVS) according to media synchronicity. In R-IVS, casting, watching, and communication occur simultaneously. R-IVS with high media synchronicity offers streaming service, in which concurrent casting, watching, and messaging are found.

On the contrary, N-IVS has a sequential process of casting, watching, and communication. N-IVS with low media synchronicity offers uploading service, in which sequential transmission, watching and messaging are found. A user can watch video contents only after another user uploads them, and he or she can communicate with the uploader via short comments or messages after watching the contents.

As already mentioned, media synchronicity differentiates characteristics of interactivity in IVS. It has an impact on use intentions of the service. Considering this aspect, this study observes the moderating effect caused by media synchronicity in analyzing use intentions of IVS.

## RESEARCH MODEL AND HYPOTHESES

### Research Model

The research model of use intentions of IVS is shown:

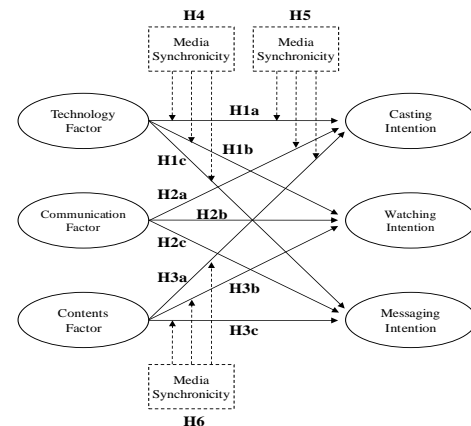


Figure 1. Research Model

### Research Hypotheses

Schneiderman (1987) emphasized the technology factor as one of the key factors in the success of an interactive system. Steuer (1992) mentions that the technology factor determines the level of interactivity in a certain system. Thus, hypotheses were established as follows.

H1: The Technology Factor of IVS has an impact on use intentions of IVS.

H1a: The Technology Factor of IVS has an impact on Casting Intentions.

H1b: The Technology Factor of IVS has an impact on Watching Intentions.

H1c: The Technology Factor of IVS has an impact on Messaging Intentions.

Many researchers who were concerned about interactivity mentioned the importance of the communication factor (Wiener, 1948, Shannon and Weaver, 1949). Therefore, the communication factor of IVS has direct influence on use intentions of IVS. Hypotheses regarding the communication factor were established as below.

H2: The Communication Factor of IVS has an impact on use intentions of IVS.

H2a: The Communication Factor of IVS has an impact on Casting Intentions.

H2b: The Communication Factor of IVS has an impact on Watching Intentions.

H2c: The Communication Factor of IVS has an impact on Messaging Intentions.

Another point of view on a system through interactivity is related to the aspect of users' perception (McMillan and Downes, 2000, Wu, 1999). Because traits of contents in certain IVS have a strong effect on users' perception, the contents factors of IVS have direct influence on use intentions of IVS. Hypotheses about the contents factor were established as below.

H3: The Contents Factor of IVS has an impact on use intentions of IVS.

H3a: The Contents Factor of IVS has an impact on Casting Intentions.

H3b: The Contents Factor of IVS has an impact on Watching Intentions.

H3c: The Contents Factor of IVS has an impact on Messaging intentions.

The power of these impacts can be differentiated by media synchronicity.

The technology factor means physical features provided by IVS such as access speed and video quality. It is usually related to the interaction between a user and the system. Thus, the technology factor will have more impact on use intentions in N-IVS than in R-IVS because human-to-computer interaction has more importance in N-IVS. Hypotheses about this idea can be established.

H4: The Technology Factor has a stronger impact on use intentions of IVS in N-IVS than in R-IVS.

H4a: The Technology Factor has a stronger impact on Casting Intentions in N-IVS than in R-IVS.

H4b: The Technology Factor has a stronger impact on Watching Intentions in N-IVS than in R-IVS.

H4c: The Technology Factor has a stronger impact on Messaging Intentions in N-IVS than in R-IVS.

The communication factor is about system-mediated interaction between users. That is, human-computer-human interaction is linked to this factor. This factor is more powerful in R-IVS as aforementioned. Therefore, it is possible to conclude that the communication factor will have more impact on use intentions of IVS in R-IVS. The hypotheses are as follows.

H5: The Communication Factor has a stronger impact on use intentions of IVS in R-IVS than in N-IVS.

H5a: The Communication Factor has a stronger impact on Casting Intentions in R-IVS than in N-IVS.

H5b: The Communication Factor has a stronger impact on Watching Intentions in R-IVS than in N-IVS.

H5c: The Communication Factor has a stronger impact on Messaging Intentions in R-IVS than in N-IVS.

The contents factor includes types or characteristics of contents in IVS. Elements such as class, amount, scarcity value, and adequacy determine this factor. The main purpose of users in N-IVS is to watch video contents because immediate communication hardly occurs. The following hypotheses are derived from this point of view.

H6: The Contents Factor has a stronger impact on use intentions of IVS in N-IVS than R-IVS.

H6a: The Contents Factor has a stronger impact on Casting Intentions in N-IVS than R-IVS.

H6b: The Contents Factor has a stronger impact on Watching Intentions in N-IVS than R-IVS.

H6c: The Contents Factor has a stronger impact on Messaging Intentions in N-IVS than R-IVS.

This study is composed of two steps. First, this study reveals the dimensions of the technology, communication, and the contents factor in order to make our research model more concrete. Afterwards, an online survey was conducted to verify the effects of each factor.

## STUDY 1

To build a conceptual model of the use intentions of IVS, factors that need to be considered carefully must be identified. Interviews were held with active users of IVS.

### Participants

Actual users of IVS were recruited as the participants for the interview. Twelve participants were users of IVS for at least a month, used IVS more than three times a week, and ranked high as an active user of each service.

### Contextual Inquiry

Contextual inquiry was selected for Study 1. Circumstantial research through contextual inquiry has some advantages. An interviewee can be deeply absorbed because observation and inquiry are carried out on real usage environment, and the cause-and-effect relationship of certain behaviors can be easily observed (Beyer and Holtzblatt, 1997). Thus, contextual inquiry enables researchers to observe the influential factors of using an IVS. Also, researchers can understand an individual motivation or a cognitive strategy of a user through interviews in real usage context (McCracken, 1988).

### Data Analysis

Acquired data in Study 1 was analyzed on the basis of grounded theory. Grounded theory is an analysis methodology that makes theory about certain phenomenon using collected data as a basis (Glaser and Strauss, 1967). Grounded theory focuses on constructing a theory rather than verifying a theory (Creswell, 1998, Suddaby, 2006). Therefore, researchers focus on the facts from data rather than existing theories, with a rough outline of theoretical background.

By doing user interviews, three factors and 14 dimensions that influence the use intention of IVS were discovered. Table 2, 3, 4 show those dimensions of each factor.

Construct	Definition
Examples of interview script	
Speed	Perceived degree of access speed to a system "It takes over 6-7 hours to upload a 2-hour video clip." (P4, an office worker)
Vividness	Perceived degree of video quality "The difference of video quality is not that great, actually." (P7, an office worker)
Range	Subjective freedom of action that users perceive in a system "... well, I can handle the volume or subtitle thing even on air." (P7, a student)
Stability	Perceived safety, consistency, and regularity "The first priority is loading time. When a video lags..." (P12, an office worker)
Direction	Perceived degree of inter-directional communication supported "...chatting repeatedly, I soon made friends..." (P5, a student)
Usability	Perceived ease of use of a system "I guess more people will try if it's easier to broadcast..." (P9, a student)

**Table 1. Dimensions of Technology Factor**

Construct	Definition
Examples of interview script	
Proximity	Perceived closeness among users in a system "... watching alone is not as fun as watching together..." (P11, a university student)
Anonymity	Perceived disclosure of private information in using a system "I can often change my nick name." (P8, a graduate school student)
Reward	Perceived reward for using a system "I was ranked 222th on overall list, 384th on star point list but..." (P1, a student)
Participation	Perceived activeness of users in a system "Only about three people watch his casting." (P2, a university student)

**Table 2. Dimensions of Communication Factor**

Construct	Definition
Examples of interview script	
Scarcity	Perceived rareness of video contents in a system "Who casts the music program is something of a novelty to me." (P12, an office worker)
Variety	Perceived diversity of video contents in a system "... not good that only one contents provider serves the entire program..." (P7, an office worker)
Preference	Perceived correspondence of personal preference and video contents in a system "This is the very one that I wanted to see here." (P6, a university student)
Reputation	Perceived popularity of video contents in a system "It's important to broadcast what is likely to be popular." (P8, a university student)

**Table 3. Dimensions of Contents Factor**

**STUDY 2**

From study 1, 14 dimensions that influence use intentions of IVS, each belonging to one of pre-defined three interaction factors, were selected. In study 2, an online survey was conducted for more objective verification of the impact of each of the interaction factors on users' intentions to use IVS. Also, an examination of the differences resulted from the level of media synchronicity.

**Measurement Development and Data Collection**

Elements which have an effect on usage patterns were measured by formative indicators. Usage patterns of casting and watching were measured by reflective indicators. Questions used for the survey were established

on the basis of the interviews performed in Study 1 and were examined for validity by actual users and experts.

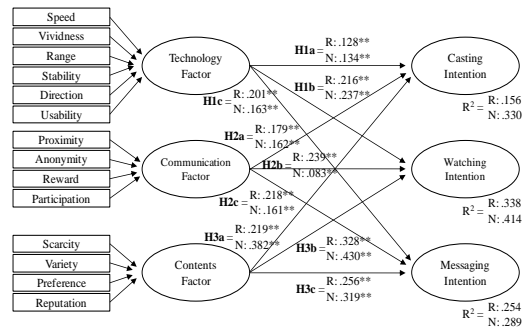
The main survey was conducted through the Internet for 2 weeks. During this period, 3,858 participants had finished the questionnaire, but 3,101 answers (1,154 users of R-IVS, 1,947 users of N-IVS) were analyzed after exclusion of answers deemed incomplete or unfaithful.

**Data Analysis**

Data collected via online survey was analyzed using PLS (Partial Least Square). PLS is an appropriate method when questionnaires used in a study are constructed with both formative and reflective measures. PLS-Graph 3.0 was chosen as the tool to analyze survey data in this study.

**Results**

In general, verification of the structural model using PLS is accomplished by checking R<sup>2</sup>, path coefficient, sign and statistical significance. Figure 2 indicates the structural model of users' use intentions of IVS. As reported in Figure 2, all R<sup>2</sup> values exceeded 0.1, which Falk and Miller (1992) indicated as a relevant value of power. It is shown that the structural model of this study is acceptable.



**Figure 2. Structural Model**

Legend: R: Real-Time IVS; N: Non-Real-Time IVS

To test the hypotheses, we examined the path coefficient between individual constructs. The effects of each factor on three use intentions as shown in Figure 2. H1, H2, H3 were all supported.

In order to analyze the effects of the three factors on use intentions of IVS according to media synchronicity, path coefficients of two groups were compared between R-IVS and N-IVS. This study adopted a formula that was offered by Keil (2000) to test H4, H5, and H6. In short, H4 is partially supported. H5 and H6 were supported (Table 5).

Hypotheses	Path	R-IVS	N-IVS	Value	Result
		Path	Path	t-stat.	
H4a	TEC → CAS	0.128	<b>0.134</b>	-5.55**	Accept
H4b	TEC → WAT	0.216	<b>0.237</b>	-20.61**	Accept
H4c	TEC → MES	<b>0.201</b>	0.163	34.25**	Reject
H5a	COM → CAS	<b>0.179</b>	0.162	16.54**	Accept

H5b	COM → WAT	<b>0.239</b>	0.083	153.73**	Accept
H5c	COM → MES	<b>0.218</b>	0.161	56.65**	Accept
H6a	CON → CAS	0.219	<b>0.382</b>	-139.79**	Accept
H6b	CON → WAT	0.328	<b>0.430</b>	-106.20**	Accept
H6c	CON → MES	0.256	<b>0.319</b>	-54.88**	Accept

**Table 4. Path Comparison**

\*\* indicates that the item is significant at the  $p < .01$  level

Legend: TEC = Technology Factor; COM = Communication Factor; CON = Contents Factor; CAS = Casting Intention; WAT = Watching Intention; MES = Messaging Intention

## DISCUSSION

We found that the technology factor consists of six dimensions. We also found that the communication factor includes four dimensions and the contents factor consists of four dimensions. According to the results of Study 1, interaction factors of IVS have significant effects on use intentions. And their effectiveness was varied among three different sorts of usage intentions.

It is shown that the technology factor has a stronger effect on messaging intentions in R-IVS unlike expected in H4c. One possible reason is that the natural habit of 'messaging' may have caused it. Communication through text messaging is more likely to occur in R-IVS rather than in N-IVS. Contrary to the contents factor, the technology factor itself has an effect on the process of interaction via text messaging. This means that a messaging system or tool that enables comments or chat has an influencing effect on messaging intentions while the contents factor does not. Thus, even if certain IVS have interesting and popular contents, it is often difficult to see that users actively interact on the contents without the support of a real-time communication system. This trend is obvious in real usage processes of IVS.

## CONCLUSION

The present work has several theoretical implications. This study has presented a theoretical framework that explains the use intentions of IVS. In addition, this study does not conclude with a mere consideration of the interactivity in IVS but with an introduction of media synchronicity to clarify factors of interactivity that can be differentiated. In other words, by integrating interactivity and media synchronicity, this study modeled and verified the differences impacts caused by R-IVS and N-IVS. This can be considered an extension of prior research on media synchronicity (Dennis et al., 2008).

This study also has practical implications. It provides guidelines that can be used by companies that construct IVS when new platforms are designed. The result points to which factors to focus on when a system that enables users to actively cast and watch is designed.

As a result, this study made clear the factors linked to the use intentions of this new mode of media known as IVS and diagnosed influential relationships between them by

understanding use intentions. This study is meaningful in its potential to become a foundation in building and designing new, enhanced types of IVS.

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