THESIS

ONLINE HIGH-DEFINITION VIDEO ADOPTION AMONG COLLEGE STUDENTS

Submitted by

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WE HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER OUR

SUPERVISION BY XU (BEVIN) SONG ENTITLED ONLINE HIGH-DEFINITION

VIDEO ADOPTION AMONG COLLEGE STUDENTS BE ACCEPTED AS

FULFILLING IN PART THE REQUIREMENTS FOR THE DEGREE OF MASTER

OF SCIENCE.

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ABSTRACT OF THESIS

ONLINE HIGH-DEFINITION VIDEO ADOPTION AMONG COLLEGE STUDENTS

As more online video products are available in high-definition format, online high-definition video (online HD video), as a specific application of HD IPTV, has become more appealing to consumers. This study applied Rogers' (2003) diffusion of innovation theory to analyze the decision-making processes used in the adoption of the new technology.

College students (n=242) completed a survey that examined the effects of technology use, media consumption, demographics (gender and family income), personality traits (innovativeness-venturesomeness and social integration), awareness-knowledge, perceptions about characteristics of online HD video, and perceptions about the benefits and risks of adoption. Dependent variables included attitudes among all respondents, satisfaction among adopters, and behavioral intent among non-adopters.

Favorable attitudes were positively related to being male, more knowledge, more time spent with the broadband Internet, more innovative and venturesome in personality, more perceptions about benefits and fewer perceptions about risks, more perceptions about the five characteristics of online HD video. Satisfaction among adopters (n=187) was positively related to being male, innovativeness-venturesomeness and social integration personality, knowledge, perceived characteristics of online HD video, and perceptions about more benefits and less risks. Findings related to behavioral intent among non-adopters were difficult to analyze due to the small number of respondents (n=55), who

were predominantly female. Behavioral intent was positively related to Rogers' notions about relative advantage, compatibility and observability, and perceptions about benefits and risks, but ***negatively*** related to a focus on social integration.

No differences based on family income were found for attitude, behavioral intent or satisfaction.

Key Terms: *online high-definition video, HD IPTV, early adopter, diffusion of innovations, individual decision-making process, perceived benefits and risks, attitude, behavioral intent, satisfaction.*

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Chapter I

INTRODUCTION

In the United States, the national conversion to the new digital television standard was almost completed by early 2008 (Seel & Dupagne, 2008). At midnight on June 12, 2009, all over–the-air TV signals in the United States began to be transmitted in digital format. Stations and networks are now providing digital TV programs in standard-definition and/or high-definition format. Consumers either need to buy a HDTV set to watch these programs, or buy a digital-to-analog converter box to watch TV if they relied on analog-only over-the-air television service (Seel & Dupagne, 2008). As the transition from analog to digital was completed, high-definition video arrived for most Americans.

Meanwhile, the broadband Internet access has increased dramatically in the United States since 2005 across all age groups, according to Pew Internet & American Life Project's *Generations Online Report in 2009* (Jones & Fox, 2009). For Americans ages 12-24, broadband access has increased by about half; for 25-64 year olds, it has about doubled; and for seniors 65 and older, broadband access has more than tripled (Jones & Fox, 2009).

As technologies continue converging and content delivery tends to go to the Internet, high-definition video programs delivered through broadband Internet connections will increasingly appeal to Americans. Watching high-definition video

online might be a rewarding option for people who spend a lot of time using computers rather than watching TV and those who don't have TV subscription or who recently stopped subscribing to cable or satellite TV services.

Online high-definition video or **online HD video** is a new convergent service that represents a synergistic combination of voice (and telephone features), data (and productivity applications), and video on a single network (Shin, 2009). People can watch high-definition videos on Hulu.com for free, while users must subscribe to watch other online shows (Stone & Stelter, 2009). Pay-per-view using micropayment software also is on the horizon.

Pew's *Generation Online Report* (Jones & Fox, 2009) shows that over half of the adult Internet population (53%) is between 18-44 years old. The "Net Generation"—young adults 18-32 years of age who grew up in the Information Age—is the largest Internet-using population, comprising 30% of all users. Teens and the Net Generation are more likely than their older counterparts to seek entertainment through online videos, online games, and virtual worlds.

Online HD video is in its initial diffusion stage, but traditional online video is well established. For example, YouTube.com was founded in 2005 and today is the world's largest user-generated-content video site and serves about 10 billion views in a single month in the United States and 20 billion globally (Helft, 2009). YouTube originally offered videos in only one format, now labeled "standard quality," although it now has three main formats—standard format, high quality and high-definition (YouTube, 2009).

If the younger generations, especially the Net Generation (18-32 years old), are more likely to watch online videos for entertainment purposes, they probably also would be likely to watch online high-definition videos for enjoyment when they use the Internet. As more and more young people get to know about online HD video, important questions involve understanding the potential factors in the innovation-decision process (Rogers, 2003) that affect people's attitudes toward online HD video, their behavioral intent to adopt it, and their satisfaction with its performance.

This research looked at the decision-making factors and attitudes toward online HD video among college students as members of the Net Generation. This research also focused on examining predictors of use as measured in the attitudes and behavioral intentions of college students who had already adopted this new technology – as well as predictors of satisfaction among student who had not adopted it.

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Chapter II

LITERATURE REVIEW

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Online high-definition video is a new technology based on traditional Internet video. This new convergent Internet service combines the features of HDTV and IPTV. This kind of convergence is the synergistic combination of voice (and telephone features), data (and productivity applications), and video on a single network (Shin, 2009).

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Technology Foundation: HDTV, IPTV and HD IPTV

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High-Definition Television

High-Definition Television (HDTV) represents the highest image and sound quality that can be transmitted over the air (Seel & Dupagne, 2008). The two common DTV (digital television) production/transmission options are HDTV, which has 16:9 aspect ratio and six-channel audio sound, and SDTV (standard-definition television), which offers lower resolution, 4:3 aspect ratio and two-channel stereo audio. Pechard, Carnec, Callet, and Barba (2006) identified three generations in HDTV's evolution. First-generation HDTV is broadcast using MPEG-2 in two definitions: 1920×1080 in interlaced mode (named 1080i) and 1280×720 in progressive mode (720p). Second-generation HDTV features the same definitions but using an MPEG-4 compression standard. Third-generation HDTV will use 1920×1080 definition in

progressive mode.

Sultan (1999) examined consumer responses to HDTV and other interim television technologies. Sultan defined the then-developing technology as an intermediate innovation based on technology that provides only some but not all the benefits of the future anticipated technology (1999). In the case of HDTV, the intermediate technology would have the wider shape but not the high resolution, or higher quality pictures but with the traditional 4:3 aspect ratio. Sultan's study (1999) illustrated that speeding up the development of HDTV was a worthwhile endeavor. Not only are consumers willing to pay more to have HDTV earlier on, but over time they are less likely to devalue HDTV compared to the existing conventional TV and the interim TV technology that only has a wide screen feature or only has superior picture quality.

Internet Protocol Television

Internet Protocol Television (IPTV)—the delivery of television channels over a broadband Internet protocol network—is another competitor for the role of content carrier, fighting it out with cable, satellite and terrestrial broadcasting (Allen, 2007). IPTV, as a convergent service of television and the Internet, is being rapidly developed around the world (Shin, 2007). IPTV has emerged as a multi-service network for carrying broadband services (Shin, 2009) and will become a common platform for systems where television and/or video signals are distributed to subscribers or viewers using a broadband connection over Internet Protocol (Shin, 2007). Broadband is defined as a 768Kbps Internet connection speed, according to the

Federal Communications Commission (Patel, 2008). Broadband Internet connections

guarantee high bandwidth needed for high-speed data and video transmission.

Broadband Internet set the stage for the development of IPTV. Market research firms

expect that global IPTV subscribers will grow to 53 million by 2009 in the United

States (Shin, 2009). In the meantime, the Internet service providers will rapidly

increase the amount of IPTV content and transport equipment (Shin, 2009). Moreover,

the widespread deployment of SDV (switched digital video) should bring cable

operators closer to the promised land of all IP transmission (IPTV) by creating an

advanced architecture for digital video delivery (Breznick, 2008).

Because IPTV is a method of distributing television content over IP that enables

a more customized and interactive user experience (Shin, 2007), IPTV grants viewers

the power of time-shifting and the ability to zap commercials. IPTV viewers can

decide the time to watch according to their own schedules, subscribe to the channels

they prefer, and pay only for the content they consume. Moreover, they are able to

bypass the commercials and watch the programs uninterrupted. Although the zapping

of commercials is of great concern to suppliers and advertisers, the interactive,

customized, and "pull" features of IPTV contribute to creation of the upcoming "my

TV" system (Marusic & Leban, 2002).

HD IPTV

HD IPTV was created as IPTV battles for audience, and content carriers are

emphasizing the richness of HD offerings (Allen, 2007). As more high-definition TV

programs and videos are produced and more people use IPTV service, it is logical to

presume that HD IPTV—the convergent service of HDTV and IPTV—will represent

a revolution in TV/video service. HD IPTV combines the features of both HDTV and

IPTV, and becomes increasingly attractive to a wide audience with the support of

advanced technologies. Supportive technologies applied to HD IPTV include:

First, broadband Internet connections allow HD video signals to be transmitted

via IP-based network after being translated to Internet protocol packets.

Second, HD IPTV features a 16:9 (wide) screen aspect ratio, higher resolution

picture images, and better sound than standard or high-quality video format.

Third, MPEG-4, which has been adopted as the standard compression format for

HD signal transmission over the Internet, allows high-quality video transmissions at

less than half the bit rate (18 to 20 Mbps) of MPEG-2 (Roush, 2006). Moreover, the

empowered MPEG-4 encoder is able to get premium quality HD down to 6Mbps or

less and deliver acceptable quality and stability for HD in as little as 4 Mbps (Allen,

2010).

Fourth, digital rights management software has been designed so any content

provider can set up and manage its own broadband HD video/TV program network

(Roush, 2006). Also, PC player programs have been used by users to pause, rewind,

or fast-forward an Internet HD program (Roush, 2006).

Online High-Definition Video: an Application of HD IPTV

Online HD video is a particular application of HD IPTV. It streams

high-definition video signals into a personal computer through the Broadband Internet.

Instead of watching HD programs on the big HDTV screen, audiences can watch online HD video on the computer or laptop. The current best examples are the high-definition videos available on Hulu.com. The video or TV signal is translated into standard Internet Protocol packets and sent to viewers via broadband Internet connections (Roush, 2006). Some video/TV suppliers have already allowed viewers to watch their programs online. For example, Time Warner, a major programming supplier, made an agreement with Comcast and the newly independent Time Warner Cable, which enables people to watch Time Warner's cable networks on the Internet (Hansell, 2009).

Online HD video: an Example of Diffusion of Innovations Theory

Rogers (2003) defined *diffusion* as the process by which an innovation is communicated through certain channels over time among the members of a social system. Historically, communication researchers investigated the effects of new technologies on human behavior and vice-versa. The diffusion of online HD video provides a case study of how individuals might engage in the innovation-decision process.

According to Rogers (2003), "…the innovation-decision process is the process through which an individual (or other decision-making unit) passes from gaining initial knowledge of an innovation to forming an attitude toward the innovation, to making a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision."(p. 168) (see Figure 1). The process of innovation

decision making consists of five sequential stages (Rogers, 2003, p.169):

1. *Knowledge* occurs when an individual is exposed to an innovation's existence and gains an understanding of how it functions.
2. *Persuasion* occurs when an individual forms a favorable or an unfavorable attitude towards the innovation.
3. *Decision* takes place when an individual engages in activities that lead to a choice to adopt or reject the innovation.
4. *Implementation* occurs when an individual puts a new idea into use.
5. *Confirmation* takes place when an individual seeks reinforcement of an innovation-decision already made, but he or she may reverse this previous decision if exposed to conflicting messages about the innovation.

Figure 1. A Model of Five Stages in the Innovation-Decision Process
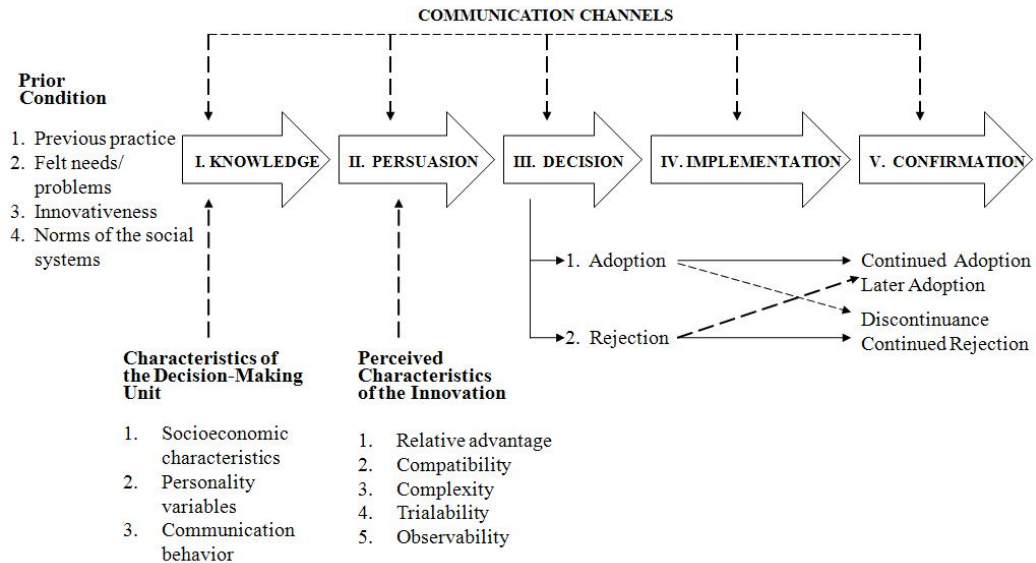
Source: Rogers (2003), p.168

Previous Innovation Research Focusing on Adoption of DTV, HDTV, and IPTV

Prior Condition

As shown in Figure 1, one of the four *prior conditions* of the innovation-decision process is previous practice; the other three are felt needs/problems, innovativeness, and norms of the social system (Rogers, 2003). In the case of online HD video, the

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previous practice can be regarded as the individual's other *media technology use*; the

felt needs/problems as the *perceived benefits and risks of adopting online HD video* ;

innovativeness as a feature of *personality traits*; and norms of the social system as

awareness-knowledge about online HD video.

Media Technology Use

Rogers' (2003) notion of "technology clusters" (p. 14) suggests that the adoption

of a new media technology is related to the adoption of other functionally similar

innovations. Reagan's study (1987) suggested that the use of telecommunication

technologies could predict the adoption of other similar technologies. Atkin,

Neuendorf, Jeffres, and Skalski (2003) studied the relation of the adoption of new

media technologies to audience's eagerness to adopt DTV. However, they found DTV

adoption was not related to adoption of other new media technologies. According to

the researchers, "technology adoption variables didn't survive the controlling

influence of other variables in the regression model" (p. 170). They argued that it was

because "DTV is so new that likely adopters don't yet know how to assimilate it into

their technology repertoires" (Atkin, Neuendorf, Jeffres, & Skalski, 2003).

Chan-Olmsted and Chang (2006) tested the relationship of new media ownership

and the level of DTV knowledge and found that ownership of many entertainment and

digital media had an impact on levels of DTV knowledge. They also found the

consumers did not perceive DTV to be superior to their current media, possibly due to

the relatively low level of DTV familiarity. Shin (2007) tested whether new media

experience played a role in the willingness to adopt IPTV and found that the early

adopters group who had experiences of using new media in recent years was more likely to adopt IPTV compared to the laggard group that never used new media in last three years. Reagan (1987) also found that the adoption of telecommunication innovations was most powerfully related to adoption of other technologies including videotext, PCs, CDs and cable. In the case of online HD video, it thus is necessary to examine the relationship of media technology use to people's intention to adopt online HD video because Americans have gained some knowledge about HDTV during the transition and have become quite familiar with IPTV as more and more people watch video programs through broadband Internet connection.

Characteristics of the Adopters

According to Rogers (2003), the characteristics of the individual (or the decision-making unit) play a role in the knowledge stage. The characteristics also influence the individual's attitude, intention and confirmation directly or indirectly. Rogers (2003) suggested that *three* characteristics of the decision-making unit should be considered. They are communication behavior, personality variables, and socioeconomic characteristics (see Figure 1).

Although Atkin, Jeffres, and Neuendorf (1998) suggested that social background variables may be significant predictors of adoption at early stages of adoption, demographic variables such as age, personal income, education, political ideology, profession/job and ethnicity were not relevant in the present study because this research focuses on a narrowly defined audience—college students, who are prime early adopters for online HD video.

In the present study, communication behavior was measured in terms of *media consumption.* Personality variables were conceptualized and tested in terms of *personality traits.* Socioeconomic characteristics involved two key explanatory variables—*gender* and economic standing, which was measured using *family income.*

Media Consumption

The relationship of adoption to media consumption is often examined in research on adoption of innovations. Chan-Olmsted and Chang (2006) applied the concept of *media use intensity* in their study and considered how a particular technology cluster might be an adoption predictor. They found that consumer Internet usage and tenure were especially significant in increasing DTV knowledge. Atkin et al. (2003) assumed that DTV adoption intention was positively related to time spent with entertainment media and found that media use was significantly related to DTV adoption intention. In particular, newspaper readership was *inversely* related to adoption intention, while magazine readership emerged as a positive predictor (Atkin et al., 2003). Shin (2007) didn't use media consumption as a predictor of people's intention to adopt IPTV. However media exposure, especially Internet usage, could be expected to influence the adoption intention of online HD video, which is a new technology based on the IP network. In both Chan-Olmsted and Chang's study (2006) and Atkin et al.'s research (2003), the measurements of media consumption were open-ended questions.

Personality Traits

Gough (1976) referred personality to the cognitive and affective structures maintained by individuals to facilitate adjustments to events, people and situations.

Ostlund (1974) used a set of personality traits such as venturesomeness, cosmopolitanism, social integration, social mobility and so forth to predict the adoption of new products.

Innovativeness and Venturesomeness

Chan-Olmsted and Chang (2006) referred to personality as innovativeness, venturesomeness, social integration, and privilegedness. Innovativeness is defined as "the degree to which an individual or other unit of adoption is relatively earlier in adopting an innovation than other members of a social system" (Rogers, 2003, p. 22). Midgley and Dowling (1978, p.236) defined innovativeness as "the degree to which an individual is receptive to new ideas and makes innovation decisions independently of the communicated experience of others". Chan-Olmsted and Chang (2006) also found innovativeness was related to DTV content and equipment knowledge. Chan-Olmsted and Chang (2006) conceptualized venturesomeness as "taking risks and trying new things/products" (p.783) and found that the personality trait of venturesomeness contributed to a higher level of DTV knowledge.

Social Integration

Since online HD video is an interactive media, the researcher substituted social integration for privilegedness as a personality trait. Chan-Olmsted and Chang (2006) used social integration to measure "the desire to participate in social activities and to enjoy interacting" (p.783). In this study, social integration was defined as the degree to which people are socially oriented and willing to interact with others in the social activities. The researcher of this study came up with the term "open-minded

personality", and assumed that individuals are more open-minded in their personality if they are more innovative, more venturesome and more socially oriented.

Gender

Gender is a variable that shapes media adoption and consumption in a variety of ways. Atkin, Neuendorf, Jeffries and Skalski (2003) found that males are more eager to adopt DTV than females. Chan-Olmsted and Chang (2006) found that males are more aware of and knowledgeable about digital television than females. According to Emarketer.com (2010), males were nearly twice as likely as females to watch most or all of their TV online.

Family Income

According to Rogers' (2003) socio-economic generalizations about adopters, adopters generally have a higher income than non-adopters. In the previous research relevant to this study, online video viewers tend to be early adopters and are also more likely to be well off (Lawler, 2010). Chan-Olmsted and Chang (2006) found that household income was a good predictor of DTV knowledge and DTV adoption intent. Baaren, Wijngaert and Huizer (2008a) found that high-income families with children tended to perceive more usefulness for HDTV.

Stage One: Knowledge

Knowledge and persuasion are the two initial stages that potential consumers go through before they make an adoption decision (Baaren, Wijingaert & Huizer, 2008a). Many researchers have shown that people's knowledge of innovation can influence their adoption behavior.

In the knowledge stage, an individual is exposed to an innovation's existence and gains an understanding of how it functions (Rogers, 2003). According to their interests, needs, existing attitudes, existing beliefs, existing values, past experiences and other prior conditions, individuals might expose themselves to innovation messages, become aware of the innovation, and gain awareness-knowledge about the innovation either actively or passively (Rogers, 2003).

Awareness-Knowledge and Adoption of Relevant Technologies

Atkin, Neuendorf, Jeffres and Skalski's (2003) 3-category knowledge measure revealed that 62% of the respondents professed to know nothing about DTV, 30.2% knew at least something about DTV, and 7.8% reported wrong information about DTV. Their study also showed the relatively low levels of agreement with items addressing DTV knowledge and eagerness to get DTV. A hierarchical multiple regression analysis predicting level of knowledge about DTV was not significant, possibly due to the low level of knowledge about DTV. The researchers suggested, this low level of consumer knowledge about DTV presented a validity threat in theoretical terms, and it also provided a painfully accurate picture of the confusion in consumers' minds.

Chan-Olmsted and Chang (2006) found that awareness, knowledge, and adoption intent were inter-related, and that it was logical for consumers to go through a stage of awareness and knowledge before they were ready to adopt a new technology such as digital television. They tested people's knowledge in terms of four aspects of DTV—related terms recognition, environment, content, and equipment. They found knowledge of the DTV environment and content was statistically significant in

relation to the intention to adopt DTV (2006).

Weber and Evans (2002) also emphasized the importance of knowledge in their study on constructing the meaning of DTV. They observed, "People's varying degree of access, knowledge, and willingness to engage with technology will invariably affect the level of perceived determinism among each member of the societal group" (p.442).

Baaren, Wijingaert and Huizer (2008a) similarly tested people's awareness and actual knowledge of HDTV and concluded that more knowledge about HDTV results in higher perceived usefulness. However, they also found knowledge levels about HDTV remained low. They argued that this could be explained by the fact that there was relatively little promotion of HDTV by distributors and broadcasters; the resulting lack of knowledge impaired the transition from wanting HDTV features to actually adopting HDTV.

Shin (2007) measured the knowledge of IPTV in terms of intrinsic factors (individualized service and personalized content) and extrinsic factors (external interaction). Shin (2007) found all the extrinsic factors were the significant factors affecting customers' intentions. The knowledge of IPTV (the intrinsic and extrinsic factors) provided significant explanatory power in explaining users' adoption of IPTV (Shin, 2007).

In the case of online HD video, awareness and knowledge should also be a predictor of people's adoption intent. Atkin et al. (2003) used an open-ended question and asked people to tell the researchers in their own words what they knew about

digital television. They coded the responses into three categories: know some

information (+1), does not know (0), and reports incorrect information (-1). As to

online HD video, this measurement is of limited value. Americans already have some

knowledge about HDTV pushed by the analog-to-digital transition, and IPTV is no

longer a strange concept because of the increasing number of people who watch TV

through an IP network. However, researchers need to find out how much people know

about online HD video, not merely whether they know it or not. Chan-Olmsted and

Chang's (2006) operationalized measures to assessing people's knowledge asking

respondents to state whether they thought a statement was true or to indicate that they

did not know the answer to the question. Baaren et al. (2008a) also presented

respondents with eight statements about HDTV and its practical use. Options for

answering were "true," "false," and "I don't know."

Every market has two sides—the demand side and the supply side. So does the

TV program producing market. However, these studies (Chan-Olmsted and Chang,

2006; Baaren et al., 2008a; and Atkin et al., 2003) focused too much on respondents'

knowledge about the demand side, and didn't fully assess their knowledge about the

supply side, especially the knowledge about how digital TV signals are distributed

and delivered. As Baaren, Wijingaert and Huizer (2008b) pointed out, "On a macro

level, the innovation development and diffusion process is often regarded as a result

of technology push- and/or demand pull- forces, where either the demand side is in

need of a new technology or the supply side tries to create a market for it" (p. 43,

2008). They suggested that HDTV diffusion on the supply side depends on devices,

content production, broadcasting and distribution (Baaren et al., 2008b).

Stage Two: Persuasion

In this stage of the adoption process, an individual forms a favorable or an unfavorable attitude toward the innovation. The persuasion in favor of or against the innovation depends on the five perceived characteristics of the innovation. These characteristics were also regarded as five criteria of personal technology perception (Baaren et al., 2008a). Rogers (2003, p. 15) explained these five characteristics of innovations as follows:

> Relative advantage—the degree to which an innovation is perceived as
>   superior to the one that it will replace or compete against;
> Compatibility—the extent to which the new product is consistent with
>   existing values and the past experience of the adopter;
> Complexity—the degree to which the innovation is difficult to understand
>   or use;
> Trialability—the degree to which an innovation may be tried out by
>   consumers on a limited basis; and
> Observability—the extent to which the results of an innovation are visible
>   to others.

In the case of online HD video, individuals obtain useful information about this innovation in the first two stages—knowledge and persuasion—and they gradually form perceptions about the five characteristics of this innovation. Besides the perceptions about these five characteristics, individuals may also perceive the benefits and risks of adopting online HD video. Based on their knowledge and perceptions, individuals will form attitudes in favor of or against online HD video.

Perceived Characteristics of Online HD Video

Baaren et al. (2008a) specified perceived usefulness of HDTV in terms of image sharpness, sound quality and screen size. They found HDTV features themselves were considered important in future television and the various HDTV characteristics

demonstrated significant correlation with each other (p< .01). Chan-Olmsted and Chang (2006) measured respondents' perceived characteristics of DTV in terms of relative advantage, compatibility, complexity, trialability, observability, perceived risks, and perceived resources. They found that respondents did not perceive DTV to be much better than their existing media and it was possible due to low levels of DTV knowledge as they explained. Better video quality seemed to be the more desirable DTV benefit, while interactive functions were the least interesting (Chan-Olmsted and Chang, 2006). Shin (2007), however, found interactivity was indeed a significant predictor of the diffusion of IPTV. He measured interactivity as "the degree to which the technology could support or enable interaction that resembles human conversation" (Shin, 2007, p.1453). This research finding might be explained by the fact that IPTV is a one-to-one customized medium that allows users to combine push and pull mechanisms depending on their needs and interests (Shin, 2007). (For online HD video, interactivity should be a significant factor of relative advantage, because online HD video could be considered as a "pull" interactive medium.) Shin (2007) also found other factors like timely/on-demand, special personal functionality, individualized content, value-added service, and compatibility were all significantly correlated at the p <.05 level, while individualized content was significant at the p<.01 level.

Perceived Benefits and Risks of Adopting Online HD Video

Baaren, Wijingaert and Huizer (2008a, p.284) observed, "Seen from a social constructivist perspective, the manner in which people make use of any technology does not (only) depend upon its intrinsic characteristics, but also on the function(s) they create for the technology in their daily lives." In the case of online HD video,

users would be expected to consider perceived benefits and risks as predictors of their intention of adoption. Chan-Olmsted and Chang (2006) measured perceived benefits in terms of respondents' perceived social importance of DTV and perceived importance of DTV benefits. Social importance of DTV was not significantly related to adoption of DTV. Shin (2009) operationalized the benefits perceived by consumers in terms of perceived control, perceived usefulness, perceived playfulness, perceived content quality, perceived quality of service, perceived security, and perceived cost. He found perceived usefulness, perceived playfulness, perceived content quality, perceived quality of service, and perceived security were all positively related to intention to use IPTV. Perceived control had a significant effect on perceived usefulness and perceived playfulness. The results suggested that cost was not an issue if the users perceived the IPTV content and system to be valuable (Shin, 2009).

In a separate study, Shin (2007) operationalized cost in terms of equipment cost, monthly fees, and additional service charges. He found that as the cost of the equipment, fees and service increased, consumers were less likely to be willing to adopt IPTV (Shin, 2007). Watching online HD video doesn't require an expensive big-screen display and seldom needs the content-access fees that are separate from the broadband Internet connection fees they are already paying. The high-quality image, theater-like sound, time-shifting ability, and ability to "zap" or skip commercials make online HD video attractive and easy to adopt. Therefore, in this study, perceived usefulness, perceived playfulness, perceived content quality, perceived service quality, perceived control, perceived security risk problems, and perceived cost risks were

used to measure the perceived benefits and risks of adopting online HD video.

Attitude

In the persuasion stage, Rogers (2003) contends an individual forms a favorable or an unfavorable attitude toward the innovation based on his/her knowledge about online HD video, perception of the characteristics of this. Eagly and Chaiken (1993, p.1) defined attitude as "a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor." Petty, Priester and Brinol (2002) regarded attitudes as the general predispositions that people use to evaluate other people, objects, and issues favorably or unfavorably. According to Rogers (2003, p.174-175), "Attitude is a relatively enduring organization of an individual's beliefs about an object that predisposes his or her actions." Fishbein and Ajzen (2010, p. 76 & p. 125) defined attitude as "a latent disposition or tendency to respond with some degree of favorableness or unfavorableness to a psychological object." They further explained that "the attitude object can be any discriminable aspect of an individual's world, including a behavior" (p. 76). Shin (2009) suggested in his study on IPTV that attitude is positively related to the intention to use IPTV. Shin (2007) defined attitude toward behavior as an individual's positive or negative feeling about performing the targeted behavior. He assumed that a person's attitude toward a behavior was determined by the salient beliefs and evaluations.

In the present study, attitude was one of the dependent variables. The attitude object was online high-definition video.

Stage Three: Decision

Decision takes place when an individual engages in activities that lead to a choice to adopt or reject an innovation (Rogers, 2003). Decision involves making a judgment based on attitudes (which, in turn, are formed based on available information, prior knowledge and experience). Although the decision process itself is impossible to observe, the outcome of a decision can be measured. If measured appropriately, behavioral intentions can "account for an appreciable proportion of variance in actual behavior."(Fishbein & Ajzen, 2010, p. 48). More specifically, in this study the researcher focused on adoption intent as a specific form of behavioral intention to see whether there was a relationship between the predictor variables suggested by Rogers (2003) and adoption intention of those who hadn't adopted online HD video.

Behavioral Intent

When depicting the Theory of Reasoned Action (Fishbein & Ajzen, 1975; Ajzen, & Fishbein, 1980), Ajzen (2002) defined behavioral intention as an indication of an individual's readiness to perform a given behavior. Behavioral intention is assumed to be an immediate antecedent of behavior. Fishbein and Ajzen (2010, p. 21) later introduced behavioral intention as "readiness to perform the behavior". Separately, Eagly and Chaiken (1993, p. 169) stated that "behavioral intention is a linear regression function of (a) attitude toward the act (or behavior) and (b) subjective norm". Millers (2005) defined behavioral intention as a function of both attitudes toward a behavior and subjective norms toward that behavior, which has been found

to predict actual behavior.

Stage Four and Stage Five: Implementation and Confirmation

The fourth and fifth steps in Roger's (2003) model involve actual

implementation of the innovation and confirmation. Implementation involves trial of

the innovation; confirmation suggests reinforcement of the adoption decision already

made.

Satisfaction

Repeat users generally are expected to express high levels of satisfaction with an

adopted innovation if no alternatives are available or if otherwise preferred solutions

impose barriers to use, such as high cost or difficulty of use.

According to Doll and Torkzadeh (1988), user satisfaction is defined as the

opinion of the user about a specific computer application that they use. Ives, Olson,

and Baroudi (1983) defined user information satisfaction as the extent to which users

believe the information system available to them meets their information requirements.

Berry and Parasuraman (1991) measured customer satisfaction with a service by using

the gap between the customer's expectation of performance and their perceived

experience of performance. Interestingly, no studies were located that focused on

evaluation of DTV, HDTV or IPTV by users that had already adopted them. Thus

there is no relevant research that focused on user satisfaction.

Summary

The discussion in this chapter suggests that online high-definition video is a

potentially important innovation that is reshaping both telecommunications and

Internet content. This study examined the adoption process within the framework of

the model presented in Figure 2.

Figure 2. Online High-Definition Video Adoption among College Students
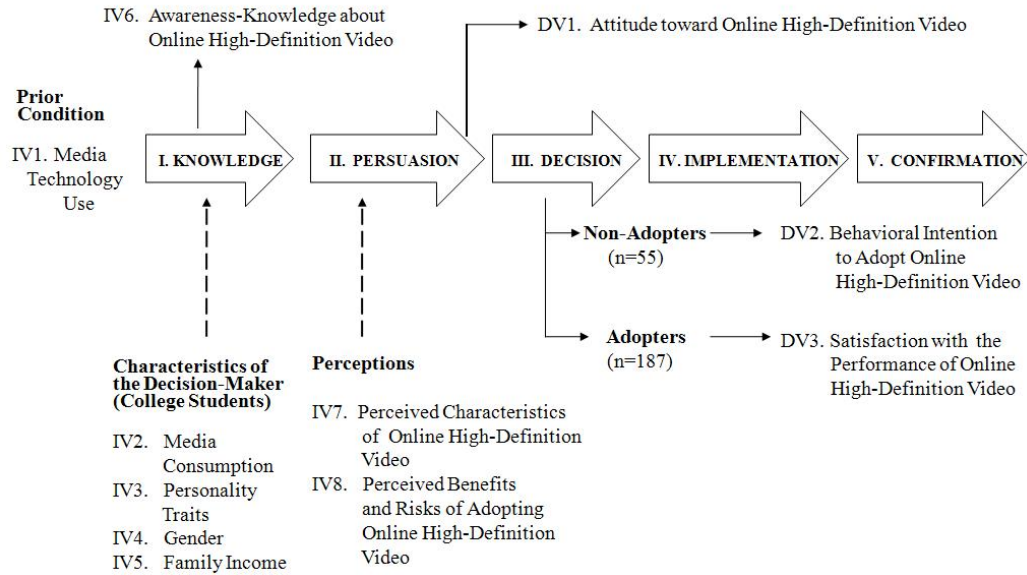
The specific hypotheses tested and the applied methods were described in

Chapter III.

Chapter III

METHODS

Hypotheses

In keeping with Rogers' (2003) innovation-decision model, this study tested

eight hypotheses related to prior conditions, characteristics of the decision-making

unit (individual), and perceived characteristics of the innovation on the five-stage

innovation-decision process for adopting online high-definition video. The key

criterion variables were attitude (a measure of persuasion), behavioral intent (a

measure of decision) and satisfaction (a measure of implementation and confirmation)

(see Figure 2).

<u>Hypothesis for Prior Conditions</u>

H1   Greater use of media technologies result in

      a) more positive attitudes among all respondents,

      b) greater behavioral intent for non-users, and

      c) greater satisfaction among current users.

<u>Hypotheses for Characteristics of the Decision-maker</u>

H2   Higher general media consumption results in

      a) more positive attitudes among all respondents,

      b) greater behavioral intent for non-users, and

      c) greater satisfaction among current users.

H3   Having a more open-minded personality results in

   a) more positive attitudes among all respondents,

   b) greater behavioral intent for non-users, and

   c) greater satisfaction among current users.

H4   Compared to females, males demonstrate

   a) more positive attitudes,

   b) greater behavioral intent, and

   c) greater satisfaction.

H5   Growing up in a household with a higher family income results in

   a) more positive attitudes among all respondents,

   b) greater behavioral intent for non-users, and

   c) greater satisfaction among current users.

H6   More awareness-knowledge about online HD video results in

   a) more positive attitudes among all respondents,

   b) greater behavioral intent for non-users, and

   c) greater satisfaction among current users.

Hypotheses for Perceived Characteristics of the Innovation

H7   More favorable perceptions about characteristics of online HD video results in

   a) more positive attitudes among all respondents,

   b) greater behavioral intent for non-users, and

   c) greater satisfaction among current users.

H8   More perceived benefits and fewer perceived risks of adopting online HD video

result in

     a) more positive attitudes among all respondents,

     b) greater behavioral intent for non-users, and

     c) greater satisfaction among current users.

Instrument and Procedures

To test these hypotheses, a survey was conducted using a four-page paper-and-pencil questionnaire (Appendix 1) in mid-November 2009.

The sample was a convenience sample of Colorado State University students enrolled in JTC 100 Media in Society, an introductory, lower-division course. Students came from different departments/majors, were in different years in school, and represented different genders. Students earned five extra credit points for completing the in-class survey, which took about 15 minutes to complete. Alternatively, students were given the option of completing a two-page writing assignment *provided* they were in class to receive the assignment on the day the survey was conducted (Appendix 2).

The researcher briefed students using a script (Appendix 3), explained the alternative assignment, and then asked students to read and sign the Informed Consent cover sheet (Appendix 4) before beginning the survey. Upon completion, students detached the Informed Consent sheet from the questionnaire and placed the two items in separate boxes in the front of the room. The signed Informed Consent forms (which included both the printed name and signature of the participant) were used to assign the extra credit points and not linked in any way to individual questionnaires in order

to maintain confidentiality. After all questionnaires were tabulated, the consent forms and questionnaires were stored separately to maintain confidentiality and retained by the Department of Journalism and Technical Communication in keeping with federal regulations. The procedures were conducted following approval by Colorado State's Institutional Review Board (Human Subjects Committee).

Operationalizations

The variables measured in the questionnaire (Appendix 1) were operationalized as follows:

Measures of Independent (predictor) Variables

Independent Variable 1: Media Technology Use (Question 2 in Questionnaire)

A 7-point Likert scale was used to measure subjects' new media technology experiences. Respondents were asked to check the number that best describes how frequently they used 10 media technologies, where 7=very often and 1=rarely. Respondents could also check **zero** if they **never** used it. The technologies were *digital video disk players, digital video recorders, personal digital assistants, video cassette recorders, high-definition TV, video games (e.g. Xbox), cell phones, digital cameras, desktop/laptop computers,* and *broadband Internet*.

Independent Variable 2: Media Consumption (Question 1)

Respondents' general media consumption was assessed using a 7-point Likert scale where 7= a lot and 1=little. If they **never** consumed a certain medium, respondents could choose **0** (zero). The tested media included *newspaper, magazine,*

TV, radio, the Internet, movies and *music*. Scores were combined and a mean

computed to serve as a media consumption index.

Independent Variable 3: Personality Traits (Question 5)

Three aspects of the respondents' open-minded personality were measured using

7-point Likert scales where they were asked to check the number that best describes

the degree to which they agree or disagree with 13 statements, where 7=strongly agree

and 1=strongly disagree. *Innovativeness* was measured using 5 statements (Q5a-5e):

I like to learn about new ideas; I like to keep up with new technologies; I don't like to

explore new technologies; I don't like to try new things in my life; and *I like to find out*

new ways to enrich my life. *Venturesomeness* was measured using 4 statements

(Q5f-5i):   *I don't like to try risky things; I am willing to take risks to try new things; I*

am curious about new technology; and I am excited to experience new things in my

life. *Social integration* was assessed using 4 statements (Q5j-5m):   *I like to*

participate in social activities; I don't like to socialize with others online; I enjoy

interacting with my friends and neighbors; and *I like to know other people and make*

new friends. The intent was to combine the scores and compute a mean for each

cluster to serve as indexes of innovativeness, venturesomeness, and social integration.

Independent Variable 4: Gender (Question 3)

Respondents identified their gender using check boxes to indicate if they are *male*

or *female*.

Independent Variable 5: Family Income (Question 12)

To measure the impact of economics on adoption, respondents were asked to

check one of six boxes representing the range of the combined income of the adult(s)

in the primary household where they grew up during high school. The six categories

were: *less than $20,000, $20,000-$39,999, 40,000-$59,999, $60,000-$79,999,*

$80,000-$99,999 and *$100,000 or more.*

Independent Variable 6: Awareness-Knowledge (Question 6)

The researcher of this study asked respondents about some statements related to

online HD video knowledge about both demand and supply sides and used an 8-point

Likert scale to measure the knowledge level among them. Respondents checked the

number that best described the degree to which they agreed or disagreed with 12

statements, where 7= strongly agree and 1=strongly disagree. They could also check

zero if they **did't know**. The 12 statements didn't overlap with other items in terms of

technological convergence and included: *a) The screen image for online*

high-definition video is wider than for traditional video. b) Online high-definition

video provides sharper images than regular Internet video. c) The sound quality for

online high-definition video is worse than for traditional video (reversed item). *d)*

Online high-definition video requires purchasing a special computer monitor

(reversed item). e) I can pause, rewind, and fast-forward online high-definition video

while watching. f) All online sites charge money to watch high-definition videos

(reversed—not true). *g) Online HD video is readily available on the Internet now. h) I*

need a broadband Internet connection to watch online HD video. i) You need high

bandwidth to watch online HD video. j) Videos on sites such as YouTube.com might be

in a wide format but are not necessarily in high-definition. k) Movie and TV producers

make shows available online in high-definition on sites such as Hulu.com. l) Any

computer can be used to watch high-definition videos; special system requirements

are not required (reversed item—false). Scores were combined and a mean computed

to serve as an online HD video knowledge index.

Independent Variable 7: Perceived Characteristics of online HD video (Question 7)

A 7-point Likert scale was used to measure the respondents' perceptions of

characteristics of online HD video. Five clusters of items (each with 4-6 items) were

based on Rogers' theory (2003) and measured: *relative advantage* (Q7a-7e)*,*

compatibility (Q7f-7i)*, complexity* (Q7j-7n)*, trialability* (Q7o-7r) and *observability*

(Q7s-7v). Respondents could check the number that best described the degree to

which they agreed with statements, where 7= strongly agree and 1=strongly disagree.

Scores for the statements in each cluster were combined and a mean computed for

each cluster to serve as indexes of relative advantage, compatibility, complexity,

trialability and observability.

The 24 items measuring perceived characteristics were: *online HD video a)*

can better fulfill my entertainment needs; b) allows me to personalize the content I

consume; c) lets me watch entertainment shows on demand; d) is not interactive; e)

includes TV programs, movies, commercials and user-generated video; f) conflicts

with my entertainment habits; g) is compatible with my life style; h) is not compatible

with the way I use the Internet; i) is compatible with my other media use; j) is difficult

to use; k) is easy to watch; l) makes it easy to figure out what to watch; m) requires a

lot of knowledge about computer; n) requires professional software skills; o) is

convenient for me to try out; p) is readily available to try out; q) requires a lot of time

to try out; r) costs little money to try out; s) is already watched by people in my area;

t) is a format I've observed already; u) is talked about by people in my daily life; v)

can be readily found on the Internet.

Independent Variable 8: Perceived Benefits and Risks of Adopting online HD video

(Question 8)

To measure the perceived outcomes (including benefits and risks) of adopting

online HD video, a 7-point Likert scale was used. Respondents responded to 7

clusters of statements (4 items each) that measured *perceived usefulness* (Q8a-8d)*,*

perceived playfulness (Q8e-8h)*, perceived content quality* (Q8i-8l)*, perceived service*

quality (Q8m-8p)*, perceived control* (Q8q-8t)*, perceived security risk problems*

(Q8u-8x), and *perceived cost risks* (Q8y-8bb). Respondents could check the number

that best described the degree to which they agreed or disagreed with statements,

where 7= strongly agree and 1=strongly disagree. Scores for statements in each

cluster were combined and a separate mean computed for each cluster to serve as

indexes of these perceived benefits and risks.

The items for the 7 clusters were: *online HD video is a) is a useful resource for*

me; b) can provide useful information to me; c) is not very useful to my life in general;

d) is helpful to enhance effectiveness of my life; e) gives me enjoyment; f) isn't fun; g)

entertains me; h) pleases me; i) provides varied programming; j) provides

high-quality programs; k) cannot provide the programs that I need; l) provides

valuable information. Online high-definition video is m) very reliable; n) satisfying; o)

available everywhere; p) is easy to access. q) I can decide when I want to watch

online HD video; r) I can pick the location where I watch online HD video; s) I can

choose the online HD video content I consume; t) I can watch online HD video

according to my own schedule; u) It is safe to watch online HD video; v) Online HD

video services can invade my privacy; w) Online HD video makes my computer

vulnerable to virus; x) Watching online HD creates computer security risks; y) The

equipment used to watch online HD video is pricey; z) The broadband Internet

connection through which I can watch online HD video is expensive; aa) Online HD

video programs are costly to watch; bb)I can watch some online HD videos for free.

Measures of Dependent (Criterion) Variables

Dependent Variable 1: Attitude toward online HD video (Question 9)

To measure the respondents' overall assessments or attitudes toward online HD

video, a 5-item 7-point Likert scale was used. Respondents were asked to opine

whether "Watching online HD video is… *a) a good idea, b) is a good experience, c)*

is bad for people (reversed item)*, d) is beneficial to me, e) makes me feel good.*"

Respondents could check the number to which they agreed or disagreed with these

statements, where 7= strongly agree and 1=strongly disagree. Scores were combined

and a mean computed to serve as a single attitude index.

Dependent Variables 2 and 3: Behavioral Intention and Satisfaction (Questions 10 &11)

At the end of the questionnaire, a filter question (Q10) asked respondents to

check (*Yes* or *No*) whether they had actually watched online HD video. The

respondents were directed with arrows to two different sets of 4 questions (Q11).

For those respondents who answered "no" because they had not adopted online HD video, a 4-item 7-point scale was used to measure their *behavioral intent* to adopt this new technology (Q11a-11d). The respondents could check the number that best described the degree to which they agreed or disagreed with the four statements, where 7= strongly agree and 1=strongly disagree. The four statements were: *I want to use it, I plan to use it, I don't intent to use it* (reversed item), and *I need to use it*. Scores were combined and a mean computed to serve as a behavioral intention index.

For those respondents who answered "yes" because they had watched online HD video, a similar set of questions was provided to measure their *satisfaction* with this already-adopted technology (Q11e-11h). The respondents could check the number that best described the degree to which they agreed or disagreed with the four statements, where 7= strongly agree and 1=strongly disagree. The 4 statements were: *I am satisfied with online HD video, Online HD video exceeds my expectations, Online HD video fulfills my needs*, and *I will continue to watch online HD video*. Scores were combined and a mean computed to serve as a satisfaction index.

Data Analysis

SPSS 17.0 (2009) was used to record and analyze the data. Reversed items were recoded so that all the items were in a consistent direction, where 7=positive and 1=negative. The various scale measures were computed by first testing for scale reliability using the Cronbach (1951) alpha statistic. Scales items with sufficient

reliability (alpha >.70) were then be combined and a mean computed as an index for use in the analyses.

Hypotheses 1, 2, 3, 6, 7, and 8 were tested using simple Pearson *r* product-moment correlations. A *t*-test was used to test H4 to compare effects of gender between males and females. Eta square statistics were included to report effect sizes. A one-way ANOVA was used to test (H5) the effects of household based on the six ordinal income groups. In keeping with the custom in the social sciences, findings are deemed statistically significant if there is less than a 1 in 20 probability that the results obtained are by chance (p<.05).

Chapter IV

RESULTS

Description of Participants

A total of 266 students took the in-class survey, resulting in 242 respondents that

could be used for final statistical tests and data analysis. Twenty-four survey

responses had to be discarded because they were incomplete or because participants

didn't make it clear whether they had or had not adopted online HD video.

As summarized in Table 1, 103 respondents (42.6%) are male students and 139

are female (57.4%). When asked family income, three participants didn't respond. As

displayed in Table 1, the largest family income group is $100,000+ group, making up

38.1%; the other five family income groups represent 3.3% to 15.1% of the

respondents. According to the *Current Population Reports* by U.S. Census Bureau

(DeNavas-Walt, Pecoraro & Smith, 2009), there were five household income quintile

groups: (1) $20,712 or less, (2) $20,713-$39,000, (3) $39,001-$62,725, (4)

$62,726-$100, 240, and (5) $100,241 or more. To achieve possibly equal "N"s for

family income comparison, the researcher considered DeNavas-Walt, Pecoraro &

Smith's way of categorizing household income, and collapsed the six income groups

into three income classes—low family income class which mostly represented the

three lowest household income quintile groups (1) (2) and (3), medium family income

class which mostly represented the household income group (4), and high income

class which mostly represented the highest household income group (5).The low

family income class combined the three lowest groups ($0-19,999, $20,000-39,999,

and $40,000-59,999) and included 73 participants (30.4%). The medium family

income class combined the $60,000-79,999 and $80,000-99,999 groups and

represented 75 participants (31.4%). The high income class included only the origin

$100,000+ group, representing 91 participants (38.1%).

A screening question was used at the beginning of the survey to understand

participants' recognition of online HD video. When asked if they were familiar with

online HD video, as shown in Table 1, 160 participants (66.1%) answered YES, 33

(13.6%) replied NO, and 49 participants (20.2%) were NOT SURE. At the end of the

survey, when asked whether they had watched online high-definition video, 187

participants (77.3%) reported that they had actually watched online HD video and 55

(22.7%) confirmed that they had not. Table 1 also provides a cross-tab comparison of

the two measures used to determine respondents' familiarity and actual use of online

HD video. At the beginning of the survey, 160 of 242 participants indicated they were

familiar with on HD Video and ostensibly 143 had actually watched it. Another 17

were familiar but had not actually watched, based on their later report of watching

(adopting) online HD video. Thirty-three respondents said they were not familiar with

online HD video, and 15 respondents confirmed they had never watched it. But 18

people who said they were unfamiliar with the concept later reported having actually

adopted online HD video. Although this might be a concern in terms of reliability, the

results are not surprising based on the minimal amount of information provided to

participants and the fact that the term "online high-definition video" is not widely

used. Similarly, it seems reasonable that the 49 respondents who initially said they

were "not sure" were equally split when asked to indicate whether they had actually

adopted online HD video.

Table 1 – Demographic of Participants

n=242	Count	Percent
Gender		
Males	103	42.6
Females	139	57.4
Family Income		
$0-19,999	8	3.3
20,000-39,999	23	9.5
40,000-59,999	42	17.6
60,000-79,999	39	16.3
80,000-99,999	36	15.1
$100,000 +	91	38.1
No Response	3	.1
Low Family Income (<$60,000)	73	30.4
Medium Family Income ($60,000-99,999)	75	31.4
High Family Income ($100,000+)	91	38.1
No Response	3	.1
Familiarity with online HD video (screening question)		
Yes	160	66.1
No	33	13.6
No Sure	49	20.2
Actually Watched online HD video		
Yes	187	77.3
No	55	22.7

Frequency Distribution of Comparing Respondents' Initial Report of Familiarity
versus Later Report of Having Actually Viewed online HD video

	Adopters	Non-Adopters	Total
Familiar	143	17	160
Not Familiar	18	15	33
Not sure	26	23	49
Total	187	55	242

$\chi2=34.41$ (2 *df*), p≤.000

Descriptive Statistics of Measures

Description of Measures: Independent Variables

Index of Media Technology Use

Participants were asked to report how frequently they use the 10 different kinds

of media technologies by using an 8-point Likert scale. Table 2 summarizes their

technology uses. Among the 10 technologies, participants used the computers the

most (mean=6.67, SD=.618), and they rarely use video cassette recorders (mean=.53,

SD=.929). The second most-used technology was cell phones (M=6.65, SD=.906) and

the Broadband Internet (mean=5.97, SD=1.674) was the third most-utilized

technology. The high use of computers and the broadband Internet indicates that this

group of people tends to use the Internet heavily. In contrast, the uses of digital video

recorders (M=1.62), personal digital assistant (M=1.13) and video cassette recorder

(M=.53) were quite low. One possible reason might be that these technologies are too

professional and are designed for assisting individuals' work, while this sample was

composed of students who don't need these technologies. Another possible reason is

that they can use cell phones and digital cameras to do some video recording, given

that most cell phones and digital cameras today have a video-recording function.

Video cassette recorders have also been largely replaced by digital video recorders.

The use of digital camera (M=4.15), High-Definition TV (M=3.97), digital video disc

player (M=3.88) and Xbox video games (M=2.85) are about average, but the high

standard deviations for these 4 technologies (SD=2.171, 2.509, 2.116 and 2.458,

respectively) suggests that people in this group follow widely use patterns. It also

implies that this group of people may have access to the alternative or supplementary

technology in terms of being entertained through the use of digital cameras, HDTV,

DVD and Xbox. Based on these data, the researcher concluded that people might use

computer and the Broadband Internet as supplementary tools to save and share the

photos taken by digital camera on the social networking Websites and blogs; and they

might use the computer and the broadband Internet as an alternative way to watch

high-definition programs online, because conventional HDTV sets are still very

expensive for most students.

When the ten technology items were combined to create the index of media

technology use, the items did not demonstrate strong scale reliability (Cronbach's

α=.594). Removing any items didn't help to obtain stronger scale reliability.

Meanwhile, the index's low mean and high standard deviation (M=3.74, SD=2.261)

also suggested that media technology use varied widely. Therefore, the researcher

didn't combine the 10 technology items and decided to analyze the 10 technology

items individually.

Factor analysis was conducted on the 10 technology items, which revealed four

underlying dimensions of media technology use. These four factors together

accounted for 61.4% of the variance in the items. The largest factor was labeled

entertainment technology and included HDTV and Xbox video games (M=3.42,

SD=2.102; Eigenvalue=2.392, 23.9% of variance). The second factor was labeled

personal devices and included DVD, DVR, PDA and digital cameras (M=2.68,

SD=1.329; Eigenvalue=1.548, 15.5% of variance). The third factor was labeled

communication devices and included cell phones and personal computers (M=6.70,

SD=.649; Eigenvalue=1.162, 11.6% of variance). The final factor combined the two

remaining items, broadband Internet and video cassette recorders (M=3.25, SD=1.003;

Eigenvalue=1.042, 10.4% of the variance). Analysis of the means and standard

deviations in Table 2 suggests that virtually everyone used cell phones and personal

computer (M=6.70, SD=.649), but the use of *entertainment technology*, *personal*

devices and broadband Internet/VCR varied much more widely, as evidenced in the

high standard deviations.

Table 2 – Use of Media Technologies

n=233
7=very often, 1=rarely, 0=Never

	Mean	S.D.
Index of Media Technology Use (α=.594)	**3.74**	**2.261**
• Desktop/Laptop Computer	6.67	.618
• Cell Phone	6.65	.906
• Broadband Internet	5.97	1.674
• Digital Camera	4.15	2.171
• High-definition TV	3.97	2.509
• Digital Video Disc Player	3.88	2.116
• Video games (e.g. Xbox)	2.85	2.458
• Digital Video Recorder	1.62	1.961
• Personal Digital Assistant	1.13	2.013
• Video Cassette Recorder	.53	.929
Combined		
• HDTV-Xbox video games	3.42	2.102
• DVD-DVR-PDA-Digital camera	2.68	1.329
• Computer-Cell phone	6.70	.649
• Broadband Internet-VCR	3.25	1.003

Index of Media Consumption

Participants also were asked to report the amount of time they spent using seven

different kinds of media—the Internet, music, TV, movies, radio, newspapers, magazines. When the seven kinds of media consumption were combined into an index of media consumption, the index did not demonstrate strong scale reliability (Cronbach's α=.660). The seven media consumption items couldn't cohere because they fulfilled different needs. In addition, removing any items didn't help to obtain stronger scale reliability. Therefore, the researcher didn't combine the items and decided to analyze the seven kinds of media consumption individually. Among these seven media, the Internet consumption was the highest (M= 6.42, SD= .996) and magazine readership the lowest (M=2.25, SD=1.770). The high consumption of the Internet (M=6.42) indicated respondents like to spend time on the Internet and are likely to watch online high-definition videos and enjoy other online content. Meanwhile, the Internet use habit is pretty consistent among this group of people, as shown by the comparatively low standard deviation (SD=.996). The lesser use of other media such as radio (M=2.83), newspaper (M=2.33), and magazine (M=2.25) implied that this group of people prefer the Internet compared to traditional media such as radio, newspapers and magazines. Consequently, content distributed through the Internet might catch the attention of people in this group more easily than content through traditional media channels. As a particular type of media content distributed through the Internet, online high-definition videos are supposed to be appealing to young audience by providing a vast variety of video-audio entertainment substances. Although watching TV (M=4.56) and watching movies (M=4.11) are both above the average level of use on the 7-point scale, the consumption habit for these two media

varied dramatically from individual to individual (TV SD=1.963, Movies SD=1.871).

As indicated by these two comparatively high standard deviations, people in this

sample group like to watch TV and movies, but they might also have alternative ways

to watch TV programs and movies. In addition to the high use of the Internet, it is

reasonable to assume that they might like to watch TV and movies content online as

an alternative to watching regular cable/ satellite TV or watching movies in theater.

Alternatively, busy college students might not watch many TV shows or movies.

Factor analysis was conducted on the seven media consumption items, which

revealed three underlying dimensions of media consumption. These three factors

together accounted for 67% of the variance in the items. Time spent with the Internet,

time spent with movies and time spent with music loaded into one factor that was

labeled *entertainment media* (M=5.54, SD=1.102; Eigenvalue = 2.442, accounting for

34.9% of the variance). Time spent with TV and time spent with radio loaded into a

second factor labeled *broadcast media* or *TV-radio* (M=3.69, SD=1.631;

Eigenvalue=1.194, 17.1% of the variance). Time spent with newspapers and time

spent with magazines loaded into a third factor labeled *print media* (M=2.29,

SD=1.421; Eigenvalue=1.055, 15.1% of the variance).

Table 3 –Time Spent With Different Kinds of Media

n=236

7=a lot, 1=a little time, 0=None

	Mean	S.D.
Index of Media Consumption (α=.660, Range 1—6.43)	**4.30**	**.969**
• The Internet	6.42	.996
• Music	6.10	1.311
• TV	4.56	1.963
• Movies	4.11	1.871
• Radio	2.83	2.092

• Newspaper	2.33	1.762
• Magazine	2.25	1.770
Combined		
• Internet-Music-Movies	5.54	1.102
• TV-Radio	3.69	1.631
• Newspaper-Magazine	2.29	1.421

Indexes of Personality Traits

Table 4 shows the results for personality traits. Participants were asked to respond to a series of statements measuring three dimensions of personality — innovativeness, venturesomeness and social integration. The researcher used a 7-ponit Likert scale and asked respondents to report the degree to which they agree with each item. The researcher initially combined the items for each of the three concepts to create three independent indexes—an index of innovativeness, an index of venturesomeness, and an index of social integration. However, neither of the indexes for innovativeness or for venturesomeness demonstrated sufficient reliability. The researcher further investigated these two personality traits and found that the index of innovativeness was correlated with the index of venturesomeness at a statistically significant level (r=.490, p<.000). When the nine items measuring innovativeness and venturesomeness were combined, the combined reliability was adequate (Cronbach's α=.707). When one of the nine items—*explore new technologies*—was deleted, the Cronbach's α was improved to α=.720. The researcher assumed that although this group of people may *like to try new things, like to find out new ways, are excited to experience new thing, are willing to take risks to try new things* and so forth, the *explore new technologies* item was simply too broad. Upon consideration, the

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researcher concluded that innovativeness and venturesomeness might, in fact,

measure the same trait. Hence, the researcher combined the remaining eight items to

create the index of innovativeness-venturesomeness.

For the social integration scale, three of the four original items showed strong

reliability (Cronbach's α=.719) but the fourth item—*like to socialize online*—was

deleted (otherwise Cronbach's α=.579). Because the item *socialize online* had the

lowest mean (M=5.24), as shown in Table 4, the researcher surmised that the online

focus of the statement was simply incompatible with the other items.

As shown in Table 4, the index of innovativeness-venturesomeness suggested

students had relatively high levels of this trait (M=5.95, SD =.651). The mean of

social integration index is 6.40 and the SD .745. In sum, these two indexes don't vary

enormously among individuals of this group (SD=.651 and .745), and they can be

used to represent two potentially key personality traits of this group. The high means

for these two indexes suggest that this group of people are generally open-minded to

new things and are likely to take risks to try something new. It also suggested that

they socialize with others in real world.

Table 4 - Personality Traits of Respondents

7=strongly agree, 1=strongly disagree
Mean (SD) for personality indices shown in bold

	Mean	S.D.
Index of Innovativeness-Venturesomeness (α=.720) (n=242)	**5.95**	**.651**
• I don't like to try new things in my life. (Reversed)	6.34	1.211
• I like to learn about new ideas.	6.31	.815
• I like to find out new ways to enrich my life.	6.05	.990
• I like to keep up with new technologies.	5.94	1.079
• I am excited to experience new things in my life.	6.33	.859
• I am curious about new technology.	5.93	1.070
• I am willing to take risks to try new things.	5.53	1.189

• I don't like to try risky things. (Reversed)	5.25	1.561
Deleted item: otherwise **(α=.707)**		
• I don't like to explore new technologies. (Reversed)	5.59	1.732
Index of Social Integration (α=.719) (n=242)	**6.40**	**.745**
• I enjoy interacting with my friends and neighbors.	6.50	.738
• I like to know other people and make new friends.	6.44	.934
• I like to participate in social activities.	6.24	1.10
Deleted item: otherwise **(α=.579)**		
• I don't like to socialize with others online. (Reversed)	5.24	1.631

Index of Knowledge

Table 5 reports the results from the 12-item 8-point Likert scale used to measure

knowledge about online high-definition video. The 12 items had strong reliability

(Cronbach's α=.885) and were combined to create the index of knowledge.

Participants' overall knowledge about online HD video was moderate (M=3.59) and

there was a big difference among individuals in this group in regard with knowledge

perceptions as suggested in the high standard deviation (SD=1.854).

Knowledge scores for the 12-item index ranged from 0 (where 14 participants

indicated they knew nothing about any of the knowledge items) to 7 (where 1

participant demonstrated perfect knowledge of online HD video). Despite possible

distortion that might result when analyzing individual knowledge items, inclusion of

the 14 participants who claimed knowing nothing at all was deemed a reasonable

approach if the purpose was to assess overall knowledge of participants.

Table 5 -- Participants' Knowledge about Online High-Definition Video

n=234   7=strongly agree, 1=strongly disagree, 0=don't know

	Mean	S.D.
Index of Knowledge (α=.885)	**3.59**	**1.854**
• Online high-definition video provides sharper images than regular Internet video.	5.31	2.282

• Movie and TV producers make shows available online in high-definition on sites such as Hulu.com.	4.30	2.783
• Videos on sites such as YouTube.com might be in a wide format but are not necessarily in high- definition.	4.25	2.679
• I can pause, rewind, and fast-forward online high-definition video while watching.	4.01	2.911
• Online HD video is readily available on the Internet now.	3.96	2.805
• The sound quality for online high-definition video is worse than for traditional video.	3.67	2.780
• All online sites charge money to watch high-definition videos.	3.50	3.115
• The screen image for online high-definition video is wider than for traditional video.	3.47	2.976
• Online high-definition video requires purchasing a special computer monitor.	2.97	2.947
• I need a broadband Internet connection to watch online HD video.	2.91	2.887
• I need high bandwidth to watch online HD video.	2.64	2.821
• Any computer can be used to watch high-definition videos; special system requirements are not required.	2.06	2.374

Indexes of Perceived Characteristics of Online High-Definition Video

Table 6 summarizes the results for five sets of measures for Rogers'

concepts—relative advantage, compatibility, complexity, trialability and observability.

The researcher created five indexes by combining related items for each concept. The

index of relative advantage (M=5.43, SD=.952) showed strong reliability (Cronbach's

α=.780) after researcher deleted one item—*Online HD video is not interactive.* The

researcher believes that being interactive might not be the most important advantage

of online HD video, and students didn't realize that online HD video could enhance

their online interactivity. The index of compatibility (M=5.53, SD=1.054) consisted of

four items and also showed strong reliability (Cronbach's α=.806). The index of

complexity (M=5.37, SD=1.122) showed strong reliability (Cronbach's α=.780) after

one item—*Online HD video makes it easy to figure out what to watch*—was deleted.

Audiences might have a lot of reasons to watch one specific program, while the easy

access to the program was not a determinative reason. The researcher increased the

scale reliability of trialability index (M=5.24 SD=1.166) (Cronbach's α=.793) by

deleting one item—*Online HD video costs little money to try* (otherwise Cronbach's

α=.675). The researcher assumed that the reason this deleted item couldn't be reliable

with other three items was that there was an unclear perception of *little money* and

misunderstanding of *try*. The last index related to observability (M=5.09 SD=1.535)

also demonstrated high reliability (Cronbach's α=.842) when one item—*online HD

video is talked about by people in my daily life*— was deleted. This deleted item had a

low mean (M=2.95 SD=1.963), and respondents apparently didn't think that people

talked a lot about online HD video. The means in Table 6 suggest that the perceptions

of the five characteristics were all comparatively high, with means ranging from 5.09

to 5.53, and that college students had generally favorable perceptions of

characteristics of online HD video.

Table 6 -- Participants' Perceptions of Characteristics of Online High Definition Video

7=strongly agree, 1=strongly disagree
Means (SD) for each characteristic shown in bold

	Mean	S.D.
Index of Relative Advantage (α=.780) (n=238)	**5.43**	**.952**
Online high-definition video:		
a) includes TV programs, movies, commercials and user-generated video.	5.81	1.152
b) lets me watch entertainment shows on demand.	5.65	1.238
c) can better fulfill my entertainment needs.	5.43	1.344
d) allows me to personalize the content I consume.	4.86	1.369

Deleted item: otherwise **(α=.711)**

e) is not interactive. (Reversed)	4.28	1.402
Index of Compatibility (α=.806) (n=240)	**5.53**	**1.054**
Online high-definition video:		
• is compatible with my life style.	5.59	1.256
• conflicts with my entertainment habits. (Reversed)	5.56	1.335
• is not compatible with the way I use the Internet. (Reversed)	5.45	1.376
• is compatible with my other media use.	5.41	1.370
Index of Complexity (α=.780) (n=241)	**5.37**	**1.122**
Online high-definition video:		
• is easy to watch.	5.80	1.266
• requires professional software skills. (Reversed)	5.45	1.475
• is difficult to use.(Reversed)	5.38	1.398
• requires a lot of knowledge about computers. (Reversed)	4.86	1.618
Deleted item: otherwise **(α=.711)**		
• makes it easy to figure out what to watch.	4.87	1.466
Index of Tralability (α=.793) (n=235)	**5.24**	**1.166**
Online high-definition video:		
• is convenient for me to try.	5.40	1.334
• is readily available to try.	5.19	1.484
• requires a lot of time to try. (Reversed)	5.15	1.344
Deleted item: otherwise **(α=.675)**		
• costs little money to try.	4.43	1.756
Index of Observability (α=.842) (n=238)	**5.09**	**1.535**
Online high-definition video:		
• is already watched by people in my area.	5.22	1.617
• can be readily found on the Internet.	5.15	1.627
• is a format I've observed already.	4.85	2.028
Deleted item: otherwise **(α=.792)**		
• is talked about by people in my daily life.	2.95	1.963

Indexes of Perceived Benefits and Risks

Table 7 shows the results of the seven measures used to assess the perceived

benefits and risks of adopting online HD video. The index of perceived usefulness had

strong reliability (M=4.77, SD=1.211; Cronbach's α=.800). Similarly, the perceived

playfulness index were reliable and high (M=5.56, SD=1.063; Cronbach's α=.846).

Although the four original items of perceived content quality had showed strong

reliability (Cronbach's α=.802), the researcher decided to delete one item—*Online*

HD video cannot provide the programs that I need—to achieve the higher reliability

(M=5.36, SD=1.066; Cronbach's α=.838). The researcher assumed that it was unfair

to judge the quality of the content against the standard of whether audience need it,

because different audiences might have different needs; the same content of high

quality might satisfy some audiences while it couldn't meet the need of others. The

index of perceived service quality consisted of four items with adequate reliability

(M=4.70, SD=1.048; Cronbach's α=.785). Deleting items didn't help increasing the

scale reliability. The index of perceived control had the strongest reliability

(Cronbach's α=.893) and highest mean score of all the indexes (M=5.68, SD=1.144,).

The index of perceived security risk also had strong reliability (M=4.84, SD=1.204;

Cronbach's α=.832). Three out of four original items of Perceived Cost Risks showed

strong reliability (Cronbach's α=.818) and were used to create an index (M=4.47,

SD=1.319). The researcher deleted one item—*I can watch some online HD video for*

free (otherwise Cronbach's α=.744). It was surprising to the researcher that the deleted

item triggered a low reliability score when included in the index, because this item did

have a high degree of agreement among the respondents (M=5.46). However, not all

online HD videos are free of charge, and free online videos might not be able to meet

audiences' needs or might not be the ones audiences would like to watch.

Table 7-- Perceived Benefits and Risks of Online High-Definition Video Adoption

7=strongly agree, 1=strongly disagree
Indices for each cluster shown in bold

	Mean	S.D.
Index of Perceived Usefulness (α=.800) (n=242)	**4.77**	**1.211**
Online high-definition video:		
a) is a useful resource for me.	5.23	1.517
b) can provide useful information to me.	5.13	1.466
c) is not very useful to my life in general.(Reversed)	4.71	1.577
d) is helpful to enhance effectiveness of my life.	4.01	1.561
Index of Perceived Playfulness (α=.846) (n=240)	**5.56**	**1.063**
Online high-definition video:		
• entertains me.	5.67	1.160
• isn't fun.(Reversed)	5.56	1.413
• gives me enjoyment.	5.56	1.309
• pleases me.	5.40	1.282
Index of Perceived Content Quality (α=.838) (n=241)	**5.36**	**1.066**
Online high-definition video:		
• provides high-quality programs.	5.65	1.181
• provides varied programming.	5.46	1.253
• provides valuable content.	4.97	1.242
Deleted item: otherwise **(α=.802)**		
• cannot provide the programs that I need. (Reversed)	5.07	1.353
Index of Perceived Service Quality (α=.785) (n=241)	**4.70**	**1.048**
Online high-definition video is:		
• satisfying.	5.39	1.169
• easy to access.	4.77	1.465
• very reliable.	4.60	1.266
• available everywhere.	4.04	1.447
Index of Perceived Control (α=.893) (n=240)	**5.68**	**1.144**
• I can watch online HD video according to my own schedule.	5.89	1.155
• I can choose the online HD video content I consume.	5.74	1.272
• I can decide when I want to watch online HD video.	5.62	1.334
• I can pick the location where I watch online HD video.	5.43	1.468
Index of Perceived Security Risks (α=.832) (n=242)	**4.84**	**1.204**
• It is safe to watch online HD video.	5.67	1.332
• Online HD video services can invade my privacy.(Reversed)	4.76	1.541
• Watching online HD video creates computer	4.50	1.481

security risks. (Reversed)		
• Online HD video makes my computer vulnerable to viruses. (Reversed)	4.45	1.543
Index of Perceived Cost Risks (α=.818) (n=240**)**	**4.47**	**1.319**
• Online HD video programs are costly to watch. (Reversed)	4.72	1.487
• The equipment used to watch online HD video is pricey. (Reversed)	4.53	1.586
• The broadband Internet connection through which I can watch online HD video is expensive. (Reversed)	4.14	1.571
Deleted item: otherwise **(α=.744)**		
• I can watch some online HD videos for free.	5.46	1.394

Description of Measures: Dependent Variables

Index of Attitude

Table 8 shows the results for the measures of the respondents' attitudes toward online HD video. The original five items showed strong reliability (Cronbach's α=.858). However, if one item—*Watching online HD video is bad for people*—was deleted, the scale reliability jumped higher (Cronbach's α=.895). As shown in Table 8, the responses to this item were consistent with responses to the other four items, and this item also had a high degree of agreement among respondents (M=5.46, SD=1.317). Considering that all the other items had high means (5.10 to 5.76) and revealed respondents' positive feelings about online HD video, the researcher assumed that the expression of this *bad for people* item was too negative and might cause the drop of reliability. Hence, the researcher combined the other four items to create the index of attitude and achieved stronger reliability among items (Cronbach's α=.895). The resulting index of attitude (M=5.44, SD=1.104) suggested that people in this group generally held positive attitudes toward online high-definition video and

the positive feeling didn't vary much among individuals.

Table 8 – Attitudes toward Online High-Definition Video

N=242 7=strongly agree, 1=strong disagree		
	Mean	S.D.
Index of Attitude (α=.895)	**5.44**	**1.104**
Watching online high-definition video:		
• is a good idea.	5.76	1.236
• is a good experience.	5.74	1.214
• is beneficial to me.	5.16	1.252
• makes me feel good.	5.10	1.360
Deleted item: **(α=.858)**		
• is bad for people. (Reversed)	5.46	1.317

Index of Behavioral Intent

Toward the end of the survey, respondents were separated by asking whether they

had actually watched online HD video. Of the total 242 respondents, 55 respondents

reported not having watched, while 187 indicated they had watched online HD video.

The respondents were then directed to separate scales that measured behavioral intent

or satisfaction.

Table 9 summarizes the results for the 55 respondents who had not watched

online HD video regarding their behavioral intent, using a 4-item 7-point Likert scale.

Three of the four original items showed strong scale reliability (Cronbach's α=.812)

after the item—*I need to use it*—was deleted (otherwise Cronbach's α=.786). The idea

expressed in the deleted item might have been too extreme, which could be revealed

through the low degree of agreement (M=2.51, SD=1.275). Hence, researcher

combined the other three items and created the index of behavioral intention. This

index suggests that those who hadn't adopted online HD video intended to use it, but

the intention was not strong (M=4.90, SD=1.232).

Table 9 – Behavioral Intention among Non-Adopters

7=strongly agree, 1=strongly disagree

	Mean	S.D.
Index of Behavioral Intention (α=.812) (n=55)	**4.90**	**1.232**
• I want to use it.	5.16	1.288
• I don't intend to use it. (Reversed)	4.98	1.569
• I plan to use it.	4.55	1.463
Deleted item: **(α=.768)**		
• I need to use it.	2.51	1.275

Index of Satisfaction

Alternatively, the 187 participants who had already watched online HD video

were asked to report their satisfaction with online HD video performance using 4-item

7-point Likert scale. Table 10 summarizes the results. The four items showed strong

reliability (Cronbach's α=.867) and were combined to create an index of Satisfaction

(M=5.43, SD= 1.158) that suggests students who had already watched online HD

video were generally satisfied by its performance and they might want to continue

watching it.

Table 10 – Satisfaction among Adopters

7=strongly agree, 1=strongly disagree

	Mean	S.D.
Index of Satisfaction (α=.867) (n=187)	**5.43**	**1.158**
• I will continue to watch online HD video.	5.94	1.216
• I am satisfied with online HD video.	5.74	1.304
• Online HD video fulfills my needs.	5.34	1.383
• Online HD video exceeds my expectations.	4.69	1.552

Hypotheses Tests Results

H1 and H2 — Effects of Technology Use and Media Consumption

Hypothesis 1 predicted that greater use of media technologies result in a) more

positive attitudes among all respondents, b) greater behavioral intent for non-users, and c) greater satisfaction among current users. Hypothesis 2 predicted that higher general media consumption and exposure results in a) more positive attitudes among all respondents, b) greater behavioral intent for non-users, and c) greater satisfaction among current users.

To test H1, Pearson r product-moment correlations were computed to check the association between the media technology use and attitude, or behavioral intent, or satisfaction. To test H2, Pearson r product-moment correlations also were computed between media consumption and attitude, or behavioral intent, or satisfaction.

Table 11 and Table 12 summarize the correlation results.

Table 11 shows that only four technologies were positively correlated with participants' attitude toward online HD video at a statistically significant level ($p<.05$); the four technologies are digital video recorders ($r=.133$, $p< .05$), high-definition TV ($r=.233$, $p<.01$), Xbox video games ($r=.233$, $p<.01$), and the broadband Internet ($r=.305$, $p<.01$). None of the ten technologies were significantly correlated with behavioral intent. Table 11 also shows that high-definition TV was the only technology positively correlated with satisfaction at a statistically significant level ($p<.05$), while the correlation between the broadband Internet and satisfaction was marginally significant ($p=.056$). When the effect of the four combined technology use factors were analyzed, the effects on attitudes, behavioral intent and satisfaction were unchanged compared to the individual correlations shown in Table 11.

Notably, this analysis does not control for possible Type I errors resulting from

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running multiple tests for H1. A separate regression analysis was conducted to address this problem and found significantly different results. Only broadband Internet use had a significant effect on attitudes (Beta=.277, p<.000). Only cell phone use had an impact on behavioral intent (Beta=.385, p<.030), although its importance is not clear. None of the technology use predictors had significant effects on satisfaction.

Table 11 – Effects of Technology Use on Outcome Measures

(Pearson r)	Attitude	Behavioral Intent	Satisfaction
Digital Video Disc Player	-.028	-.052	-.035
Digital Video Recorder	.133*	.131	.059
Personal Digital Assistant	.021	-.078	.041
Video Cassette Recorder	-.007	.014	-.005
High-definition TV	.233**	.111	.164*
Video games (e.g. Xbox)	.233**	.167	-.022
Cell Phone	.050	.194	.094
Digital Camera	-.112	-.061	-.061
Desktop/Laptop Computer	.119	.025	.050
Broadband Internet	.305**	.195	.140(p=.056)
***p<.001, **p<.01, *p<.05			
(One tail)			

Table 12 shows that time spent with the Internet was the only media consumption measure that was positively correlated with attitude at a statistically significant level (r=.179, p<.01).For behavioral intent, the only valuable insight was a marginally significant *negative* correlation with magazine readership (r=-.195, p<.077). Table 12 also shows that the consumption of the Internet was positively correlated with satisfaction at a statistically significant level (r=.130, p<.05). However, none of the other measures of media consumption were significantly correlated with satisfaction.

In a separate factor analysis, where the seven separate media use measures were combined into three factors, only the Internet-music-movies factor was significantly

correlated with attitude (r=.124.p<.027), but this can probably be explained by the

underlying correlation between the Internet and attitude. When the items were

combined, neither TV-radio consumption nor newspaper-magazine readership was

correlated with attitude. Although newspaper readership also appeared to be

negatively related to behavioral intent (r=-.132), it was not significant (p<.335), but

probably contributed to the marginally significant *negative* relationship found

between behavioral intent and the readership of newspapers-magazines on a combined

basis (r=-.194, p<.078). Although it would be tempting to argue that print media use

represents a disincentive for adopting online HD video, the findings are simply

inconclusive and might be explained by the insufficient statistical power resulting

from the small number of non-adopters in the sample (n=55). For satisfaction, none of

the three combined factor clusters had significant effects.

Similar to the findings for H1 reported in table 11, this initial analysis did not

control for possible Type I errors resulting from running multiple tests for H2. A

separate regression analysis was conducted to address this problem. Time spent with

the Internet was the only variable related to attitudes (Beta=.220, p<.006). No media

consumption variables had a significant effect on either behavioral intent or

satisfaction.

Table 12 – Effects of Media Consumption on Outcome Measures

(Pearson r)

	Attitude	Behavioral Intent	Satisfaction
The Internet	.179**	.069	.130*
Music	.055	.054	.087
TV	.046	-.076	-.024
Movies	.089	-.030	.001
Radio	-.064	.034	-.018

Newspaper	.011	-.132	-.005
Magazine	-.086	-.195(p=.077)	-.023
Combined			
Internet-Music-Movies	.124*(p=.027)	.025	.074
TV-Radio	-.022	-.022	-.039
Newspaper-Magazine	-.043	-.194 (p=.078)	-.013

***p<.001, **p<.01, *p<.05
(One tail)

To review: For the measures of attitude, H1a was partially supported, but only the use of the broadband Internet was positively related to Attitudes. H2a was also partially supported, but only the consumption of the Internet was positively related to attitude.

For the measures of behavioral intent, H1b was partially supported and H2b was not supported. Only the use of cell phone was significantly correlated with behavioral intent in a positive way, while no media consumption variables were significantly related to behavioral intent in either positive or negative ways.

In the case of satisfaction among adopters, H1c and H2c were not supported because neither technology use nor media consumption was positively related to satisfaction.

H3— Effects of Personality Traits

Hypothesis 3 predicted that having a more open-minded personality results in a) more positive attitudes among all respondents, b) greater behavioral intent for non-users, and c) greater satisfaction among current users. To test H3, Pearson r product-moment correlations were run to ascertain the association between the two indexes of personality traits and attitude, or behavioral intent, or satisfaction.

Table 13 summarizes the correlation results and shows that the index of Innovativeness/Venturesomeness was positively correlated with attitudes (r=.266, p<.001) and satisfaction (r=.347, p<.001) at statistically significant levels. However, the correlation between the index of innovativeness-venturesomeness and behavioral intent was not significant. Table 13 also shows that the index of social integration was *negatively* correlated with behavioral intent (r=-.235, p<.05) but positively correlated with satisfaction (r=.193, p<.01). The correlation between social integration and attitude was not statistically significant.

Table 13 – Effects of Personality Traits on Outcome Measures

(Pearson r)	Attitude	Behavioral Intent	Satisfaction
Innovativeness/Venturesomeness	.266***	.106	.347***
Social Integration	-.014	-.235*	.193**
***p<.001, **p<.01, *p<.05 (One tail)			

H3a was partially supported, because innovativeness-venturesomeness was significantly related to attitude while social integration wasn't.

H3b was not supported, because the correlation between innovativeness -venturesomeness and behavioral intent was not significant and social integration was not positively related to behavioral intent.

H3c was supported, because both innovativeness-venturesomeness and social integration were positively related to satisfaction.

H4 and H5—Effects of Demographics: Gender and Family Income

Hypothesis 4 predicted that when compared to females, males demonstrate a) more positive attitudes, b) greater behavioral intent, and c) greater satisfaction.

Hypothesis 5 predicted that growing up in a household with a higher family income results in a) more positive attitudes among all respondents, b) greater behavioral intent for non-users, and c) greater satisfaction among current users.

To test H4, a simple *t*-test was run to compare the means of attitudes, behavioral intent and satisfaction between males and females. To test H5, a one-way ANOVA was run to compare the means between low family income class, medium family income class and high income class (The one-way ANOVA incorporated a polynomial contrast and Bonferroni post hoc comparisons to take into the ordinal nature of the three levels of family income used in the analysis).

H4 was mostly supported. Table 14 summarizes the results for gender and shows males had higher mean scores than females in attitude (Male M=5.88, Female M=5.11), behavioral intent (Male M=5.53, Female M=4.76), and satisfaction (Male M=5.66, Female M=5.19). The gender differences in attitude (t=5.715, df=240, p<.001) and satisfaction (t=2.852, df=185, p<.005) were statistically significant. The gender differences in behavior intent were in the predicted direction, but not statically significant (t=1.845, df=53, p=.071), which might be caused by the small number of participants who had not yet adopted online HD video and the fact that males were underrepresented in the non-adopters (Male n=10, Female n= 45).

By contrast, H5 was not supported for any of the dependent measures. The effect of family income was not significant on attitudes, behavioral intent or satisfaction

Table 14 – Effects of Gender and Family Income on Outcome Measures.

Means (SD, n)   7=positive, 1=negative

	Attitude	Behavioral Intent	Satisfaction
Gender			
Males	5.88(.970, n=103)	5.53(1.398, n=10)	5.66 (1.017, n=93)
Females	5.11(1.086, n=139)	4.76(1.16, n=45)	5.19(1.25, n=94)
All	5.44(1.104, n=242)	4.90(1.232, n=55)	5.43(1.158, n=187)
	*** (p= .000)	(p=.071)	** (p=.005)
Family Income	n=239	n=53	n=186
<$60,000	5.37(1.116)	5.06 (1.167)	5.28(1.220)
$60,000-$99,999	5.39(1.132)	4.75 (1.401)	5.38(1.146)
$100,000+	5.54(1.063)	4.67(1.054)	5.62(1.043)
	(p=.528)	(p=.595)	(p=.209)

***$p<.001$, **$p<.01$, *$p<.05$

To summarize, the results related to gender show, H4a was supported, because males had more positive attitude than females. H4b was not supported, because the effect of gender was not statistically significant on behavioral intent (p=.071). H4c was supported, because male adopters were more satisfied with online HD video performance than female adopters. Meanwhile, H5a, b and c were not supported, because the effect of family income was not statistically significant on attitudes (p=.528), behavioral intent (p=.595) or satisfaction (p=.209)

H6—Effect of Awareness-Knowledge

Hypothesis 6 predicted that more awareness-knowledge about online HD video results in a) more positive attitudes among all respondents, b) greater behavioral intent for non-users, and c) greater satisfaction among current users. To test H6, Pearson *r* product-moment correlations were computed to look at the association between the participants' awareness-knowledge and attitude, behavioral intent, and satisfaction.

Table 15 summarizes the correlation results and suggests that H6a and H6c were

supported but H6b was not. Knowledge was positively correlated with attitudes

(r=.446, p<.001) and satisfaction (r=.280, p<.001), while the correlation between

knowledge and behavioral intent was not statistically significant (r=.173, p=.108).

Table 15 –Effects of Knowledge on Outcome Measures.

(Pearson r)			
	Attitude	Behavioral Intent	Satisfaction
	n=234	n=53	n=181
Knowledge	.446***	.173	.280***
	(p=.000)	(p=.108)	(p=.000)
***p<.001, **p<.01, *p<.05			
(One tail)			

H7—Effects of Perceived Characteristics of Online HD Video

Hypothesis 7 predicted that more favorable perceptions about characteristics of

online HD video results in a) more positive attitudes among all respondents, b) greater

behavioral intent for non-users, and c) greater satisfaction among current users. To

test H7, Pearson *r* product-moment correlations were calculated to exam the

correlations between the perceived characteristics of online HD video and attitude, or

behavioral intent, or satisfaction.

Table 16 summarizes the correlation results and suggests that H7a and H7c were

supported, while H7b was only partially supported (not significant for two of the five

indexes). The five indexes of characteristics were all positively correlated with

attitude and satisfaction at statistically significant levels (all p<.01). The indexes of

relative advantages, compatibility and trialability were positively correlated with

behavioral intent (p<.01), while the indexes of complexity and observability were not.

Table 16 – Effects of Rogers' Predictor (Characteristics of Online HD Video) on Outcome Measures

(Pearson r)	Attitude	Behavioral Intent	Satisfaction
Relative Advantage	.605**	.333**	.472**
Compatibility	.513**	.553**	.377**
Complexity	.454**	.188	.318**
Trialability	.530**	.334**	.422**
Observability	.548**	.067	.425**
***p<.001, **p<.01, *p<.05			
(One tail)			

H8—Effects of Perceived Benefits and Risks

Hypothesis 8 predicted that more perceived benefits and fewer perceived risks of adopting online HD video result in a) more positive attitudes among all respondents, b) greater behavioral intent for non-users, and c) greater satisfaction among current users. To test H8, Pearson *r* product-moment correlations were computed to look at the association between the indexes of benefits and risks and attitude, or behavioral intent, or satisfaction.

Table 17 summarizes the correlation results and suggests H8a, b and c were supported. As Table 17 shows, the five indexes of perceived benefits in online HD video use (Usefulness, Playfulness, Content Quality, Service Quality and Control) and the two indexes of perceived risks in online HD video use (Security Risks and Cost Risks) were all positively correlated with attitudes, behavioral intent and satisfaction at statistically significant levels (p<.01 or p<.05).

Table 17 – Effects of Perceived Benefits and Risks on Outcome Measures

(Pearson r)	Attitude	Behavioral Intent	Satisfaction
Usefulness	.644**	.506**	.491**

Playfulness	.699**	.337**	.554**
Content Quality	.679**	.477**	.593**
Service Quality	.609**	.311*	.568**
Control	.501**	.372**	.407**
Security Risks	.346**	.242*	.319**
Cost Risks	.253**	.242*	.270**

***p<.001, **p<.01, *p<.05

(One tail)

Secondary Analyses

Hierarchical Regression Effects Analysis

The statistical results presented so far imply that the independent variables have strong effects on attitude and satisfaction but little effects on behavioral intent. To further understand the effects of these variables, the researcher conducted hierarchical regressions on attitudes, behavioral intent, and satisfaction.

Hallahan (2010) explains that hierarchical regression is a form of linear regression that analyzes the effects of multiple interval variables on a dependent variable by entering them into the equation sequentially. In general, the basic or inherent characteristics of participants are entered first (demographics, media use, etc.) followed by more theoretical constructs of interest. At each stage, the focal statistics of interest are a) the cumulative variance explained (R^2) and b) the change in variance explained (change in R^2), based on the calculation of an ANOVA using the number of new variables entered into the equation and the number of subjects in the calculation. Thus the focus is on whether the newly entered variables are significant. As with all linear regression analyses, this procedure also allows analysis of the effect on individual variables based on a Beta statistic calculated for each variable then in the

equation. Beta is a standardized coefficient that takes into account differences in the measures for different variables by subtracting the mean and dividing by the standard deviation. Beta thus represents a standardized measure of the change in the dependent variable (measured in terms of standard deviations) that results from a change of one standard deviation in an independent variable and allows comparison of which independent variables have a greatest effect on the dependent variable. The effects of previously entered variables can be become non-significant (or explained by the new variable) or can be sustained by maintaining a p value of <.05.

Table 18 shows the results of hierarchical regressions performed on three potentially useful explanatory variables: attitudes among all respondents, behavioral intent among non-adopters, and satisfaction among adopters. For each dependent variable, preliminary regressions were first performed for each set of variable to confirm which independent measures were positively related to attitudes, behavioral intent and satisfaction. These results are not reported here. Only significant measures were then entered into the regression models. Gender was treated as a dummy variable were 0=female and 1=male. All other measures were composed of the mean index scores (where high numbers were positively valenced and low numbers were negatively valenced). Variables (only if significant) were entered as groups into the equation in the following order: gender, broadband use, personality traits, knowledge, Rogers' predictors, and perceived benefits and risks.

Table 18 – Hierarchical Regression Analyses for Attitude, Behavioral Intent, and Satisfaction

In each analysis, only variables with statistically significant effects in the preliminary regression analyses were entered in the model. Groups of variables were regressed

against the dependent variable in using the steps shown. Bold data show the results for each step, including the change in variance explained (R^2) for each successive step and the significance of the change explained. The beta and significance level of each item at each step are shown at the right.

a) Attitude toward online HD video among all respondents (N=242)

Step Entered in Equation	R^2	R^2 Chang	df	F Change	Sig.	Beta	Sig.
Gender	**.154**	**.154**	**1, 214**	**38.836**	**.000**		
Gender						.392	.000***
Broadband Use	**.216**	**.062**	**1, 213**	**16.809**	**.000**		
Gender						.334	.000***
Broadband Use						.256	.000***
Personality Traits	**.250**	**.035**	**2, 211**	**4.859**	**.009**		
Gender						.291	.000***
Broadband Use						.227	.000***
SocialIntegration						-.075	.279
Innovativeness/Venturesomeness						.218	.002**
Knowledge	**.315**	**.065**	**1, 210**	**19.985**	**.000**		
Gender						.194	.003**
Broadband Use						.199	.001***
Social Integration						-.017	.804
Innovativeness/Venturesomeness						.162	.020*
Knowledge						.289	.000***
Roger's Predictors	**.555**	**.240**	**3,207**	**37.115**	**.000**		
Gender						.152	.004**
Broadband Use						.094	.062
Social Integration						-.047	.393
Innovativeness/Venturesomeness						.035	.548
Knowledge						.133	.029*
Relative Advantage						.423	.000***
Complexity						.145	.016*
Observability						.121	.075
Benefits and Risks	**.696**	**.141**	**4,203**	**23.635**	**.000**		
Gender						.144	.001***
Broadband Use						.076	.072
Social Integration						-.031	.506
Innovativeness/Venturesomeness						-.040	.413

						Beta	Sig.
Knowledge						.090	.077
Relative Advantage						.110	.047*
Complexity						.075	.143
Observability						.027	.653
Usefulness						.196	.001***
Playufulness						.189	.003***
Content Quality						.179	.005***
Service Quality						.135	.020***

b) Behavioral intent to adopt online HD video among non-adopters (n=55)

Step Entered in Equation	R^2	R^2 Change	df	F Change	Sig.	Beta	Sig.
Personality Traits	**.061**	**.061**	**1, 53**	**3.406**	**.071**		
Social Integration						-.248	.071
Rogers' Predictors	**.365**	**.304**	**2, 53**	**14.629**	**.000**		
Social Integration						-.241	.035*
Compatibility						.551	.000***
Benefits and Risks	**.445**	**.080**	**3, 53**	**13.377**	**.000**		
Social Integration						-.194	.076
Compatibility						.435	.000***
Usefulness						.311	.010**

C)   Satisfaction with online HD video performance among adopters (n=187)

Step Entered in Equation	R^2	R^2 Change	df	F Change	Sig.	Beta	Sig.
Gender	**.043**	**.043**	**1,172**	**7.786**	**.006**		
Gender						.208	.006**

Broadband Use -- Not significant, not entered into model

Personality Traits	**.152**	**.109**	**1,171**	**21.989**	**.000**		
Gender						.147	.042*
Innovativeness/Venturesomeness						.336	.000***
Knowledge	**.178**	**.025**	**1,170**	**5.246**	**.023**		
Gender						.088	.241
Innovativeness/Venturesomeness						.302	.000***
Knowledge						.175	.023*
Roger's Predictor	**.323**	**.145**	**1,169**	**36.300**	**.000**		

Gender						.069	.315
Innovativeness/Venturesomeness						.185	.008**
Knowledge						.136	.054*
Relative Advantage						.406	.000***
Benefits and Risk	**.470**	**.147**	**3,166**	**15.371**	**.000**		
Gender						-.004	.951
Innovativeness/Venturesomeness						.069	.287
Knowledge						.090	.155
Relative Advantage						.069	.381
Playfulness						.204	.016*
Content Quality						.219	.016*
Service Quality						.246	.003**

*** p<.001, ** p<.01, *p<.05

Effects on Attitude

As shown in Table 18a, demographic variables of participants were added into the

hierarchical regression model first, while variables which represented more theoretical

attributes were added sequentially. In the first step, gender explained 15.4% of the

variance explained. In the second step, the Broadband Internet use added 6.2%. In the

third step, social integration proved to be not significant, but

innovativeness-venturesomeness added 3.5% to the variance explained, which

contributed to the 25% cumulative variance. In the fourth step, knowledge added

6.5% to the variance explained in the model. In the fifth step, the effects of relative

advantage and complexity diminished the effects of other factors and pushed the

cumulative variance explained to 55.5%. In the last step, the four benefits and risks

factors overtook the effects of the other variables except gender and relative

advantage, which sustained their explanatory power. In sum, this regression model

explained 69.6% of the variance in the attitude measures.

Effects on Behavioral Intent

As shown in Table 18b, social integration explained 6.1% variance in the first step in the regression model. However, the effect was only marginally significant (p=.071) and social integration was *negatively* related to behavioral intent (Beta=-.248). In the second step, compatibility added 30.4% to the variance explained and it enhanced the explanatory power of social integration (p<.05). In the last step, usefulness only added 8.0% to the variance explained and it overtook the explanatory power of social integration which became non-significant (p=.076).

Effects on Satisfaction

As shown in Table 18c, variables were added into the regression model in a similar order as they were in Table 18a. In the first step, gender was significant but explained only 4.3% of the variance. In the second step, innovativeness-venturesomeness added 10.9% to the variance explained. In the third step, knowledge explained 2.5% more of the variance but eliminated the effects of gender. In the third step, relative advantage increased the cumulative variance explained to 32.3%. In the last step, the benefits and risks factors added 14% to the variance explained but eliminated the effects of the other variables. The final model accounted for 47.0% of the variance explained.

Chapter V

DISCUSSION

Summary of Findings

<u>Summary of Supported Hypotheses</u>

As the results for the hypotheses tests indicate, college students who spend more time on the Internet and who use the broadband Internet have more positive attitudes toward online high-definition video. Students who are more innovative and venturesome have more positive attitudes towards online high-definition video and are more satisfied with its performance. Students who are more socially oriented are more satisfied with watching online high-definition video. Compared to female students, male students have more positive attitudes toward online high-definition video and are more satisfied with watching online high-definition video. Students who have more knowledge about online high-definition video have more positive attitudes toward online high-definition video and are more satisfied with its performance than students who have less knowledge about it. Not surprisingly, students who have more perceptions about the five characteristics of online high-definition video also have more positive attitudes towards online high-definition video, and feel more satisfied with its performance than those who have fewer perceptions. If students perceived more relative advantage, compatibility and observability of online HD video, they have stronger intent to adopt it. Students who perceived more benefits and fewer risks

of watching online high-definition video have more positive attitudes towards online high-definition video, have stronger intent to adopt online high-definition video, and are more satisfied with its performance.

Summary of Unsupported Hypotheses

College students use various kinds of technologies and consume different kinds of media, but their overall technology use and overall media consumption does not necessarily lead them to adopt online high-definition video. Instead, the use of *specific* technologies and media appear to drive positive attitude, behavioral intent, and satisfaction. More innovative and venturesome personality doesn't encourage students to adopt online high-definition video. Students who are more socially oriented don't have more positive attitudes towards online high-definition video and don't present stronger intent to adopt online high-definition video. Although male students (M=5.53) demonstrate more positive attitudes than female students (M=4.76), the male students among the non-adopters (n=10) did not demonstrate a higher behavioral intent to adopt online high-definition video when compared to females (n=45). Students who are from higher income families do not have more positive attitudes towards online high-definition video, don't have stronger intent to adopt online high-definition video, and don't feel more satisfied with online high-definition video performance than students from lower family-income backgrounds. Among non-adopters, students who have more knowledge about online high-definition video don't have stronger intent to adopt it.

Surprising and Unexpected Findings

In this study, the uses of technologies couldn't be combined as a single index. Neither could media consumptions. This is surprising and contradicts Rogers' (2003, p.14) "technology cluster" assumption.

The fact that greater use of the broadband Internet does not increase students' satisfaction with online high-definition video is really surprising because the access to the broadband Internet is a necessary condition for students to watch online high-definition video. That is to say, students must have access to the broadband Internet if they have already watched online high-definition video. This finding implies that once students use the Broadband Internet to watch online high-definition video, their satisfaction is not determined merely by access to the Broadband Internet.

As mentioned earlier, social integration was *negatively* related to behavioral intent. This result was unexpected because the researcher predicted that students who were more socially oriented would have stronger intent to adopt online high-definition video given that online HD video is an interactive communication technology. This result implies that students who are highly socialized in the real world either might not be motivated to watch online high-definition video or simply don't have time to watch online high-definition video.

Secondary Analysis Findings

Students who spend more time on the Internet also spend more time listening to music and watching movies (Table 12), they also have more favorable attitudes towards online high-definition video. This indicates that students are attracted to

online high-definition video for its entertainment value as a way to enjoy music and movies. When they use the Internet, they might watch high-definition MTV programs online and watch HD movies online in addition to other online activities.

The hierarchical regression models (Table 18) indicate that knowledge is not an adequate predictor of attitude, behavior intent or satisfaction. This result might be explained by the fact that college students share similar lifestyles in terms of online video use and detailed knowledge about details pertaining to online high-definition video is not required to actually use and enjoy online high-definition video.

The regression models also summarize what predictors can best measure online high-definition video adoption among college students. Gender (being male), perceived relative advantage, perceived usefulness, perceived playfulness, perceived content quality, and perceived service quality are good predictors of attitude toward online high-definition video among college students. This implies that students form attitudes on the basis of the perceived enjoyment and superiority of online high-definition video when compared to other types of video watching. For students' behavioral intent, perceived compatibility and perceived usefulness are best predictors. This implies that students will consider whether online high-definition video is useful for them and compatible with their other technology uses before they decide to adopt it. However, strong social orientation might work against adoption because users might obtain gratifications from other sources. The best predictors of students' satisfaction with online high-definition video are perceived playfulness, perceived content quality, and perceived service quality. This implies that once students start

watching online high-definition video, it is the high-quality videos and actual enjoyment that keeps them watching.

Implications

Although there are some unexpected findings, this research generally supports Rogers' (2003) diffusion of innovations theory, as a model for understanding individual decision-making processes.

The research findings suggest that online high-definition video is successfully diffused among college students and it has potential to be promoted to the general public. For online high-definition video, college students are the early adopters (Rogers, 2003). They are useful sources for providing feedback to service providers and content producers via online surveys and other consumer research, and for providing recommendations to their peers.

The findings suggest that "technology use" and "media consumption" are umbrella constructs that might be too broad as predictors of media adoption. Some technologies and media types should not have been counted for the "technology cluster" in this study (Rogers, 2003). Two possible reasons: (1) certain technologies are continuously being replaced by new technologies and have no connection to today's digital world; and (2) people can't spend equally long time on all kinds of media because consumption of one medium will take up the time spent on other media. Although the total amount of time spent with media (vis-à-vis other activities in people's lives) is creeping upward, overall high levels of media use might create a

ceiling effect that minimizes the effects of small variances of media use.

Knowledge level of online high-definition video among college students is not high (M=3.59, based on an 8-point scale). The initial report for familiarity shows that 49 out of 242 participants (nearly 20%) were not even sure whether they were familiar with online high-definition video, which underscores the fact that college students, as early adopters, didn't have much detailed knowledge about online HD video. On the other hand, knowledge might not be a necessary condition to use online high-definition video, at least among college students who have already adopted personal computing and/or the Internet use. For college students, knowledge might not be a good predictor to measure online high-definition video adoption because students are exposed to similar digital environments and don't vary much in their knowledge perceptions about online HD video. However, the general public might vary in its perceived knowledge about online high-definition video. Therefore, greater knowledge could be a good predictor of online high-definition video adoption among the general public-at-large.

The general public-at-large will also vary more widely in terms of technology use, media consumption, personality traits, their perceptions about characteristics of online high-definition video, and their perceptions about benefits and risks of watching online high-definition video. This study showed that there are big differences in knowledge and perceptions among adopters and non-adopters. Therefore, these predictors of attitude, behavior intent and satisfaction might also apply to the general public-at-large.

Family income is not a good predictor of online high-definition video use among college students, but it might be a good predictor for the general public. In part, the non-significant result for college students might be explained by the ubiquitous nature of personal computers and the broadband Internet connections in families with children—even in lower middle class and poor families that spend money on entertainment while foregoing other luxuries. Importantly, other demographic factors might be good predictors (including education, age, marital status, household size, and professional career/lifestyle) among the population-at-large. However, these differences might quickly conflate as digital devices and more portable personal computers (such as computer tablets) are promoted to the mass market.

This study also has other implications. For example, males are more likely to adopt online high-definition video than females. Once students have already adopted online high-definition video, the appeal appears to be sustained by the actual enjoyment, not just perceptions about relative advantages. When it comes to actual adoption, high-quality content is more appealing than free not-so-good content. In addition, the acknowledgement that online high-definition video is compatible with other technologies and the declaration of what audience can benefit from watching it can help with promoting online high-definition video among the general public, because compatibility and usefulness are the two main factors that had significant effects on behavioral intent.

Strengths of Study

This study successfully applied Rogers' theorizing about the individual decision-making process to the adoption of online high-definition video among college students. The results generally corresponded with Roger's assumptions about the characteristics of an innovation. In addition, this study examined the effects of perceived benefits and risks on online high-definition video adoption. That is to say, this study not only supported, but also complemented Rogers' diffusion of innovations model. Since the participants are all college students, this study can be considered as a case study on the early adopters of online high-definition video.

Limitations of Study

The study has limited external validity due to its use of a convenient sample—college students from one class at only one university. The research findings might not be generalized to the population as whole. College students are probably early adopters of online high-definition video, but the validity of study findings are not clear for other adoption groups—innovators, early majority, late majority and laggards (Rogers, 2003).

Watching online high-definition video on a computer is a specific application of HD IPTV which delivers HD signal over IPTV network (Allen, 2007). So the study findings might not be valid for other kinds of HD IPTV applications such as watching high-definition programs on HDTV set through an IP network.

Because there is discrepancy between responses on "familiarity" (used as a

screening question) and "have actually watched" (completed after responding to various questions), some questions in the survey biased responses. Participants might have learned something about the technology while responding to the survey, which might have biased or affected their answers.

Replication of the results reported also is susceptible to significant history affects due to the rapid changes taking place in the marketplace. This study was conducted in November 2009. Since then, Websites such as YouYube.com already have expanded their offerings of high-definition videos and HD format video cameras have become widely promoted by camera-makers. Indeed, it is likely that HD will quickly become the standard for online video production, and thus consumers will have few alternatives but to watch HD videos online.

There was some confusion about concepts related to media consumption. Media consumption was supposed to be the overall consumption of various kinds of media content. However, the researcher didn't distinguish media content from media distribution modes in the study. The results for high music consumption in this study might be explained by the fact that "music" is a type of content that can be enjoyed using various media distribution channels such as iPod (MP3 player), radio, CD, music downloads (e.g. iTunes), and so forth. The same problem applies to movies. A movie is a type of content that can be enjoyed in various ways (watched in the theater, using a DVD player, streaming online, using portable devices, and so on). The Internet, TV, radio, newspaper and magazine were media distribution channels, not specific forms of media content.

Last, this study was conducted in America and the findings might not be valid in other countries or other various cultures. The same study may end up with different results, because the analog-to-digital transition may have been completed for a long time in some countries while it is still not going to take place in some other countries in the near future.

Recommendations on Improvement of Study

If replicated, the researcher would improve this study in various ways. To best represent the student population at one university and enhance the external validity of the study, the researcher will use a random sample instead of using the convenient sample—students from one class. Given that not all the technologies are connected to online high-definition video use, researcher should reconsider the group of technologies when applying Roger's (2003) "technology cluster" assumption (p.14). Given that different media fulfill different needs, the researcher won't try to create a single index of media consumption. Instead, the researcher will distinguish media content from media distribution modes, focus on the consumption of various media content, and investigate the relationship between different kinds of media content consumption and online HD video adoption. Given that college students don't have much knowledge about online HD video, the researcher needs to re-exam the relationship between knowledge and the characteristics of decision-makers (gender, age, income, personality traits, media consumption and so forth) in order to understand what are the best predictors of knowledge. For personality traits, the

researcher would retest the combined index for innovativeness and venturesomeness, further investigate social integration, and consider alternative personality traits that might predict the adoption of online high-definition video. The researcher might also delete low reliability items and clarify potentially ambiguous terms such as "little money." If time and budget permit, a pre-test would be useful to exam the measurements.

Future Research

To fully understand the adoption of HD IPTV, researchers need to conduct other research on the general public on other types of HD IPTV including using HDTV sets to watch "over-the-top TV" (Bernoff, Lopez, Golvin, & Baer, 2007; Helft, 2009)—TV programming that is delivered over the Internet.

The popularity of mobile devices also suggests the possibility of wireless HD signal transmission. As more people have access to wireless broadband Internet and more people use mobile phones through 4G networks instead of 3G (LaGesse,2010 & Toothman, 2010), "Quadruple Play" service (Shin, 2009) may eventually replace "Triple Play" service and become the future standard by bundling mobility to the legacy services of the Internet, telephone and TV. If watching streaming HD videos on mobile phones or on other portable devises contributes to the high use of 4G networks, the technology convergent with portable computer, the broadband Internet, mobile phones and streaming HD programs might really take off and boost the market by granting the consumers the convenience of mobility. However, such a conclusion

needs to be tested in future research. Therefore, research about mobility and HD IPTV

should be conducted in order to predict market trends and promote the variety of HD

IPTV services.

Shin did several research studies on IPTV (Shin, 2007; Shin 2008), while

other researchers studied DTV or HDTV (Atkin, et al., 2003, Baaren et al., 2008a,

Baaren et al., 2008b, Chan-Olmsted and Chang, 2006). Now is the right time for

researchers to understand how high-definition will impact IPTV.

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Appendices

Appendix 1: Survey Questionnaire

Online High-Definition Video Survey

1. How much time do you spend using each of the following on a typical day? Check the number that best describes your use, where 7=a lot and 1=little. Check **zero** if you **never** use it.

	A Lot of Time			Some Time		A Little Time		None
Newspaper	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
Magazine	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
TV	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
Radio	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
The Internet	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
Movies	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
Music	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0

2. Below are listed some media technologies. For each, check the number that best describes how frequently you use this media technology, where 7=very often and 1=rarely. Check zero if you never use it.

	Very Often			Often		Rarely		Never
Digital Video Disc Player	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
Digital Video Recorder	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
Personal Digital Assistant	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
Video Cassette Recorder	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
High-definition TV	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
Video games (e.g. Xbox)	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
Cell Phone	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
Digital Camera	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
Desktop/Laptop Computer	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0
Broadband Internet	❏7	❏6	❏5	❏4	❏3	❏2	❏1	❏0

3. You are: (check one)   ❏Male   ❏Female

4. Are you familiar with or have you heard of **online high-definition video**?

   ❏Yes   ❏No   ❏I am not sure.

5. Please tell us a little about yourself. Check the number that best describes the degree to which you agree or disagree with the following statements, where 7=strongly agree and 1=strongly disagree.

	Strongly Agree			Neutral			Strongly Disagree
a) I like to learn about new ideas.	❏7	❏6	❏5	❏4	❏3	❏2	❏1
b) I like to keep up with new technologies.	❏7	❏6	❏5	❏4	❏3	❏2	❏1
c) I don't like to explore new technologies.	❏7	❏6	❏5	❏4	❏3	❏2	❏1
d) I don't like to try new things in my life.	❏7	❏6	❏5	❏4	❏3	❏2	❏1
e) I like to find out new ways to enrich my life.	❏7	❏6	❏5	❏4	❏3	❏2	❏1
f) I don't like to try risky things.	❏7	❏6	❏5	❏4	❏3	❏2	❏1
g) I am willing to take risks to try new things.	❏7	❏6	❏5	❏4	❏3	❏2	❏1
h) I am curious about new technology.	❏7	❏6	❏5	❏4	❏3	❏2	❏1
i) I am excited to experience new things in my life.	❏7	❏6	❏5	❏4	❏3	❏2	❏1
j) I like to participate in social activities.	❏7	❏6	❏5	❏4	❏3	❏2	❏1
k) I don't like to socialize with others online.	❏7	❏6	❏5	❏4	❏3	❏2	❏1
l) I enjoy interacting with my friends and neighbors.	❏7	❏6	❏5	❏4	❏3	❏2	❏1
m) I like to know other people and make new friends.	❏7	❏6	❏5	❏4	❏3	❏2	❏1

PLEASE READ: High-definition video differs in various ways from traditional video you might be familiar with. Among these, the screen image is 16 units wide and 9 units high (16:9 aspect ratio).

6. Below are statements about **online high-definition video**. Check the number that best describes the degree to which you agree or disagree with the following statements, where 7= strongly agree and 1=strongly disagree. Check **zero** if you **don't know**.

	Strongly Agree			Neutral		Strongly Disagree		Don't Know
a) The screen image for online high-definition video is wider than for traditional video.	❑7	❑6	❑5	❑4	❑3	❑2	❑1	❑0
b) Online high-definition video provides sharper images than regular Internet video.	❑7	❑6	❑5	❑4	❑3	❑2	❑1	❑0
c) The sound quality for online high-definition video is worse than for traditional video.	❑7	❑6	❑5	❑4	❑3	❑2	❑1	❑0
d) Online high-definition video requires purchasing a special computer monitor.	❑7	❑6	❑5	❑4	❑3	❑2	❑1	❑0
e) I can pause, rewind, and fast-forward online high-definition video while watching.	❑7	❑6	❑5	❑4	❑3	❑2	❑1	❑0
f) All online sites charge money to watch high-definition videos.	❑7	❑6	❑5	❑4	❑3	❑2	❑1	❑0
g) Online HD video is readily available on the Internet now.	❑7	❑6	❑5	❑4	❑3	❑2	❑1	❑0
h) I need a broadband Internet connection to watch online HD video.	❑7	❑6	❑5	❑4	❑3	❑2	❑1	❑0
i) I need high bandwidth to watch online HD video.	❑7	❑6	❑5	❑4	❑3	❑2	❑1	❑0
j) Videos on sites such as YouTube.com might be in a wide format but are not necessarily in high-definition.	❑7	❑6	❑5	❑4	❑3	❑2	❑1	❑0
k) Movie and TV producers make shows available online in high-definition on sites such as Hulu.com.	❑7	❑6	❑5	❑4	❑3	❑2	❑1	❑0
l) Any computer can be used to watch high-definition videos; special system requirements are not required.	❑7	❑6	❑5	❑4	❑3	❑2	❑1	❑0

7. Even if you have not actually watched **online high-definition video**, please think about the possible attributes of this new form of online video. Check the number that best describes the degree to which you agree or disagree with the following statements, where 7= strongly agree and 1=strongly disagree.

Online high-definition video:	Strongly Agree			Neutral			Strongly Disagree
a) can better fulfill my entertainment needs.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
b) allows me to personalize the content I consume.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
c) lets me watch entertainment shows on demand.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
d) is not interactive.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
e) includes TV programs, movies, commercials and user-generated video.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
f) conflicts with my entertainment habits.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
g) is compatible with my life style.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
h) is not compatible with the way I use the Internet.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
i) is compatible with my other media use.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
j) is difficult to use.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
k) is easy to watch.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
l) makes it easy to figure out what to watch.	❑7	❑6	❑5	❑4	❑3	❑2	❑1

	Strongly Agree			Neutral			Strongly Disagree
m) requires a lot of knowledge about computers.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
n) requires professional software skills.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
o) is convenient for me to try.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
p) is readily available to try.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
q) requires a lot of time to try.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
r) costs little money to try.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
s) is already watched by people in my area.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
t) is a format I've observed already.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
u) is talked about by people in my daily life.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
v) can be readily found on the Internet.	❑7	❑6	❑5	❑4	❑3	❑2	❑1

8. Even if you have not actually watched **online high-definition video,** please think about the possible outcomes of watching this new form of online video. Check the number that best describes the degree to which you agree or disagree with the following statements, where 7= strongly agree and 1=strongly disagree.

Online high-definition video

	Strongly Agree			Neutral			Strongly Disagree
a) is a useful resource for me.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
b) can provide useful information to me.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
c) is not very useful to my life in general.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
d) is helpful to enhance effectiveness of my life.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
e) gives me enjoyment.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
f) isn't fun.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
g) entertains me.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
h) pleases me.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
i) provides varied programming.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
j) provides high-quality programs.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
k) cannot provide the programs that I need.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
l) provides valuable content.	❑7	❑6	❑5	❑4	❑3	❑2	❑1

Online high-definition video is:

m) very reliable.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
n) satisfying.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
o) available everywhere.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
p) easy to access.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
q) I can decide when I want to watch online HD video.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
r) I can pick the location where I watch online HD video.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
s) I can choose the online HD video content I consume.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
t) I can watch online HD video according to my own schedule.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
u) It is safe to watch online HD video.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
v) Online HD video services can invade my privacy.	❑7	❑6	❑5	❑4	❑3	❑2	❑1
w) Online HD video makes my computer vulnerable to viruses.	❑7	❑6	❑5	❑4	❑3	❑2	❑1

	Strongly Agree			Neutral			Strongly Disagree
x) Watching online HD video creates computer security risks.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
y) The equipment used to watch online HD video is pricey.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
z) The broadband Internet connection through which I can watch online HD video is expensive.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
aa) Online HD video programs are costly to watch.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
bb) I can watch some online HD videos for free.	☐7	☐6	☐5	☐4	☐3	☐2	☐1

9. Check the number that best describes the degree to which you agree or disagree with the following statements, where 7=strongly agree and 1=strongly disagree.

Watching online high-definition video:

	Strongly Agree			Neutral			Strongly Disagree
a) is a good idea.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
b) is a good experience.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
c) is bad for people.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
d) is beneficial to me.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
e) makes me feel good.	☐7	☐6	☐5	☐4	☐3	☐2	☐1

10. Have you actually watched **online high-definition video** on sites such as Hulu.com, YouTube.com or vimeo.com?

☐Yes   ☐No

11. **If no,** what is your intention to adopt or begin to watch online high-definition videos? Check the number that best describes the degree to which you agree or disagree with the following statements, where 7= strongly agree and 1=strongly disagree.

	Strongly Agree			Neutral			Strongly Disagree
a) I want to use it.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
b) I plan to use it.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
c) I don't intend to use it.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
d) I need to use it.	☐7	☐6	☐5	☐4	☐3	☐2	☐1

11. **If yes,** how would you describe your experience? Check the number that best describes the degree to which you agree or disagree with the following statements, where 7= strongly agree and 1=strongly disagree.

	Strongly Agree			Neutral			Strongly Disagree
e) I am satisfied with online HD video.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
f) Online HD video exceeds my expectations.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
g) Online HD video fulfills my needs.	☐7	☐6	☐5	☐4	☐3	☐2	☐1
h) I will continue to watch online HD video.	☐7	☐6	☐5	☐4	☐3	☐2	☐1

12. Which of the followings best describes the combined income of the adult(s) in the primary household where you grew up during high school? (check one)

☐less than $20,000   ☐$20,000-$39,999   ☐$40,000-$59,999

☐$60,000-$79,999   ☐$80,000-$99,999   ☐$100,000 or more

Appendix 2: Alternative Writing Assignment

Hallahan-Song In-Class Online HD Video Survey
Appendix 2 – Alternative Writing Assignment

JTC100 Media in Society

WATCHING ONLINE VIDEO

As an alternative to the in-class survey being conducted in class today, you may opt to write a paper not to exceed two double-spaced typewritten pages, as described as below. Your paper must be e-mailed by no later than December 1, 2009 to Bevin Song <bevin.song@colostate.edu>. Be sure to retain a copy of your paper. Your extra credit points will appear in the JTC 100 gradebook on RamCT by no later than Friday, December 4. You are responsible for verifying that your extra credit points are properly posted. This extra credit is only available to students who were in class and who opted not to participate on the day of the research study.

Assignment: Watching videos online is becoming an increasing important form of obtaining information and being entertained. Based on your experience in using the Internet and mobile communications, what are some of the ways that video is being used on Web sites, on video sharing sites such as YouTube.com, on entertainment sites such as Hulu.com, and on social networking sites such as Facebook and MySpace? Do you think videos are an effective form of online communication compared to text or still images? Why? What are the advantages and disadvantages of watching videos online or using mobile devices compared to traditional television or home video systems (DVDs, VCRs, DVRs, etc.)? Do you think there is much of a difference between *traditional* video formats and *high-definition* video that has begun to be shown online? Explain.

Appendix 3: Briefing Script

Hallahan/Song In-Class Survey on Online HD Video
Appendix 3-- Briefing Script

Instructor introduces Bevin Song and explains that he is a graduate student in
the Department of Journalism and Technical Communication who will explain
an optional research project students are invited to participate in during class.
Instructor departs.

*In the study we are conducting today, we'd like to get your ideas about online
high-definition video, a new form of video that is expected to be the standard
when people watch videos online in the future.*

*We are handing out a questionnaire. Please carefully read the cover sheet,
which provides your Informed Consent to participate in the study. If you
choose to participate, you can earn five extra credit points in this class. Please
note that your participation is completely voluntary and you may elect to end
your participation at any time without penalty. To earn extra credit, you also
have the alternative of writing a two-page paper on a related topic and turn it in
by December 1, 2009 for credit. If you prefer that option, please see me for
instructions.*

*If you choose to participate -- in order to obtain the extra credit you must print
your name, sign and date the separate beige form. Please do not make any other
identifying marks on the questionnaire. Please be sure to read and follow the
instructions carefully in the questionnaire. Please be sure to read the brief
description at the top of page 2. For several of the questions, if you are not
familiar with online high-definition video, please base your responses on your
perceptions. Complete it at your own pace--it should take about 12-15 minutes.
Upon completing the questionnaire, please sit quietly and wait for instructions.
Thanks for your cooperation.*

Upon completion, the researcher will ask students to come forward, to separate
the Informed Consent from the questionnaire, and to place them in separate
boxes in the front of the room. Students will then return to their seats. When
all questionnaires are collected the proctor will thank students for their
participation and depart. Regular class will resume.

Appendix 4: Informed Consent Sheet

INSTRUCTIONS AND INFORMED CONSENT FORM

ONLINE HIGH-DEFINITION VIDEO USE AMONG COLLEGE STUDENTS

You have the opportunity to participate in an extra credit assignment for this class by completing the attached questionnaire as part of this research study.

Here is important information you should know:

- You may participate even if you do not watch videos online. The purpose of the study is to investigate students' opinions about new technology.
- Your participation is entirely voluntary. If you choose to not participate, you can still earn extra credit by completing an alternative assignment if a) you sign up today and b) complete the assignment by December 1. Ask a proctor for details. There is no cost to participate in the study.
- You may withdraw your participation at any time, although you are encouraged to complete the entire questionnaire. The survey will take about 15 minutes. Your opinions matter to us!
- There is no known benefit to you. However, your opinions might help improve the design of online videos in the future.
- There are no known risks beyond those you might encounter in completing any other opinion survey.

It is not possible to identify all possible potential risks in research procedures, but the researcher(s) have taken reasonable safeguards to minimize any known and potential, but unknown, risks.

- Your answers will be anonymous. The results will be tabulated for statistical purposes only.
- For questions about your rights as participants in this study, contact Janell Barker in Colorado State's Research Integrity and Compliance Review Office, (970) 491-1655
- For questions about the survey after today, or the status of your extra credit, call co-principal investigator Bevin Song, 970/492-9595. Mr. Song is completing the study for his master's thesis under the direction of Professor Kirk Hallahan, who serves as the study's principal investigator. The course instructors will not be in class while you complete the survey, will not know whether you chose to participate, and will not have access to your signed consent form later.

Instructions to complete the questionnaire and <u>earn your five extra credit points</u>:

- Carefully read and understand these instructions.
- Sign and print your name in the spaces below.   Include today's date.
- Do <u>not</u> begin the questionnaire until instructed to do so.
- Do <u>not</u> write your name on the survey.
- Upon completing the questionnaire, sit quietly and wait for instructions.
- To turn in your questionnaire, detach this signed consent form and place it in the designated box in the front of the room. Then, place your questionnaire in the other box.
- Your printed name must be legible in order to receive extra credit points. Extra credit scores will be posted in the RamCT gradebook next week.

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I have read the above and have agreed voluntarily to participate in this survey.   In exchange, I understand I will receive 5 extra credit points in this class.

_____   _____   ☐ 11 a.m. section

Printed Name   Date
☐ 12 noon section

_____

Signature

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