

Testing a Model of Users' Web Risk Information Seeking Intention

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Abstract

This study aims to understand the web risk information seeking intention of end users. Applying the risk information seeking and processing model (RISP), this paper examines end users' web risk information seeking intention. Hypotheses are proposed concerning the intention to seek information about one emerging web risk: cross site scripting. Data were collected from 201 college students in the southern United States. The results suggest that information insufficiency, informational subjective norm, and affective response are positively related to web risk information seeking intention. In addition, informational subjective norm and negative affect are positively related to information insufficiency. Negative affect is determined by perceived vulnerability and perceived severity of the web risk. The study proves RISP to be an adequate model to use in the web risk context and provides an enriched understanding about users' intention to seek web risk information.

Keywords: communication effectiveness, computer crime, web risk, information security

Introduction

Evolved from a mere catalog tool, the web now has become a platform for electronic commerce, social networking, entertainment, and much more; however, more aggressive risks appear with increasing web functionalities (Waldow & Gorelik, 2009). Many forms of malicious web attacks can cause great damage to individuals as well as organizations. According to a security study

conducted between January 1st, 2006, and August 25th, 2010 (WhiteHat Security, 2011), the average website has thirteen serious unresolved vulnerabilities. The worst industries are Information Technology, Retail, and Education with an average of 24, 17, and 17 serious vulnerabilities per website, respectively. With these alarming numbers of vulnerabilities, end users may face the danger of disclosing their credit card number,

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social security number, personal health information, and other private information. To prevent potential losses, end users should actively seek information about web risks to learn how to cope with them. In this paper, risk is defined as things, forces, or circumstances that pose danger to people or to what they value (Stern & Fineberg, 1996).

Much research has been conducted on end user security. However, there are several gaps that need to be addressed. First, there is a paucity of research on users' web risk information seeking. Researchers often focus on attitude towards the risks or protective intention, but this stream of research pays little attention to the mechanism that occurs during users' risk information seeking process. Second, most research has targeted traditional security risks such as spyware or viruses in email attachments (Dinev & Hu, 2007; Ng, Kankanhalli, & Xu, 2009). New emerging web risks have not been investigated. Crimes on the web today are very different from the traditional network attacks. The browsers have become increasingly complex with access to more powerful scripting tools and external plug-ins, attracting more stealthy attacks (Provos, Rajab, & Mavrommatis, 2009).

The article intends to address one question: What motivates a user to actively seek web risk information? To answer the question, the study draws from communication research and adapts the risk information seeking and processing model (RISP) to predict users' intention to actively seek web risk information. The paper is organized as follows: first, RISP and the new risks on the web are detailed. Next, the survey methodology is described and the results are analyzed. Finally, academic and practical implications of this research are explored.

Literature Review

Risk Information Seeking

The risk information seeking and processing model (RISP) was proposed by Griffin, Dunwoody, and Neuwirth (1999). Adapted and synthesized from the Heuristic-Systematic Model (HSM) (Eagly & Chaiken, 1993) and the Theory of Planned Behavior (TPB) (Ajzen & Fishbein, 1980), the model intends to predict the extent to which a person seeks out the risk information and the extent to which he or she will spend time and effort analyzing the risk. The previous risk communication paradigm adopts a top-down approach; that is, the general public relies on institutions, industries, and experts for risk management. The assumption is that people do not have sufficient knowledge and capability to judge risks. Therefore, the risk communication messages are based on experts' conceptualization of these risks. The major drawback of this approach is that it ignores the role of the people who are ultimately exposed to the risks. Therefore, the message conveying risk information may be incomprehensible to the general public.

The RISP model adopts a bottom-up approach that indicates that the information providers should take into consideration the general public's information needs and perception. People are more likely to seek and process information when the information is perceived as important, useful, and relevant. Rather than asking how messages may influence people, the bottom-up approach focuses on how people evaluate risks, make reasonable choices, and develop changes in their attitude and behaviors. Crafted this way, messages communicating risks may produce a more profound effect on people's risk-related attitude and behavior.

The RISP model posits that a person's risk information seeking intention or behavior is affected by information sufficiency, perceived information gathering capacity, and relevant channel belief (Griffin et al., 1999). The concept of information sufficiency follows the HSM's assumption of validity seeking motive and describes the confidence that one wants to have in one's knowledge about a risk will affect the risk information seeking intention. Perceived information gathering capacity reflects one's perceived ability to gather and locate relevant risk information. Relevant

channel beliefs relate to the individual's trust and perceived usefulness about the information source that delivers the message. People can get Internet risk information from multiple channels, including newspaper, magazines, websites, social media, and other people. The beliefs about each media channel will be formed based on the perceived quality of information of each channel as well as the search cost. However, this portion of the model is still exploratory (Griffin et al., 2006).

Another notable RISP component is informational subjective norms, which originates from Ajzen's (1991) concept of subjective norm in theory of planned behavior (TPB). The informational subjective norms refer to the perceived social influences affecting one's perception about the knowledge he or she should have. RISP proposes that the informational subjective norms will affect the information sufficiency. An additional TPB component used in the RISP model is perceived behavioral control, which is labeled as perceived information gathering capacity.

The RISP model also incorporates perceived hazard characteristics and affective responses to risk. Risk judgment is considered multidimensional and includes several hazard characteristics such as risk severity, risk vulnerability, risk immediacy, and risk benefits. In the RISP model, perceived hazard characteristics affect affective responses. Emotional aspects of risk perception such as worry, fear, dread, or outrage are strongly related to perceived hazard characteristics (Witte, 1992). Affective responses also affect the judgmental confidence and motivate information seeking and processing more than the cognitive component of risk perception.

Scholars have applied this model in investigating industrial risks (Huurne & Gutteling, 2005; B. B. Johnson, 2005), environmental risks (Kahlor, 2007; Kahlor, Dunwoody, Griffin, & Neuwirth, 2006), and food risks (Kuttschreuter, 2006), and the support for the model has been quite strong. Recently the robustness of the RISP model has been validated by two ways: a report of a comparative analysis across five risks and a review of literature that has utilized at least some of the RISP model (Griffin, Dunwood, & Yang, 2012). However, current research has not incorporated this model to explain web risk information seeking behavior. Much research has explored users' perception of online risks and how it may influence their behavior on the Internet; how users seek web risk information remains to be studied.

Risks on the Web

The web is a very open platform, where new technologies enable a combination of content and services from multiple sources. Users today expect the web to be sophisticated, functional, and easy to navigate. However, the complex architecture of the web also leads to new types of vulnerabilities. Most browsers tolerate malformed inputs so attacks may succeed despite appearing abnormal. For example, SQL injection occurs when a database query is inserted into a web form input box to gain access to data or make changes to the data. In addition, browser cookies, the mechanism for storing user or session information, are susceptible to theft, forgery, and hijacking. Common website vulnerabilities include cross site scripting (XSS), information leakage, content spoofing, and SQL injection. Among all the vulnerabilities, cross-site scripting is the most prevalent website vulnerability, identified in over 71% of all websites (Grossman, 2010). This study will focus on XSS.

Cross-site scripting was first reported in an advisory from Carnegie-Mellon University's CERT Coordination Center (CERT, 2000), XSS is an attack in which scripting code is injected into the web pages generated by web applications. This potentially malicious code executes in a user's browser when the page is accessed. According to Grossman (2010) there are two types of XSS attacks: persistent XSS attacks and non-persistent XSS attacks. In a persistent attack, hackers submit XSS exploit code as part of a free-form text input such as a comment or a product review. The actual attack happens when a future visitor requests to view this text. Rather than being dis-

played to the visitor, as would the text of a traditional comment or review, the script code (referred to as the “payload”) is executed, often without the visitor even being aware of its execution. In a non-persistent attack, the exploit code is not stored persistently on a web site. Instead, it is encoded as part of the universal resource locator (URL) used to access a dynamically created page. When the page is accessed, the script payload is rendered along with the page and the script code is executed. XSS infected URLs can be distributed through email messages, discussion board posts, or any number of other media channels.

Most types of conventional security measures such as firewalls, virus protection software, and intrusion detection systems cannot do much to detect or protect against XSS attacks. These attacks do not require a web application developer to be intentionally malicious and often exploit otherwise trustworthy web sites. The attacks are enabled by web application developers’ lack of security awareness or programming mistakes. To prevent XSS attacks, developers need to perform solid data input validation on user-submitted content and only accept expected characters in the appropriate data format.

Many companies have been victims of XSS worms. In 2005, MySpace was hit by an XSS worm which infected over one million users’ profiles within 20 hours of the initial infection. MySpace was forced to shut down to fix the problem after two days. Twitter has suffered from four variants of an XSS attack, hijacking users’ account and advertising the hacker’s website by posting tweets on behalf of account holders.

Hypothesis Development

Based on the RISP model, a web risk information seeking and processing model is proposed in Figure 1. Two components, informational subjective and perceived information gathering ability, are maintained in full from the original RISP model. Affective response is relabeled as negative affect since the emotional reactions towards risks are mainly negative. In this paper, information insufficiency is used instead of information sufficiency to clearly indicate the gap between de-

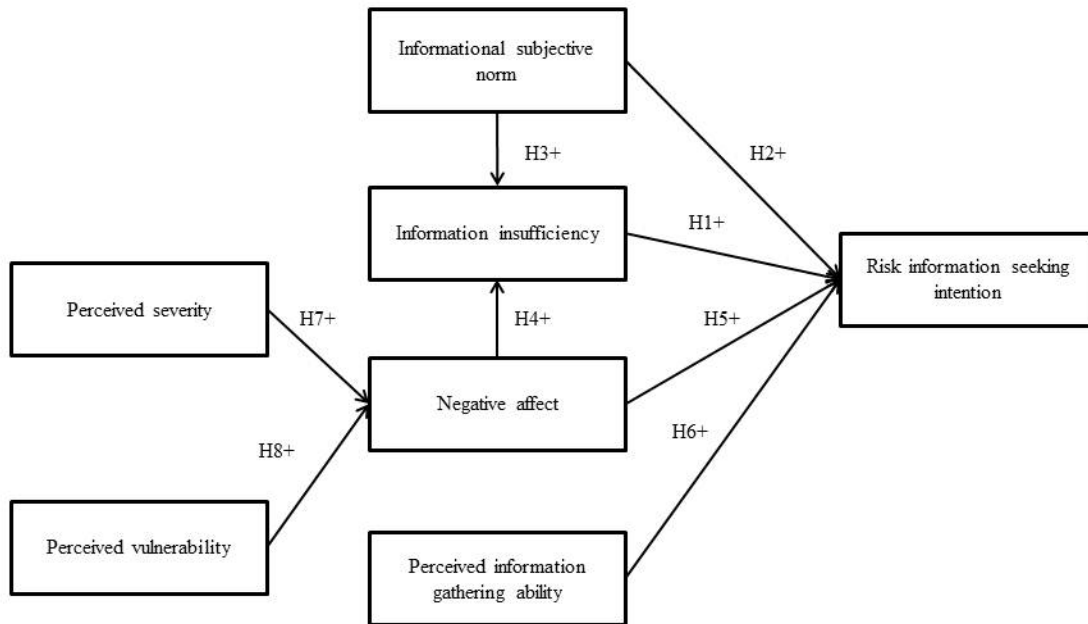


Figure 1: Research model

sired confidence and perceived confidence in one's knowledge about risk. For the component perceived hazards characteristics, two dimensions of risk perception are examined: perceived severity and perceived vulnerability. The component perceived channel belief is not included since the portion of the model is still exploratory (Griffin et al., 2006). The dependent variable web risk information seeking intention is defined as individuals' intention to seek information about web risks.

Information Insufficiency

Information insufficiency is defined as the perceived size of the gap between the information held and information needed that will affect the information seeking behavior about a certain risk (Kahlor, 2007). As a central concept in RISP, it suggests that each individual has a different quantity of information requirements that he or she considers as necessary to deal with a risk. The concept originates from Eagly and Chaiken's (1993) notion of "sufficiency threshold". Eagly and Chaiken (1993) defined sufficiency threshold as the receiver's desired level of confidence about a risk. The receivers are often guided by the principle of least effort. That is, they often exert as little effort as necessary to close the gap between the actual and desired level of confidence. Therefore, as the discrepancy between the actual and desired level of confidence grows, motivations on active information seeking increase.

Previous studies show that users often have misconceptions of web security, including those who work in high-technology communities (Friedman, Hurley, Howe, Felten, & Nissenbaum, 2002). Users often have an incomplete or incorrect understanding of various web security technologies (Furnell & Karweni, 1999). They have tried to educate themselves regarding web security but with mixed results, largely due to the technical difficulties of the subject (Flinn & Lumsden, 2005). It is argued, however, that a user will be motivated to seek more information about web risks when they perceive a need for more information. Recent research finds that information insufficiency is related to information seeking (Kahlor, Dunwoody, Griffin, Neuwirth, & Giese, 2003). Thus:

H1: Information insufficiency is positively related to web risk information seeking intention.

Informational Subjective Norm

Originating from the concept of subjective norm (Ajzen & Fishbein, 1980), informational subjective norm refers to perceived social influence motivating the desire to be informed about a certain risk. According to the model of planned behavior, the best predictors of people's behavior are determined by two variables: individuals' own attitude towards the behavior and individuals' perception of how other people want them to behave. People tend to conform to the social pressure of what is expected from them. Therefore, web risk information seeking may have a social component. Through shared cognition, individuals may believe the security knowledge is important if their peers believe so. In addition, individuals prefer to ensure the favorable evaluation of themselves and satisfactory reactions from others. Being a victim of security breach or identify theft will bring embarrassment, which plays an important role in security-related behavior. Recent research finds that that subjective norm is influential in users' intention to engage in protective behavior (Anderson & Agarwal, 2010; Herath & Rao, 2009).

In the context of web risk information seeking, if a person's family and friends think that seeking knowledge about a risk is important, it will increase his or her desire to obtain information. The subjective norms may make people feel their information on the web risks is insufficient and drive them to actively seek and accumulate information pertaining to these risks. Studies have reported that the subjects reported a larger gap between the knowledge they had about the risk and the amount of knowledge that they felt was sufficient when others expect them to be in-

formed about a risk (Griffin et al., 1999; Kahlor, 2007; Lerner & Kelner, 2000). Therefore, the following hypotheses are proposed:

H2: Informational subjective norm is positively related to web risk information seeking intention.

H3: Informational subjective norm is positively related to information insufficiency.

Negative Affect

Affect has been incorporated into people's judgment and decision making (Lerner & Kelner, 2000; Loewenstein, Weber, Hsee, & Welch, 2001). Emotional reactions to risks are often different from the cognitive evaluations of the risks. Affective response is more rapid and basic than cognitive evaluations, providing a fast and rough assessment. Affect can also influence cognitive processing. For example, participants who are induced to feel negative affect consistently made more pessimistic estimates about a certain risk than others who were induced to feel positive affect (E. Johnson & Tversky, 1983).

When it comes to web security issues, the common affect people experience are negative emotions such as fear, worry, anger, anxiety, and frustration. Negative affect is defined as a dimension of subjective distress and unpleasant engagement that includes a variety of aversive mood states, such as worry, anger, fear, disgust, and other moods (Watson, Clark, & Tellegen, 1988). Negative affect could increase the relevance of the message and produce behavior change consistently. Many studies have found a significant relationship between negative affect and compliance with the recommended action (Sutton, 1982; Zhang & McDowell, 2009). A recent study finds that fear appeal impacts end user behavioral intentions to comply with recommended security guidelines (E. Johnson & Tversky, 1983). According to RISP, negative affect such as worries and fear could make people feel inadequate about their knowledge about the risks and motivate people to seek more information. Therefore, the following hypotheses are proposed:

H4: Negative affect is positively related to information insufficiency.

H5: Negative affect is positively related to web risk information seeking intention.

Perceived Information Gathering Capacity

Perceived information gathering capacity refers to one's perceived ability to perform the information seeking steps for the desired outcome, especially when the outcome requires effort and non-routine information gathering (Griffin et al., 1999). Seeking information about web risk requires information gathering. For example, to learn about a new web risk, an individual needs to be actively involved and gather information from different channels, such as talking with experts, researching on the Internet, and reading security news and reports. A person capable of gathering risk information is likely to spend more efforts and persistence on seeking risk information. Higher levels of perceived capacity may lead individuals to approach a task, whereas lower levels of perceived capacity may lead individuals to avoid it. Huurne (2008) found that perceived information-gathering capacity is positively associated with information seeking and negative associated with information avoidance. Thus:

H6: Perceived information gathering capacity is positively related to web risk information seeking intention.

Perceived Hazard Characteristics

RISP posits that the perceived hazard characteristics have multiple components. This study will focus on two components: perceived severity of the threat and perceived vulnerability of the threat. Perceived severity assesses how severe a person believes a threat will be to his or her life.

The more serious a person perceives a risk to be, the more likely he or she will experience negative emotions such as fear and anxiety. Web users develop a perception of threat after assessing problems in their computing environment. If they do not perceive a threat as severe, then they will not feel negative affect.

Perceived vulnerability concerns the susceptibility a person has to a threat. Even severe threats may be ignored if people think they are not vulnerable to them. People tend to believe that they are less vulnerable to risks than others. For example, most people believe they are better than the average driver and that they will live longer than average life expectancy (Slovic, Fischhoff, & Lichtenstein, 1986). Therefore it is not surprising to find that people perceive themselves at less risk of computer vulnerability than others. Users believe that only people with important information or people who have annoyed the attackers should be concerned with any computer risks (Weirich & Sasse, 2001). It is expected, however, that those individuals who do have a high degree of perceived vulnerability will be more likely to have negative emotions towards the risks. Previous research has shown that perceived vulnerability and perceived severity are positively related to perceived threat and protective intention (Lee & Larsen, 2009; Liang & Xue, 2010). Therefore, the following hypotheses are proposed:

H7: Perceived severity of the threat is positively related to negative affect.

H8: Perceived vulnerability of the threat is positively related to negative affect.

Methodology

The research model was tested with data obtained using an online survey instrument from students in two universities in southern United States. The authors have obtained the approval of the institutions' IRB for the study and the participants gave written informed consent. All students are business undergraduate students enrolled in senior-level business classes such as information systems management, healthcare marketing, operation management, and system analysis and design. They were given extra credit for taking the survey. The student sample was deemed appropriate since the study focuses on information seeking on the web and students, in general, tend to be the most active web users. Researchers have used student samples for theory testing (Lopes & Galletta, 2006), which fits the purpose of this study. In addition, as indicated in a previous study (Wang & Wallendorf, 2006), the decision-making processes of students are consistent with that of other populations. The students were presented an excerpt about XSS from a report by WhiteHat (2011). The article is about a page long with 599 words. Then they were asked to answer the questions of the survey. A total of 201 completed responses were used. Among them, 49.5% of them were males and 50.5% of them were females. 81% of them were between 20 to 29 years old. 68% of them had work experience.

All survey items were borrowed or adapted from existing scales. All constructs are measured in Likert or semantic scales except information insufficiency. Information insufficiency is measured by two items. One is current knowledge: "Rate your current knowledge about XSS on a scale of 0 to 100 where zero means knowing nothing and 100 means knowing everything you could possibly know about this topic." The other one is sufficiency threshold: "Think of that same scale again. This time we would like you to estimate how much knowledge you would need to achieve a comfortable understanding of XSS. You might feel you need the same, more, or possibly even less information about the topic. Using a scale of zero to 100, how much information would be sufficient for you?" Information insufficiency can be obtained by subtracting the current knowledge score from the sufficiency threshold score for each individual. However, this procedure can multiply reliability problems and suffer from ceiling effects. Consistent with previous studies (Kahlor et al., 2003; Yang et al., 2010), the second item was used to evaluate the impact of information insufficiency while controlling for current knowledge.

Negative affect is measured by six items using a semantic scale ranging from -2 to +2. Items include “anxious—comfortable,” “tense – content” and “worried – at ease.” The scale is recoded where 5 represents the most negative mood and 1 represents the most positive mood. All other constructs are measured by Likert scales ranging from 1 to 5. Informational subjective norm is measured by four items. One example item is “The people I spent most of my time with are likely to seek information related to XSS.” Perceived vulnerability, perceived severity, and perceived information gathering capacity are measured by three items each. The dependent variable was measured by three items: “I plan to seek more information about XSS in the future”, “I intend to find out more about XSS,” and “In the future, I will try to seek as much information as I can about XSS.” All items, along with their descriptive statistics are listed in the Appendix

Results

Partial Least Squares (PLS), specifically SmartPLS 2.0 (Ringle, Wende, & Will, 2005), was used to assess the psychometric properties of the measurement model and to test the hypotheses. Utilizing a component-based approach, PLS is designed to not only explain the variances, i.e., to examine the significance of the relationships and variance explained, such as in linear regression, but also to simultaneously model the structural paths and measurement paths (Gefen, Straub, & Boudreau, 2000). PLS was chosen over covariance-based Structural Equation Modeling for two reasons. First, it is not contingent upon the data having multivariate normal distributions and interval nature (Fornell & Bookstein, 1982), which makes PLS suitable for handling variable such as information insufficiency. Second, it is appropriate for testing theories in the early stages of development (Fornell & Bookstein, 1982). Although RISP has been tested in other fields, it is a relatively new theory in the context of web risk. According to Gefen, Rigdon, and Straub (2011), substantive reasons for using PLS include exploratory research objectives and ensuring convergence.

Assessment of Measurement Model

The adequacy of measurement model can be demonstrated through measures of convergent and discriminant validity. Discriminant validity of the constructs were assessed by two criteria: 1) each item should have a higher loading on its hypothesized construct than on other constructs and 2) the square root of each construct’s average variance explained should be higher than its correlation with other constructs. Table 1 shows the factor loading and cross-loading results from a principal component factor analysis. Items do have much higher self-loadings than cross loadings. Then the square root of the AVE of a construct is compared with its correlation. As Table 2 indicates, the AVE’s square root is greater than the cross correlations among the constructs. The construct “information insufficiency” is not included since it is measured by one item. Convergent validity is assessed by composite reliability of constructs and variance extracted. Table 1 provides reliability results. The data shows that the constructs demonstrate satisfactory internal reliability. The composite reliabilities range from 0.75 to 0.98, which exceeds the recommended value of 0.70 (Gefen et al., 2000). The average variance extracted (AVEs) are above 0.5, as recommended by Fornell and Larcker (1981).

Table 1: Cross-loading of the constructs, composite reliability and AVE

Item	Severity	Info Seeking	Info Gathering	Negative Affect	Subjective Norm	Vulnerability
Severity1	0.85	0.45	0.31	0.31	0.42	0.54
Severity2	0.89	0.43	0.22	0.27	0.42	0.49
Severity3	0.79	0.38	0.39	0.35	0.37	0.43
InfoGather1	0.23	0.27	0.78	0.13	0.38	0.21
InfoGather3	0.28	0.26	0.83	0.10	0.46	0.20
InfoGather4	0.32	0.28	0.86	0.13	0.39	0.25
InfoSeek1	0.47	0.98	0.34	0.41	0.58	0.41
InfoSeek2	0.48	0.98	0.35	0.42	0.55	0.40
InfoSeek3	0.49	0.96	0.32	0.42	0.57	0.33
NegaAffect1	0.37	0.39	0.20	0.89	0.34	0.36
NegaAffect2	0.30	0.38	0.15	0.91	0.31	0.36
NegaAffect3	0.29	0.37	0.18	0.87	0.31	0.33
NegaAffect4	0.37	0.39	0.28	0.87	0.36	0.44
NegaAffect5	0.28	0.33	0.16	0.84	0.25	0.33
SubNorm1	0.37	0.49	0.44	0.33	0.80	0.34
SubNorm2	0.42	0.47	0.45	0.30	0.86	0.39
SubNorm3	0.46	0.52	0.42	0.31	0.81	0.43
SubNorm4	0.30	0.42	0.40	0.22	0.80	0.24
Vulnerability1	0.49	0.37	0.26	0.43	0.36	0.91
Vulnerability2	0.52	0.35	0.32	0.33	0.40	0.91
Vulnerability3	0.59	0.35	0.29	0.37	0.43	0.92
<i>AVE</i>	<i>0.71</i>	<i>0.95</i>	<i>0.51</i>	<i>0.77</i>	<i>0.67</i>	<i>0.84</i>
<i>Composite reliability</i>	<i>0.88</i>	<i>0.98</i>	<i>0.75</i>	<i>0.94</i>	<i>0.89</i>	<i>0.88</i>

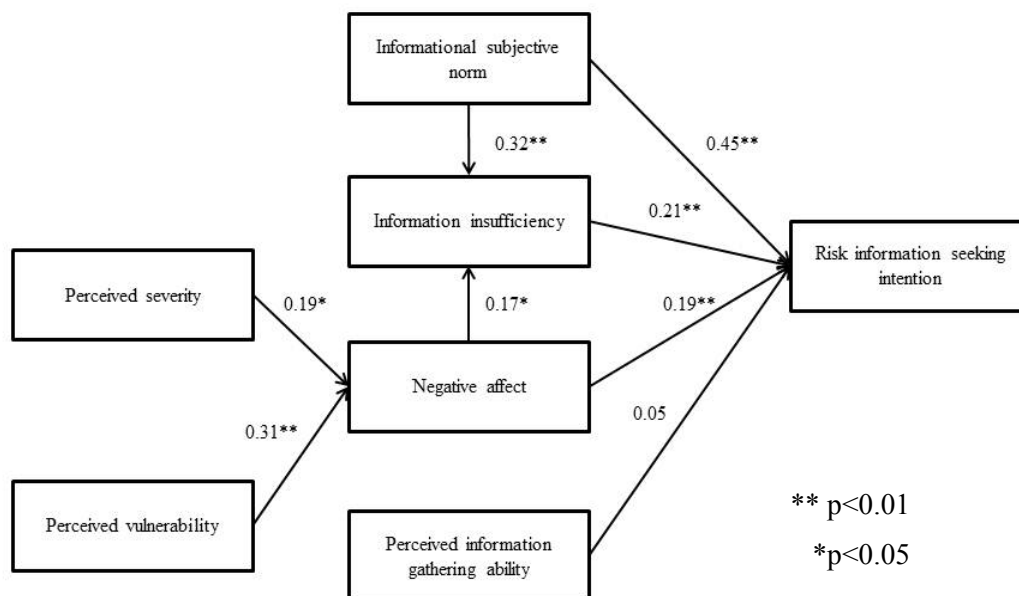
Table 2: Discriminant validity of the constructs

Construct	1	2	3	4	5	6
Perceived severity	0.84					
Negative affect	0.37	0.88				
Perceived info. gathering capacity	0.37	0.22	0.71			
Information seeking intention	0.50	0.43	0.35	0.97		
Informal subjective norm	0.48	0.36	0.52	0.58	0.82	
Perceived vulnerability	0.58	0.42	0.31	0.39	0.43	0.91

Note: The diagonal elements represents square root of AVE

Assessment of Structural Model

With adequate measurement model, the hypotheses were tested by examining the structural model. The PLS algorithm and the bootstrapping re-sampling methods were used with the 201 cases, and 1000 re-samples were used to estimate the model. Figure 2 shows the results. The model accounts for 43% of variance in information seeking intention, 17% of variance in information insufficiency, and 20% of variance in negative affect. According to Chin (1998), R^2 values of 0.67, 0.33, or 0.19 for endogenous latent variables are described as substantial, moderate, or weak. Therefore, the variance explained in information seeking intention can be described as moderate while the variances of negative affect and information insufficiency can be described as being weak.

**Figure 2: Model testing results**

As hypothesized, information insufficiency ($b=0.21$, $p<0.01$) and informational subjective norm ($b=0.45$, $p<0.01$) are positively related to web risk information seeking intention, providing support for H1 and H2. Sufficient support is found for H3 ($b=0.32$, $p<0.01$), which hypothesized that informational subjective norm is positively related to information insufficiency. There is a signif-

icant relationship between negative effect and information insufficiency ($b=0.17$, $p<0.05$). Therefore H4 is supported. Negative affect has a significant relationship with information seeking intention ($b=0.19$, $p<0.01$), lending support to H5. The results do not reveal any significant relationship between perceived information gathering capacity and web risk information seeking intention. Therefore H6 is rejected. Negative affect is significantly determined by perceived severity ($b=0.19$, $p<0.05$) and perceived vulnerability ($b=0.31$, $p<0.01$). Thus, H7 and H8 are both supported. Table 3 summarizes the results of the study.

Table 3: Summary of results			
Path	Coefficient	Std. Error	Result
Information insufficiency → intention	0.2034	0.0658	Supported
Informational subjective norm → intention	0.4469	0.0687	Supported
Informational subjective norm → information insufficiency	0.3162	0.0765	Supported
Negative affect → information insufficiency	0.1741	0.0805	Supported
Negative affect → intention	0.1935	0.0691	Supported
Perceived information gathering capacity → intention	0.0453	0.0648	Rejected
Perceived severity of the threat → negative affect.	0.1934	0.0991	Supported
Perceived vulnerability of the threat → negative affect	0.3065	0.0795	Supported

The PLS structural model is mainly evaluated by Goodness-of-Fit (GoF) (Tenenhaus, Esposito Vinzi, Chatelin, & Lauro, 2005) and by using the Stone-Geisser Q-square test for predictive relevance (Geisser, 1975; Stone, 1974). Goodness-of-Fit (GoF) (Tenenhaus et al., 2005) was employed to judge the overall fit of the model. GoF, calculated as the geometric mean of the average communality and the average R^2 , representing an index for validating the PLS model globally. For this model, the GoF is 0.43 which exceeds the cut-off value of 0.36 and shows that the model performs well (Wetzels, Odekerken-Schröder, & van Oppen, 2009).

The Q-squares statistics measure the predictive relevance of the model by reproducing the observed values by the model itself and its parameter estimates. When estimating Q square, blind-folding procedure ignores a part of the data for a particular block during parameter estimation (a block of indicators is the set of measures for a construct). The ignored data part is then estimated using the estimated parameters, and the procedure is repeated until every data point has been ignored and estimated (Chin, 1998). In PLS, one type of Q-squares statistics is cross-validated redundancy. The cross-validated redundancy measures the capacity of the path model to predict the endogenous manifest variables indirectly from a prediction of their own latent variable using the related structural relation by cross-validation (Tenenhaus et al., 2005). The cross-validated redundancy measure can be a reliable measure of the predictive relevance of the model investigated (Fornell & Cha, 1994). If the redundant communality was found to be larger than 0 for all the endogenous variables, the model is considered to have predictive validity, otherwise, the predictive relevance of the model cannot be concluded (Fornell & Cha, 1994). The results of our model indicate that the cross-validated redundancies for information seeking intention, negative affect, and information insufficiency were respectively 0.39, 0.15, and 0.18. Thus the predictive validity of the used model was established.

Discussion

Overall the study shows that the RISP model can be applied in a web risk information seeking context. The model proposes four predictors of web risk information seeking intention: information insufficiency (H1), informational subjective norm (H2), negative affect (H5), and perceived information gathering capacity (H7). The results reveal that there is a strong relationship between information insufficiency and web risk information seeking intention. The larger the knowledge gap a person perceives, the stronger the intention of information seeking. The results also support the hypothesis that informational subjective norm is positively related to web risk information seeking intention. The social pressure to stay on top of web risks, such as XSS, motivates people to acquire knowledge about them. Negative affect is also significantly related to information seeking intention. The more negative emotion people experience, the stronger their information seeking intentions are. There is no significant relationship between perceived information gathering capacity and web risk information seeking intention. In this study, the participants perceived themselves capable of gathering information about XSS (mean = 3.21), but that does not lead to higher likelihood of web risk information seeking.

This study also hypothesizes that informational subjective norm (H3) and negative affect (H4) are significantly related to information insufficiency. H3 is supported. The social pressure to be informed about the web risks increases the need for information. It should be noted, however, users' higher need for information does not imply that they are less knowledgeable about security issue. Interestingly, the two items measuring current knowledge and information insufficiency have a significant positive correlation. In other words, the people who rate themselves as having higher levels of knowledge about XSS also perceive higher need to acquire more information. There is also a significant relationship between negative affect and information insufficiency. Strong negative emotions experienced by an individual lead to larger perceived information insufficiency. Perceived severity (H7) and perceived vulnerability (H8) are hypothesized to be related to negative affect. Both hypotheses are supported. Negative emotions are aroused by the perceived susceptibility and severity levels of XSS.

Theoretical Implications

This study makes important contributions to the behavioral issues of seeking web risks. This is the first study drawing on RISP, providing empirical support for the cognitive process of a user's web risk seeking. As a relatively new model, RISP serves as a satisfactory model in the new context. First, the model highlights the cognitive mechanisms that occur during the web risk seeking. In particular, the results demonstrate that the information insufficiency strongly relates to web risk information seeking intention. The study also investigates the role of affective response on shaping a user's intention in seeking web risks. From the affective perspective, the results show that greater levels of perceived vulnerability and severity substantially increase emotions, which also impacts risk information seeking intention. This finding highlights the roles that affect, along with cognition, plays in an individual's desire to seek out risk information to alleviate risk perception. Finally, model testing highlights the importance of social norms for facilitating risk information seeking. This study extends research on social norms and shows that its robustness even extends to behaviors such as risk information seeking in a web context. In summary, as a bottom-up approach, RISP supports the notion that users' needs and perceptions should be taken into consideration along with social factors in modeling web risk information seeking intention.

Practical Implications

In practical terms, the results provide an enriched understanding of why users seek web risk information. The finding that informational subjective norm has a strong positive relationship with

information seeking highlights the importance of a strong organizational security culture. When employees feel the social pressure from other people for keeping updated with the security knowledge, they will be more likely to do so.

The model also suggests that affective response is related to information seeking intention. In order to motivate users to seek web risk information, the reports conveying those risks need to be presented in a way that appeals emotionally to the audience. When the audience feels emotional anxiety and fear after receiving the message, they are more likely to feel that their knowledge is inadequate. The risk-as-feeling hypothesis (Loewenstein et al., 2001) states that people respond to risks based on their emotional influences. In addition, for the messages conveyed in the articles to be emotionally appealing, they should be easily interpretable. Users may get confused if they encounter technical terms and eventually give up any further attempts at understanding the messages. Currently the majority of articles on XSS focus on the technical dimensions of the risk with software developers as the target audience. Without having end users as the target audience, these articles will not be considered relevant and useful. It is imperative to implement an end user based approach to web risk communication.

The participants had a low level of knowledge on web risks such as XSS. In this study, the current perceived knowledge is 33 on a 100 scale indicating that participants knew very little about XSS. It is imperative that individuals raise their level of awareness pertaining to these emerging risks since calls for protective action are dependent on end-users' awareness. End users' blindness to emerging web risks delays the implementation of protective actions, further confounding the security risk. Online companies, social advocacy groups, and educational institutions should allocate enough time to develop training courses for end users. Well-designed security courses can effectively raise end users' awareness and assist in speeding up the development of counteractions for addressing web security risks. Online games have been proven successful in teaching users to identify fraudulent websites and avoid phishing attack (Sheng et al., 2007).

There are several limitations of the study. First, the sample consists of a convenience sample of undergraduate business students. While previous research has demonstrated the value of student samples for affirming propositions about specific independent and dependent variables in specific circumstances, limitations exist pertaining to the generalizability of the results to other cohorts (Gordon, Slade, & Schmitt, 1987). Future studies using non-student samples may yield different results. Second, causal inferences cannot be drawn due to the cross-sectional survey data. Experiments could be utilized in future studies to rigorously test the proposed model. Third, the study did not investigate the role of self-efficacy in information seeking. More research is needed in examining how self-efficacy may affect the risk perceptions, affective response and information seeking intention.

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Appendix: Descriptive Statistics

Factor	Mean	STD	Source
Negative affect: when I read articles like this, I feel _____ (scale was recoded and inverted: +2 → 1 to -2 → 5)			
Anxious(-2) -- Comfortable (+2)	3.06	0.97	Huurne (2008)
Tense (-2) -- Content (+2)	3.13	1.06	
Angry (-2) -- Calm(+2)	3.27	1.11	
Worried (-2) -- At ease (+2)	3.19	0.94	
Afraid (-2) -- Bold (+2)	2.90	1.11	
Informational Subjective Norm (5=Strongly agree , 1=Strongly disagree)			
The people I spent most of my time with are likely to seek information related to XSS.	2.82	0.96	Kahlor (2007)
I am expected to be knowledgeable about this topic.	3.07	1.04	
Seeking information about XSS is likely to give me something to talk about with others.	3.12	1.05	
Most people who are important to me think I should stay on top of information about the topic.	2.56	1.05	
Perceived Vulnerability (5=Strongly agree , 1=Strongly disagree)			
I am likely to visit a website infected by XSS.	3.15	0.97	Ng et al. (2009)
There is a good possibility that I will be a victim of XSS.	3.21	1.10	
The chances of me being a victim of XSS are high.	3.13	0.98	
Perceived Information Gathering Capacity (5=Strongly agree , 1=Strongly disagree)			
If I wanted to, I could easily get all the information I need about XSS.	3.43	0.97	Johnson (2005)

Factor	Mean	STD	Source
I would know where to go for more information.	2.37	0.86	
I would know what questions to ask of the experts about XSS.	3.17	1.00	
Perceived Severity (5=Strongly agree , 1=Strongly disagree)			
Losing my sensitive information as a result of visiting an XSS infected website is a serious problem for me.	3.19	1.14	Ng et al. (2009)
Being directed to a fraudulent website due to XSS is a serious problem for me.	3.67	1.25	
If I lose my sensitive information, my daily life could be negatively impacted.	4.01	0.92	
Current Knowledge			Johnson (2005)
Rate your current knowledge about XSS on a scale of 0 to 100 where zero means knowing nothing and 100 means knowing everything you could possibly know about this topic.	33.10	24.96	
Information insufficiency			
Think of that same scale again. This time we would like you to estimate how much knowledge you would need to achieve a comfortable understanding of XSS. You might feel you need the same, more, or possibly even less information about the topic. Using a scale of zero to 100, how much information would be sufficient for you?	69.20	19.29	
Web risk information seeking intention (5=Strongly agree , 1=Strongly disagree)			Kahlor (2007)
I plan to seek more information about XSS in the future.	3.37	0.97	
I intend to find out more about XSS.	3.36	0.95	
In the future, I will try to seek as much information as I can about XSS.	3.25	0.93	

Biographies



Lixuan Zhang is an Associate Professor in the Hull College of Business at Georgia Regents University. She received a Ph.D. in Management Information Systems from the University of North Texas. Her major research interest includes social media, security and privacy. Her research papers appeared in journals including *International Journal of Electronic Commerce*, *Cornell Hospitality Quarterly*, *CyberPsychology, Behavior and Social Networking* among others.



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YouTube: An Effective Web 2.0 Informing Channel for Health Education to Prevent STDs

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Abstract

YouTube is a social media venue with great potential as a health education-informing channel. Health educators and the Centers for Disease Control and Prevention (CDC) (2011) recognize that YouTube enjoys a high level of engagement and comfort among young users. This enhances its educational value for this vulnerable population, who already account for half of the new sexually transmitted diseases (STDs) diagnosed annually. It is imperative to reach these users with information about safe sex and sexual risk prevention. In this work, 18-24 year old undergraduates were pre-tested, and half of the participants viewed an entertaining YouTube safe sex education video while the other half viewed a factual YouTube safe sex education video. Post-tests on both groups confirmed YouTube's significant value as a health education-informing channel that fosters knowledge acquisition and provokes healthy future behavior change. This study clarifies user preferences for health education messaging on YouTube, and confirms YouTube's substantial educational utility, while guiding health educators' effective use of this health education-informing channel.

Keywords: YouTube, health-informing channel, information seeking behavior, social media

Introduction

The successful delivery of accurate, timely, and relevant health information that promotes knowledge acquisition and behavior change in targeted populations is a primary goal for public health educators (Valencia, Kingston, Nakamura, Rosenfield, & Schwartz, 2004). Health educators have recently identified social media as viable health-informing channel for young adults, ages 18-24 (Centers for Disease Control and Prevention [CDC], 2011). These users are already using YouTube and other social media venues for entertainment, social engagement, relaxation, and information exchange (Hordemann & Chao, 2012; Jones & Fox, 2009). Health educators must determine if these users view YouTube and its associated video content as a viable health-informing channel. This study seeks to answer two research questions. First, this work will test whether or not YouTube, an Internet based social media informing channel, can deliver safe sex/condom use information designed to facilitate knowledge acquisition in a population of 18-24

year old users. Second, this work assesses whether an entertaining or factual message delivery format for the same content results in a different level of knowledge acquisition.

In the 2010 Centers for Disease Control and Prevention (CDC) Sexually Transmitted Disease Surveillance Report (CDC, 2010), the CDC revealed that there are an estimated 19 million new

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sexually transmitted disease (STD) infections each year. The financial impact to the United States' healthcare system is \$17 billion per year, and STDs bring immediate and lifelong consequences to infected individuals. "Young people represent 25% of the sexually experienced population in the United States, but account for nearly half of new STDs" (CDC, 2010, p. 1). Clearly, 18-24 year old users can benefit from education about safe sex. Yet often, this at risk population does not intentionally seek information about safe sex (Singhai & Rogers, 2002). This is true for several reasons. First, the media often casts sexual activity as spontaneous and unplanned (Yu, 2010), which is not consistent with seeking information. Also, as young, healthy adults, people this age do not usually consider themselves at risk. They frequently have no interest in learning about risks associated with unprotected sex, or if sexually active, might use a form of birth control that does not include a barrier because they are not cognizant of the associated health risks (Singhai & Rogers, 2002).

The purpose of this study is to test the viability of using YouTube as a health-informing channel to facilitate knowledge acquisition about safe sex/condom use for young adults, ages 18 to 24. The study specifically examines two issues: the viability of using YouTube as an informing channel for health education, and the differences in 18-24 year old viewer knowledge acquisition based on the type of YouTube safe sex video message (factual vs. entertaining) provided. Arroyave (2008) reported that Education Entertainment (E-E) is defined as intentionally embedding important health information in a media message in order to educate viewers and encourage risk reduction or disease prevention behaviors. Arroyave reported that E-E does this successfully in the United States and in over 50 other countries. Both factual and entertaining message formats deliver relevant and memorable information aimed at provoking healthy sexual behaviors. It is important to examine and quantify whether users in this age group absorb and retain the same health education content presented on YouTube, and whether retention differences exist based on an entertaining message delivery format or a factual one. The data collected in this study will help health educators to present important information successfully about health maintenance and disease prevention using a message delivery format and social media venue that most effectively engages 18-24 year old users. This study will also help to quantify which message delivery format best facilitates knowledge acquisition, retention and future healthy behavior change. A study by Smith, Nazione, Laplante, Kotowski, Atkin, Skubisz and Stohl (2009) has already demonstrated that a memorable message, even if not acted upon immediately, can result in a behavior change when remembered.

Literature Review

The Internet as an Informing Channel

In 1995, Everett Rogers, in *Diffusion of Innovations (4th edition)*, stated that diffusion of innovation is the "process by which innovation (or communication about new ideas) is transmitted through channels from one person to another in a social group, over a period of time" (p.5). Rogers coined the term "communication channel", defining it as "the means by which messages get from one individual to another" (p.18). He described two types of information channels: mass media channels and interpersonal channels. Mass media channels, like newspapers, radio, and TV, allow one source of information to reach many people at the same time and are fast and efficient. Interpersonal communication channels are rooted in the interactions between people and, while less efficient, are often more persuasive. Bargh and McKenna (2004) stated that "the Internet affords a new and different avenue of social interaction that enables groups and relationships to form that otherwise would not be able to, thereby increasing and enhancing social connectivity" (p.575). The Internet and its associated social media sites offer an ideal blend of Rogers'

two communication channels, providing both the broad reach of mass media information channels and the personal interaction typical of interpersonal communication channels.

Informing science was defined by Cohen (2009) as a “transdiscipline that explores how best to inform clients using information technology” (p 1). Hardin, Ryan and Prybutok (2012) extended the application of Cohen’s work and suggested that an informing system had three components: “the informing environment, the delivery system, and the task completion system” (p.207). They identified social media as an information delivery system or informing channel for both personal and professional communications.

Internet Use Statistics

The Pew Research Center’s Internet and American Life Project, funded in 2000, evaluates the impact of Internet use in the United States, and produces a number of targeted reports each year (Pew Internet and American Life Project, n.d.). In 2010, a report by Baumann showed that 74% of Americans use the Internet. The May 2010 Pew Research Center Tracking Survey reported that 95% of 18 to 29 year olds use the Internet (Pew Internet and American Life Project, 2010). Greenwood (2009) also found that more than 50% of active Internet users are between 18 and 24 years of age. These statistics reveal the potential of the Internet and, particularly, of interactive Web 2.0 venues to provide important health information capable of encouraging risk management and disease prevention behaviors in users ages 18 to 24.

The Internet as a Health Informing Channel

With the advent of Web 2.0, Internet users of all ages became more likely to seek health information on the Internet because information on the Web is easy to access and provides anonymity when the information need is highly personal (L. Luo, 2010). Prior to development of the World Wide Web, people relied on family doctors when they needed health information or advice. When they realized that health information was conveniently available on the Internet, they initially explored sites with “URL’s ending in .edu, .net, .com or.org” (J. S. Luo, 2008, p.24) because they believed that the information on these sites was most credible. As users gained experience with Internet based health information, they recognized the Internet as a cost effective health-informing channel, available 24/7. Users relied on it as a valuable aid in health care decision-making that allowed them to actively participate in their own healthcare (Suggs, 2006).

Several types of people rely on the Internet for healthcare information. Brashers, Goldsmith, and Hsieh (2002) reported that healthy people seek health information that reassures them of their wellness, while the sick look for information about their specific illness, treatment choices and the expected course of their infirmities. Abrahamson, Fisher, Turner, Durrance, and Turner (2008) proposed a third type of person that seeks health information on the Internet: “Lay information mediaries seek information on behalf or because of others without necessarily being asked to do so, or engaging in follow up” (p. 310).

Many health information seekers value the ability to interact via Web 2.0 social media venues. They appreciate the exchange of information with health experts and the dialogue about shared experiences with other people suffering from the same conditions. Weaver, Thompson, Weaver and Hopkins (2009) hailed the interactive nature of Web 2.0 as a new public health venue and Cline and Hayes (2001) determined that interactive health communication, available through social media venues, promotes wellness in the healthy public. Additionally, social media offers an informing channel that supports the sick and offers a valued cluster of communication resources for health care providers who use them to reach targeted groups.

Social Media on the Internet

In 2007, Boyd and Ellison defined the parameters of a social media site. They noted that social media sites:

- allow users to create public or semi-public profiles within a closed environment
- permit the user to identify other users with whom they are willing to connect, and prevent undesigned users from viewing the owner's profile and information
- allow the user to view the pages of other users that have given their permission to do so, and facilitate interaction between them.

Social media in this context includes familiar sites like Twitter, MySpace, Facebook, Flickr, and YouTube, and extends to blogs, wikis, and online medical support groups (Kahn, 2008). Rajipat (2009) suggested that social media benefits all users by providing an equal opportunity to share ideas and opinions, and Scale (2008) noted that these venues have the ability to make users feel secure while sharing highly personal information. Choi, Kim, Sung and Sohn (2011) pointed out that users have become quite comfortable with online discourse because social media and Internet use have become important components of users' daily routines. Kahn (2008) noted the ability of users to interact both with information and with other users by exchanging videos and textual messages, participating in blogs and social networks, sharing recorded materials, and joining online communities. In 2010, Madden determined that 65% of adults online in the United States reacted positively to social networking. Chou, Hunt, Beckjord, Moser, and Hesse (2009) pointed out that social networks reach users in spite of differences in ethnicity, race, educational background, and geographical location. For these reasons, social media sites have multiplied exponentially. L. Liu's 2010 study showed that the three most often used social media sites were Wikipedia, YouTube, and Facebook, and the top four reasons for using social media were for "social engagement ...communication, speed of feedback and relationship building" (p.101). Hence, social media venues are informing channels with significant educational potential.

Social Media as a Health Informing Channel

Chou et al. (2009) view social media venues as ideal mediums for health educators seeking to educate the public and encourage risk management and disease prevention behaviors. Reynolds (2010) reported on the Center for Disease Control's (CDC) implementation of a social media communication campaign during the H1N1 crisis several years ago. At that time, public confidence in government organizations was low, and the CDC, in an effort to inform many people rapidly, decided to capitalize on the popularity of social media. They provided essential information about H1N1 using Twitter, MySpace, Facebook, YouTube, and podcasts and delivered simple, honest, and relevant messages during the crisis. A post-crisis public opinion survey, conducted by the American Customer Satisfaction Index, showed an 8% increase in public satisfaction over the rating in the prior quarter, to a new high of 82% (Reynolds, 2010). Spurred by this success, the CDC produced the *Social Media Toolkit* (CDC, 2011), a collection of best practice guidelines for health educators interested in using Facebook, Twitter, text messages, online videos, e-cards, and other materials to educate users and stimulate healthy behavior change.

YouTube as a Health Informing Channel

Alexa (2011) reported that YouTube, an Internet social media and video viewing site, ranks third in the world for volume of video traffic and enjoys a larger audience of 18 to 24 year olds than other Internet sites. Paek, Kim, and Hove (2010) conducted a content analysis of 934 YouTube antismoking videos and determined that there was significant opportunity available on YouTube to promote health education materials. They also concluded that the interactive nature of this venue was useful not only for the viewing audience, but also for health educators who could use

viewer comments to evaluate audience response. Dr. William Howe, a University of Colorado dermatologist, used YouTube between 2010 and 2011 to effectively distribute messages about skin cancer prevention to young people (Dawson, Hamstra, Huff, Gamble, Howe, Kane, & Delavalle, 2011). Howe chose YouTube for its easy access and because it was the most highly used social network for video viewing (Buzzetto-More, 2012). Keelan, Pavri-Garcia, Tomlinson, and Wilson (2007) conducted a content analysis of YouTube videos about immunization and again saw great potential for YouTube to be an effective health-informing channel.

Education Entertainment

The benefit of framing an important health education message in an entertainment venue, or Education Entertainment (E-E), is under investigation in the health education literature. In 2006, Jin studied the educational impact of a popular health television program in Korea and found that health E-E programming was “positively associated with overall interest in health issues and perceptions of the severity of personal health problems” (p.79). In other words, it is an effective means of engaging audience members in learning how take better care of themselves.

Are Entertaining or Factual Message Appeals More Effective, and is Learning Affected by the Type of Message Appeal?

In 2002, Singhai and Rogers studied the mediating effect of entertainment on eHealth education (or Internet based health education). They incorporated a safe sex/condom use presentation made by a physician avatar in a 3D virtual world, Second Life, during the participants’ gaming experience. Participants who received eHealth education from the avatar were tested, and they understood and remembered the educational material presented well. Their understanding and recollection was, in part, attributed to the entertaining nature of the presentation. In 2011, Moyer-Guse, Mahood, and Brookes also studied the impact of humor on E-E that focused on sexual health. They noted that while a humorous message can increase viewer attention, be more persuasive, and provoke a positive viewer response, it is important to ensure that the important risk prevention message does not become trivial because of the humorous context.

Literature suggests that YouTube can be an effective health informing channel for 18 to 24 year old users and that viewer engagement and learning can be affected by the type of message appeal (factual or entertaining) used in the YouTube video. This study provides data that provides insight on these suggestions.

Methodology

This work extends the informing science framework to health information delivery by quantifying whether YouTube can deliver safe sex/condom use information and facilitate knowledge acquisition in a population of 18-24 year old users. In addition, this mixed method study will quantify whether an entertaining or factual message delivery format of the same content more effectively fosters knowledge acquisition.

Lopez-Fernandez and Molina-Azorin (2011) state that mixed method studies offer richer results that lead to greater understanding of the issue at hand and facilitate new ideas in a way that cannot be achieved by either quantitative or qualitative methods alone. This study relies on pre- and post-test measures (Rosner, 2011) and a quantitative survey to assess knowledge acquisition about STD prevention. Then, the investigator used a qualitative, open-ended question to collect specific feedback about participant response to each type of STD message presentation style (factual vs. entertaining).

For this study, the investigator recruited 33 student participants from an undergraduate business course at the University of North Texas. Participants needed to be between the ages of 18 and 24 to participate. Participants signed informed consent forms during the recruitment session and understood that they would participate in a study about safe sex. The investigator assigned participants to one of the two study groups (factual or entertaining safe sex video) via randomization of the signed informed consent forms that the participants provided. The investigator subsequently emailed each participant a link to the appropriate survey version, based on this random assignment.

Using the search term “safe sex”, the investigator reviewed available YouTube videos that delivered educational content about the prevention of sexually transmitted diseases. The goal was to identify two tasteful safe sex education videos with the same educational content but with two different message delivery styles, one factual and the other entertaining. The factual video selected was “STD Prevention and Protection (Safe Sex, Sexy Sex #1)”, found at <http://youtu.be/mr5ghuaTK14?t=5s>. The video was uploaded to YouTube from Healthguru.com, a popular resource library of health, pregnancy, and sex education videos. The available video statistics showed that the video posted on 12/17/07. On the selection date, the video had 26,475,632 views, 13,262 documented likes, and 4824 documented dislikes. Alice W. Ko, MD, from the Department of Obstetrics and Gynecology, Doctors of the World, Johns Hopkins, a world-renowned medical institution, presented information in the video. The video lasts 3 minutes and 8 seconds. The second video selected was an entertaining video entitled “How to Have Safe Sex”, found at http://youtu.be/VYNDe_eoJZg?t=6s. Howcast uploaded the video on 2/8/08, and on the selection date had 89,414 views, 122 documented likes, and 26 documented dislikes. Howcast, founded in 2008, is a provider of instructional video content in many topic areas. In this video, the educational content comes through a “voice over” narration to a mimed and comical interaction between two older adults and highlights key points that also appear as text on screen. This video lasts 3 minutes and 20 seconds. Both videos are similar in length, were determined by health educators to share the same educational content, and were professionally made. The investigator created a test based on the safe sex educational content present in both videos. The goals of this study are the following:

- (1) to demonstrate that YouTube is viable as a health education-informing channel for 18-24 year old users. To do this, the investigator will measure knowledge acquisition using a pretest and identical posttest.
- (2) to identify whether participants acquire a different level of knowledge about safe sex content based on the message delivery style (an entertaining YouTube safe sex video, or the more serious factual alternative).

Hence, the following research hypotheses about the effectiveness of the YouTube safe sex educational videos to promote knowledge acquisition and the difference in mean posttest difference scores between viewers based on the two video message presentation styles (factual or entertaining) were tested.

Hypothesis I states:

H1o: The average difference in the pre- and post-test scores for all participants was less than or equal to 0

H1a: The average difference in the pre- and post-test scores for all participants is greater than 0

Or

H1o: $m_{\text{Diff}(\text{post-pre})t} \leq 0$

$$H1a: m_{\text{Diff (post-pre)}} > 0$$

The second hypothesis about the difference between the delivery formats of Entertaining (E) versus Factual (F) videos states:

H2o: There is no difference in the mean difference scores between the entertaining treatment group and the factual treatment group

H2a: The mean difference in the entertaining video post-test score minus pre-test score is not the same as the mean difference in the factual video post-test minus pre-test score

Or

$$H2o: m_{E \text{ Diff (post-pre)}} = m_{F \text{ Diff (post-pre)}}$$

$$H2a: m_{E \text{ Diff (post-pre)}} \neq m_{F \text{ Diff (post-pre)}}$$

Participants received a link to one of two online surveys delivered by Qualtrics. Qualtrics (www.qualtrics.com) is an online survey vehicle available to academic departments conducting research at the University of North Texas. Using Qualtrics, the researcher created custom surveys that were available to participants electronically, via a link embedded in an email to the participant. Respondents took the survey at a time and location convenient to them during a specified seven-day period. In order to preserve participant anonymity and to separate participant responses from collection of their names for extra credit awards, at the completion of the safe sex survey participants clicked a link to a separate survey instrument, where a single question asked for their name and Enterprise User ID (EUID).

The investigator created two identical Qualtrics surveys. (A copy of the safe sex survey questions appears in the Appendix.) Both Survey A (for group A) and Survey B (for group B) collected demographic information (sex, age, race, educational level) and asked the participants if they knew what the term “safe sex” meant. Participants were asked if they had received sex education in the past, and if so, where and from whom. Participants were asked to document their relationship status (single, dating, in a committed relationship, married) and were given an identical pre-test to evaluate their current knowledge about safe sex. Next, participants viewed one YouTube video that the investigator embedded in the survey and which the participant could only view one time. Survey A had the entertaining video showing the older dating couple embedded, and Survey B had the factual presentation by the physician embedded. Participants were retested using the same test given prior to watching the videos to evaluate knowledge acquired from viewing each type of video. Both surveys concluded with a single open-ended question asking for comments about video presentation style, value of information presented, and thoughts about finding educational content on YouTube. The investigator compared pre- and post-test scores for all participants using a paired t-test to evaluate whether YouTube proved with statistical significance to be a viable health education-informing channel. Pre- and post-test scores for participants viewing the entertaining video were compared to the same scores of the participants that viewed the factual video using a paired t-test to determine if a statistically significant difference in pre- and post-test scores existed between participants in each treatment group.

Research Findings/Results

Overall, 33 study participants were recruited and 33 responses were received. Fifteen respondents (group A) had taken Survey A and eighteen respondents (group B) had taken Survey B. At the conclusion of the survey period, the investigator reviewed participant data and removed three participants from each group of respondents. Among the participants that took survey A, the investigator removed one participant because he was older than the target age range. The investigator

removed two participants for providing conflicting answers, such as identical answers to all questions, which invalidates the data that they provided. The investigator removed three respondents to Survey B for similar data issues. One respondent was older than the targeted age range and two provided unreliable answers such as identical answers to all questions. After cleaning the data, 27 usable responses remained (12 for Survey A and 15 for Survey B).

An examination of study sample demographics revealed the following. In providing demographics, total population statistics in each demographic category is followed by a statistic in parentheses showing the demographic for participants that viewed the factual (F) video, and those that viewed the entertaining (E) video. Of the 27 participants that took both surveys (15F, 12E), 14 were female (6F, 8E) and 13 were male (9F, 4E), providing a relatively even gender distribution among the respondents. Three participants were between the ages of 18 and 20 (1F, 2E), and twenty-four participants were between the ages of 21 and 24 (14F, 10E). Twenty-six participants were undergraduates (14F, 12E) and one participant identified himself or herself as a graduate student (1F). The racial distribution of the participants was broad, and showed that 2 were African American (1F, 1E), 8 were Asian (4F, 4E), 13 were Caucasian (8F, 5E) and 4 were Hispanic (2F, 2E). In terms of relationship status, 14 participants reported that they were single (6F, 8E), 4 were in a committed relationship (2F, 2E), 6 were dating (4F, 2E) and 3 were married (3F, 0E). Twenty-two participants claimed to have received sex education in the past (11F, 11E), while 5 had not (4F, 1E). Of those that had received prior sex education, family members taught four (3F, 1E), 14 received training in school (7F, 7E), one was self-taught (1F), and three received sex education from an unidentified source (3E). Five participants claimed to have received no prior sex education (4F, 1E). Interestingly, all participants claimed to understand what the term “safe sex” meant.

Participants completed the designated survey and the instructor collected the data. It is important to compare overall pretest and posttest results to determine whether YouTube is an effective health education-informing channel. Then, the comparison of pre- and post-test results between the participants that viewed the entertaining video versus those that viewed the factual video will be used to determine if one message delivery style (factual vs. entertaining) is more effective than the other in facilitating participant knowledge acquisition. Finally, it is important to explore participant perceptions about each video type and to examine the differences in their perceptions about the reliability of health information found on YouTube.

First, to test Hypothesis 1, the investigator conducted a paired t-test (Rosner, 2011) to evaluate whether YouTube was a viable health education-informing channel. The statistically significant results support the contention that YouTube is a viable informing channel for providing safe sex education.

The paired t-test resulted in a t calculated (3.35) that is greater than t critical (1.70) and a p value of 0.0012, which was less than the alpha of 0.05. Therefore, we reject the null hypothesis 1 at the 5% level of significance and have statistically significant results to support the contention that YouTube is an effective health education-informing channel.

This result was also examined for each sample, factual versus entertaining, and Table 1 again shows a significant difference in the post-test score versus the pre-test score for each treatment group.

Table 1: t-Test: Paired Two Sample for Means						
	Post- test Score	Pre-test Score	Factual Post test Score	Factual Pre-test Score	Entertaining Post-test Score	Entertaining Pre-test Score
Mean	13.81	11.96	14.6	12.53	12.83	11.25
Variance	18.39	14.34	20.69	16.84	15.24	11.48
Observations	27	27	15	15	12	12
Pearson Correlation	0.755		0.70		0.821	
Hypothesized Mean Difference	0		0		0	
df	26		14		11	
t calculated	3.359		2.391		2.455	
P(T<=t) one-tail	0.0012		0.0157		0.0160	
t Critical one-tail	1.706		1.761		1.796	

Next, to test Hypothesis 2, the investigator conducted a two-tailed t-test (Rosner, 2011) to evaluate whether the two video formats were different in their ability to facilitate knowledge acquisition in participants. The test compared the mean differences between the pre-test and post-test scores for each treatment group, and the results are shown in Table 2.

Table 2: t-Test: Two-Sample Assuming Equal Variances		
	Factual Video Difference	Entertaining Video Difference
Mean	2.066666667	1.583333333
Variance	11.20952381	4.992424242
Observations	15	12
Pooled Variance	8.474	
Hypothesized Mean Difference	0	
Df	25	
t calculated	0.428703361	
P(T<=t) two-tail	0.671810519	
t Critical two-tail	2.059538553	

The t-test resulted in a t calculated (0.42) that is less than t critical (2.05) and a p value of 0.672 that was more than the alpha of 0.05. Therefore, the investigator failed to reject the null hypothesis 2. Therefore, for Hypothesis 2, the mean difference of the difference in test scores in both treatment groups is not statistically significant, indicating that no significant difference exists in the ability of the videos to facilitate knowledge acquisition for participants and suggesting that message presentation style was not a significant factor in knowledge acquisition.

However, in order for health educators to capitalize on YouTube as a health education-informing channel, it is important to explore participant perceptions about the two message presentation

styles, their planned behavioral intention, and their thoughts about the likelihood of finding reliable health information on YouTube.

Participants in both groups, after watching their video, rated their feelings about being able to find reliable health information on YouTube. The percentage of responses in each response category for both study groups are in Table 3 below. Table 3 shows that 67% of participants in Group A (12), who viewed the entertaining video, agreed at some level (Slightly Agree 33% plus Agree 17% plus Strongly Agree 17%) that they could find reliable health information on YouTube. In Group B, who viewed the factual video, 60% agreed at some level (Slightly Agree 13.33% plus Agree 40% plus Strongly Agree 6.67%) that they could find reliable health information on YouTube. Greater doubt or disagreement was present in Group B (factual video) with 40% neutral or with some level of disagreement than in Group A (entertaining video) which had 33% neutral or with some level of disagreement. Still, in the total combined sample, over 59% of the 27 participants slightly agreed, agreed or strongly agreed they could find reliable health information on YouTube. This suggests to health educators that YouTube is a viable health education-informing channel for this age group.

Table 3 Question: I feel that I can find reliable health information on YouTube.		
Response	Participant Group	
	Group A (entertaining video)	Group B (factual video)
Strongly Disagree	0	6.67%
Disagree	0	6.67%
Slightly Disagree	25%	13.33%
Neutral	8%	13.33%
Slightly Agree	33%	13.33%
Agree	17%	40%
Strongly Agree	17%	6.67%

Participant criteria for determining the reliability of health information presented on YouTube is further detailed in Table 4. Participants in both groups selected from a series of choices the statements that best reflect the way that they determine if health information that they find on YouTube is accurate. The number of responses in each category for all 27 participants is shown in Table 4 below, and the number of responses in each category for each treatment group is also shown. Participants selected as many of the possible choices as they felt were applicable.

Table 4 shows that the participants in both groups value information presented by a medical professional (13F, 9E) in a serious (6F, 6E) and professional tone (4F, 8E). The information in Video A (entertaining video) had no evidence of a medical professional's input and was somewhat comedic. A physician identified as a member of a premier and well-revered medical institution presented the information in Video B (factual video) in a serious manner. The presence of a medical professional was mentioned as important more often by those that viewed the factual video, whereas more of the participants that viewed the entertaining video were concerned with the number of views that a video had or whether or not a friend felt that the information given was accurate.

Table 4 Question: I think that I know how to determine if health information that I find on YouTube is accurate. I would consider the following in making that decision (mark all that apply)			
Response	Number of Times Selected	Number of Times Selected (factual)	Number of Times Selected (entertaining)
How popular (how many views) a video has	9	3	6
Whether a medical professional created or presents the information	22	13	9
Whether the tone of the video is serious	12	6	6
Whether the tone of the video is professional	12	4	8
Whether a friend that I trust thinks it is accurate	4	0	4
If the video was professionally made or homemade	7	1	6

The survey asked participants, after watching the video, about how the video would affect their safe sex behavior in the future. The impact on potential behavior change of the safe sex education provided was substantial. First, 85% (23/27) of the respondents indicated that because of watching the video, they intended to ask a new sexual partner about their sexual history before having sex the first time. Additionally, 89% (24/27) of the participants indicated that they felt that it is important to test regularly for STDs, and 96% (26/27) of the participants indicated that it is important to ask their partners if he or she tested regularly for STDs. Another large portion of participants 93% (25/27) indicated that they planned to discuss condom use with any new sexual partners, and an identical group (25/27 or 93%) of participants felt that they could suggest condom use to a new sexual partner. Finally, 64% (16/27) of the participants reported that they were likely to change their current behavior because of watching the video. The Fisher exact likelihood test (Siegel & Castellan, 1988) shows that all these proportions excluding the behavior change proportion (16/27) are statistically significant despite the small samples involved. These findings further support the potential impact of YouTube as a health-informing channel.

Participants' open-ended comments, collected at the end of the survey, further elaborate. The survey asked participants in both groups the following question: "In your own words, please describe your thoughts about the video that you watched. Provide information about the video presentation style, the value of the content to you and your opinion about finding this information on YouTube."

Participants in Group A (12), who viewed the entertaining video, gave the following responses, several of which indicate a preference for a more serious presentation of health information:

"It was very helpful in helping young adults be informed about safe sex".

"I thought it was informative".

"I found this video very helpful with some sexual information I didn't know. Already new STDs are a serious concern of mine but after this video it has made it clear that there are certain methods of further preventing STDs. Talking to your partner is key when it

comes to sexual information. Video overall was good and provided lots of serious information.”

“I didn’t like the fact that it was presented (demonstrated) by older people. The info that was given was professional and seemed accurate. The presentation style was great, excluding the people used. Possibly more visuals would help.”

“I thought the video had decent information but it was not shown so well. It was kind of a joke with 2 old people smiling and playing with a teapot with a crochet cap. The information was good about dental dams and anal and how Al Capone died of syphilis, but I felt the demonstrations should have been more realistic if they want people to actually go through with these safe sex methods. I liked the info but I wouldn’t take the video as seriously just cause the video showed two old people fooling around with a teapot and crochet cap. I kinda laughed at their actions.”

Another interesting perspective from Group A was:

“The video was good. It provided decent information and tips while also further provoking the viewer to abstain from sex by putting the mental image of the older couple possibly getting it on, while also providing a comical scenario with the old couple. I think by using the older couple viewers will pay more attention. When I was in school the video we had to watch had kids our age or actors pretending to be our age, by making the video to relate to us. The viewers (young high school students) who already feel like the world doesn’t understand us) were less inclined to a) take the video seriously and b) listen. It grabbed my attention and I am sure it will help educate someone who hasn’t heard this information before.”

Participants in Group B (15), who viewed the factual video, offered the following:

“The video seemed to be told by a professional health worker of some sort and it looks to be made for educational purposes. The content of the video was mostly unnew to me but the information given was important all the same.”

“About educating people about STDs and how to prevent them and practice safe sex. I feel that you can’t trust any medical information you get from YouTube because it hasn’t been evaluated by a doctor.”

“Very informative and to the point on safe sex practices. I like how it was presented and the information that was given.”

“Professional; serious but informative; interesting use of graphics to better demonstrate the topics.”

“It was informative. However, I wasn’t expecting this for the survey!”

“I am really happy for having seen this video. I think that this video helps understand the impact of different diseases that we could contract. It helps us be careful about ourselves in a relationship.”

“It was a well-made video and I totally agree that everyone should pay attention to this because it is not something to play around with. We are talking about how to prevent STDs and prevent causes of death.”

“Actually somewhat entertaining”

“The video was interesting. I had never heard of the use of female condoms before. The way the video showed diagrams to explain how different things worked was very helpful.”

“The video was well made and the narrator did a good job of articulating the most key points of sexual education.”

“It was very informational. It’s not uncommon to find reliable sources on YouTube but it would always be wise to consult a health professional.”

Comments from both groups of participants suggest a willingness to receive health information from YouTube. In general, participants value video presentations that are “interesting” and “attention grabbing”, yet “serious”. Participants also claimed to appreciate illustrations or diagrams that clarified key points. The presence of a health care professional (such as the MD) in Video B seemed to add credibility to the information presented and to help viewers to focus and subsequently articulate the serious consequences of not following safe sex practices. The information shown in Table 4 supports the claim that those that watched the factual video had a preference for information presented by a clinical professional in a serious manner. Table 4 also shows that those that watched the entertaining video preferred to rely on subjective measures, like video popularity, as measured by the number of recorded viewings for the video. Table 4 further shows that those that watched the entertaining video valued their friends’ assessments of the accuracy of the information presented, which was not an important criterion for those that watched the factual video.

Practical Implications

This study provides statistically significant evidence that YouTube is a viable health education-informing channel capable of facilitating knowledge acquisition for users in this age group. The study also supports the contention that YouTube can facilitate behavior change regardless of the type of message appeal (entertaining or factual) presented. This significant finding enhances the growing awareness of the power of this social media venue for the informer to educate and inform in the healthcare arena.

In addition, the study has provided a framework of user preferences for health education messaging on YouTube. While users in both groups acquired important knowledge about safe sex practices, and many indicated that they planned to change their future behavior, distinct message preferences emerged. Users prefer health education messages presented by a medical professional, to have a serious and professional tone and yet be engaging, as well as including diagrams or other visual tools to enhance understanding. While no one message delivery style will work for all users, future work will define further the use of this popular and important informing channel by health educators. While there is no evidence to suggest any difference in the positive educational impact of videos with distinctly different message delivery styles, future work can clarify the user characteristics or content that make a particular message delivery style successful for specific user populations.

Study Limitations

This work has several limitations. The use of a small sample of college students limits the ability to apply the study results to the general population of users in this age group, particularly those affected by the Digital Divide or economic factors that may prevent them from accessing online health education via YouTube. Despite these limitations, college students represent an important population for whom this health risk management information is relevant. While the small sample size is a limitation, the investigator would not expect the statistical significance of the results in Table 1 to change if the sample were larger. The investigator also would not expect the lack of statistical significance in Table 2 to change because both results were relatively extreme. However, a larger sample size would be likely to improve the counts in some of the response categories shown in Table 4. In addition, another limitation in this work is that the sensitive and direct

nature of the content of these videos is potentially distracting to some viewers, and may affect their ability to learn or retain new information.

Conclusions

This work advances knowledge about the use of YouTube as an effective health education-informing channel for a specific user demographic. In this study, YouTube health education messages, both factual and entertaining, resulted in a statistically significant improvement in knowledge of safe sex practices and STD prevention for all participants. Health educators recognize that YouTube is a favored social venue for users in this age group. Because of this work, health educators can take advantage of existing user behaviors to promote improved sexual behavior decision-making and a reduction in the incidence of STDs for vulnerable 18-24 year olds. This study confirms both YouTube's health education utility and its ability to serve as a health education-informing channel. Because of these contributions, this study also extends the informing science framework to health information delivery.

Appendix

Safe Sex Survey Questions

Indicate your gender

Indicate your age

Indicate your academic level

Indicate your race

Indicate your relationship status

I know what the phrase 'safe sex' means

I have received safe sex education in the past

If you answered no to the last question, skip to the next section. If you answered yes to the previous question, please indicate where you received education about safe sex

The following section will assess your current knowledge about safe sex practices

I think that safe sex only refers to preventing pregnancy

Sexually transmitted diseases (STD's) are something that I am concerned about

Sexually transmitted diseases are visible to the eye if your partner has one

I consider sexual abstinence to be a realistic way of preventing STD's

To prevent an STD I must have sex only with a partner that is not infected

People are honest when they talk about sex

The most important first step in preventing STD's is to limit the number of sexual partners that you have

Everyone should be tested for STD's on a regular basis

Condoms are only made for males

The goal of using a condom is to prevent contact with your partner's bodily fluids

Oral sex is a safe way to prevent STD's

Condoms, if removed carefully from the package, are safe to use

Condoms should be put on the male before sexual intercourse begins, just to be safe

Condoms should fit tightly around the penis to be effective

Condoms are good for a long time as long as the package is intact

Female condoms are as effective as male condoms

If a woman uses a female condom, she can remove it properly after she stands up after having sex

A man can remove a condom properly after sex by simply pulling it off

An oil-based lubricant like Vaseline can reduce tearing of both the skin and the condom

All condoms are made of latex

Oral barriers (dental dams) are not necessary when the man is wearing a condom

You should explore your partner's sexual history before having sex the first time

You don't have to be concerned about your partner's sexual history if you know your partner well.

When is it important to ask if your partner has been tested or treated for an STD?

In the next segment, you will watch a YouTube video about safe sex. The video is currently available on YouTube. Please watch the video embedded below. Do not download the video. Start the video by clicking the right arrow (>) in the gray bar beneath the video. Do not advance to the next screen until after you have watched the video. You will not be able to return to it.

VIDEO EMBEDDED HERE

Now that you have watched the video, please answer the following questions based on information that was provided in the video. You will not be able to return to the video. Simply answer the questions based on what you remember from watching the video.

I think that safe sex only refers to preventing pregnancy

Sexually transmitted diseases (STD's) are something that I am concerned about

Sexually transmitted diseases are visible to the eye if your partner has one

I consider sexual abstinence to be a realistic way of preventing STD's

To prevent an STD I must have sex only with a partner that is not infected

People are honest when they talk about sex

The most important first step in preventing STD's is to limit the number of sexual partners that you have

Everyone should be tested for STD's on a regular basis

Condoms are only made for males

The goal of using a condom is to prevent contact with your partner's bodily fluids

Oral sex is a safe way to prevent STD's

Condoms, if removed carefully from the package, are safe to use

Condoms should be put on the male before sexual intercourse begins, just to be safe

Condoms should fit tightly around the penis to be effective

Condoms are good for a long time as long as the package is intact

Female condoms are as effective as male condoms

If a woman uses a female condom, she can remove it properly after she stands up after having sex

A man can remove a condom properly after sex by simply pulling it off

An oil-based lubricant like Vaseline can reduce tearing of both the skin and the condom
All condoms are made of latex
Oral barriers (dental dams) are not necessary when the man is wearing a condom
You should explore your partner's sexual history before having sex the first time
You don't have to be concerned about your partner's sexual history if you know your partner well
When is it important to ask if your partner has been tested or treated for an STD?

The section below asks about your thoughts after watching the video

After watching the video I will ask a new sexual partner about their sexual history before having sex
I feel that it is important to be tested regularly for STD's
I feel that it is important to ask my partner if he or she has been treated for STD's
I plan to discuss condom use with any new sexual partner that I have
I feel that I could suggest condom use to a new sexual partner
I am likely to change my behavior as a result of watching this video
I feel that I can find reliable health information on YouTube
I think I know how to determine if health information that I find on YouTube is accurate

In your own words, please describe your thoughts about the video that you watched, Provide information about the video presentation style, the value of the content to you, and your opinion about finding this information on YouTube.

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Biography



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The Social Network Application Post-Adoptive Use Model (SNAPUM): A Model Examining Social Capital and Other Critical Factors Affecting the Post-Adoptive Use of Facebook

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Abstract

Facebook is an informing social networking application that has experienced phenomenal worldwide user growth within a relatively short time and continues to grow at a rapid rate. This study examines the motivations for users to continue to use Facebook after adoption. Using a transdisciplinary approach, we draw on the technology acceptance research stream, post-adoption theories, and social capital theory to develop a model of the critical factors that affect the post-adoptive use of Facebook. We argue that social capital is also poised to play a significant part in social networking informing environments for the foreseeable future. Other critical factors affecting post-adoptive use of Facebook include hedonic enjoyment, perceived usefulness, satisfaction, and attitude toward using.

Keywords: Facebook, informing environment, social networking applications, social capital, post-adoption.

Introduction

Social Networking Applications (SNAs) have experienced a surge in popularity in recent years. The term Social Networking Application is used in this paper instead of the more common Social Networking Site (SNS) because it is less platform specific (web sites are no longer the only means of social network content delivery) and is more inclusive of mobile devices and other means of accessing social networking computing offerings. Recent data suggests that 65% of U.S. teens use a SNA and up to 35% of Internet users age 55 and older make use of SNAs (Lenhart

2009). In 2008, nine SNAs reported registered users of over 50 million each (Cardon, 2009). Four of those nine are estimated to have received over 100 million unique visitors, and two of the nine reported over 200 million unique visitors (Schonfeld, 2008). Among SNAs, Facebook has demonstrably outgrown its rivals growing an estimated 157 percent from 2008 to 2009. In 2009 Facebook had grown so large that it was es-

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timated to be the fourth largest Internet site in the world, trailing only Google, Microsoft, and Yahoo (Schonfeld, 2009), and as of March 2010, at least one measuring method showed Facebook to have surpassed Google in weekly U.S. traffic (Hardawar 2010). Since 2009, Facebook has embarked on a growth spurt that has more than quadrupled the amount of active users (more than 500 million active users as of July 21, 2010), at times growing by over 700,000 users per day (Smith, 2009; Zuckerberg, 2010). Translated into over 100 languages, Facebook has demonstrated its ability to penetrate nearly one third of the national population in many developed nations, and these international growth rates are increasing (Smith, 2010). Thanks to the ubiquity of the Internet, Facebook may be modeling the most explosive growth curve ever experienced by an information technology. If there is a “killer app” for social networking, Facebook is it. Now is certainly the time to examine Facebook and its users during its highest growth phase and while it is still developing.

Social networking applications, such as Facebook, have become part of what we can call the informing environment, which can be understood as the collection of factors and influences that affect, enable, and limit the process of informing clients (Cohen, 2009). SNAs allow informers and clients to become interconnected by creating informal networks of friends to whom they communicate with and share information. According to Rambe and Ng’ambi (2009, p. 64), “an informer may focus on a subset of a network as a target to be informed,” thus creating “layers of complexity and barriers to seeking and sharing information.” Facebook’s popularity notwithstanding, there is little research that has empirically examined the critical factors that contribute to the continued use of Facebook, or other SNAs, beyond initial adoption, and none to our knowledge that use an informing science transdisciplinary approach. Therefore, the research question for this present study is: What factors contribute to users continuing to use Facebook after adopting it?

Also noticeably absent are technology post-adoption studies that incorporate social capital as a motivating factor. Social capital is the benefits attained from the information shared and the relationships in which an individual participates. The core idea is that social networks have value. However, as Cohen (2009) discussed, there are issues in the informing environment that affect how clients attend, perceive, and act on information provided, thus influencing the social capital derived. The desire to obtain social capital can be a motivator for continued participation in the social networking informing environment. This study strives to fill the gap in transdisciplinary post-adoptive SNA research by examining the factors contributing to the post-adoptive continued use of Facebook and to advance the technological use theory stream by demonstrating the role that social capital can play in social networking technologies.

From a practitioner perspective, the answer to the question of what factors contribute to post-adoptive Facebook use affects how businesses should approach leveraging SNAs to relate to their customers and how SNA design can be improved upon. Industry advisors assert that successful corporate entry into the online social networking community is not as simple as establishing a profile on a SNA and waiting for users to flock to the company’s online presence (Warr 2008). Some companies have been successful utilizing SNAs, and some are still waiting for success. Addressing SNA usage in a satisfactory way will benefit both businesses and customers through knowledge that contributes to productive online communities that meet the needs of both entities. From an academic perspective, it is important for researchers to understand the specific aspects of SNAs that contribute most to continued use for a particular SNA because of the possibility that the same factors may contribute to continued use in other related or derived technologies.

We have adopted the philosophy of informing science as laid out by Cohen (2009) and conducted research on this phenomenon that is transdisciplinary in nature. There have been many studies of social networking applications done purely along disciplinary lines. Our research on social networking is steeped in theories from the disciplines of information systems, marketing, psychol-

ogy, and communication. These disciplines have evolved and will continue to evolve, and with technology in the throes of constant change, it is imperative that social networking researchers avoid becoming isolated by discipline and the risk of developing weak theoretical models for want of input from other, relevant fields (Gill & Cohen 2008).

This paper makes the following contributions to academic research. First, we review previous literature on the adoption and post-adoptive usage of technology, synthesizing it and theorizing on its application to a new context: the realm of social networking applications. Second, we develop and empirically test a theoretically grounded model that can be used and extended in future research on social networking, online communities, and social software. Social media is ubiquitous and has become an important part of users' daily lives. We argue that adoption and post-adoption theories should be contextualized for this new environment which aids participatory information sharing and collaboration. Therefore, the derivation and empirical testing of such a model is timely and important. Third, we introduce a validated instrument for measurement of SNA usage factors to the field. We expand on the system usage construct used in Venkatesh, Brown, Maruping, and Bala (2008) by adding items designed to measure the breadth of usage in addition to frequency, duration, and intensity, thus clearly moving toward a richer conceptualization and measurement of usage.

Theoretical Background

The phrase post-adoptive use in this study refers to continued active use of the technology beyond the point where the technology was first adopted. Our goal in looking at post-adoptive use is to investigate the critical factors that explain why people continue to use a social networking site. Therefore, we use post-adoptive use as our research model's dependent variable. We note, however, that other approaches, such as examining changes in usage patterns from a baseline taken at adoption to a given (post-adoptive use) point in time, also have value and should be considered in future research.

In the remainder of the Theoretical Background section, we first discuss SNAs, themes of research in the SNA literature, and categories of SNA usage studies. Next, we discuss post-adoptive use. Third, we examine technology acceptance and post-adoptive model fit to SNAs. And fourth, we discuss the theoretical background of social capital.

Social Networking Applications

In this study, a SNA is defined as a computing application that supports and encourages online social networking. Users of SNAs participate in a kind of online community that simulates, after a fashion, the offline social interactions of individuals. SNAs are usually accessed through a web browser from a website, although they can also be accessed through mobile devices or other electronic means. SNAs typically share a common set of features which include:

a profile (representation and/or description) for each user, the means to build and manage a personal relational network (i.e., friends, family, acquaintances, etc.), and access to creative methods to communicate with members of their relational network and the online community. (Magro, Ryan, Sharp, & Ryan, 2008, p. 1)

Academic literature on SNAs has begun to proliferate over the last few years but there is still a limited amount of knowledge on the phenomenon. An analysis of the available academic literature on SNAs for the last six years reveals a collection of five themes or areas of interest that are representative of the kinds of research being conducted on SNAs. The five themes are (1) general analysis of the SNA phenomenon; (2) privacy, trust, security, and ethics; (3) SNAs as artifacts; (4) SNA suitability as tools for a discipline, field of study, or division of industry; (5) SNA use and motivations for use. Key articles from each of these themes are listed in Table 1.

Table 1 Themes of Research in SNA Literature

Theme	Description	Examples
PRIVACY/ TRUST	Privacy, trust, security, or ethics	Dwyer, Hiltz & Passerini 2007; Fogel & Nehmad 2009; Hinduja & Patchin 2008; Acquisti & Gross 2006.
USE	Use and motivations for usage	Bolar 2009; Bruque, Moyano & Eisenberg 2008; Ellison, Steinfield & Lampe 2007; Hargittai 2008; Hu & Kettinger 2008; Ross, Orr, Sisic, Arseneault, Simmering, & Orr 2009.
TOOL	Suitability as a tool for use by a discipline, field of study, or division of industry	Bailey & Zanders 2008; Baker-Eveleth, Eveleth & Sarker 2005; Connell 2009; Pasfield-Neofitou 2008; Lockyer & Patterson 2008.
ARTIFACT	Analysis of the design, improvement, or assessment of SNAs as artifacts	Bouman, Hoogenboom, Jansen, Schoondorp, de Bruin & Huizing 2007.
GENERAL	General Analysis of the SNA Phenomenon (including history, growth, classification, and general user behavior)	Boyd & Ellison 2007; Brown, Broderick & Lee 2007; Snyder, Carpenter & Slauson 2007; Thelwall 2008; Richter & Koch 2008; Beer 2008.

Additionally a sixth category exists and consists of a growing collection of individual case studies that look at a specific SNA or a specific user group for a purpose other than that listed above.

Of the six categories of SNA literature given above, our research question suggests that primary attention should be focused on SNA studies which examine use. To that end, we examined and categorized the literature on SNA usage into the following three groups: Motivations (reasons for use), Activities (what people use SNAs for), and Associations (factors associated with use or adoption which are not necessarily motivational). Examples of articles in each category are shown in Table 2. Of these categories, the literature that focuses on motivations for use is the most applicable to our research question.

Table 2 Categories of Usage Studies in SNA Literature

Category	Description	Examples
MOTIVATION	Reasons individuals use SNAs	Agarwal & Mital 2009; Arthur, Sherman, Appel & Moore 2006; Bolar 2009; Bumgarner 2007; DiMicco, Millen, Geyer, Dugan, Brownholtz & Muller 2008; Dwyer, Hiltz & Widmeyer 2008*; Lampe, Ellison & Steinfield 2008; Pempek, Yermolayeva & Calvert 2009; Subrahmanyam, Reich, Waechter & Espinoza 2008*
ACTIVITIES	What people use SNAs to do	Dwyer, Hiltz & Widmeyer 2008*; Ellison 2007; Ellison, Steinfield & Lampe 2006; Ellison, Steinfield & Lampe 2007; Subrahmanyam, Reich, Waechter & Espinoza 2008*
ASSOCIATIONS	Factors associated with the use or adoption of SNAs that don't fit the above two categories	Hargittai 2008; Pfeil, Arjan & Zaphiris 2009; Ross, Orr, Sisic, Arseneault, Simmering & Orr 2009

* Article fits in two categories

Post-Adoptive Use

The second major category of our theoretical background section categorizes published studies on post-adoptive use of information technology. Our examination reveals two strong themes of research, user behavior and prediction/modeling, plus a third miscellaneous use category. There are many studies on post-adoptive user behavior (Hsieh & Zmud, 2006; Jasperson, Carter, & Zmud,

2005; etc.) where the focus is on categorizing and examining specific actions, behaviors, or perspectives that users develop after initial technology adoption. There are also studies that attempt to predict or model continued usage beyond adoption (Bhattacharjee, 2001; Saeed & Abdinnour-Helm, 2008; Wang, Lii, & Fang, 2009). Additional studies examine specific aspects of post-adoptive use (besides user behavior) that make them difficult to group together (Ahuja & Thatcher, 2005; Al-Natour & Benbasat, 2009; Mangalaraj, Mahapatra, & Nerur, 2009). A summary of relevant post-adoptive literature is shown in Table 3. Of these categories, the collection of literature that focuses on continued usage beyond adoption is most applicable to our research question (What factors contribute to users continuing to use Facebook after adopting it?).

Table 3 Categories of Post-Adoption Usage Studies in IS Literature

Category	Description	Examples
USER BEHAVIOR	Categorizing and examining specific actions, behaviors, or perspectives users develop after initial technology adoption	Hseih & Zmud 2006; Jasperson et al. 2005; Kim, Malhotra & Narasimhan 2005; Karahanna, Straub & Chervany 1999; Bhattacharjee & Premkumar 2004; Kim & Son 2009; Wang et al. 2009*.
PREDICTION/ MODELING	Studies that attempt to predict or model continued usage beyond adoption	Wang et al. 2009*; Bhattacharjee 2001; Saeed & Abdinnour-Helm 2008; Hu & Kettinger 2008
MISCELLANEOUS	Studies examining specific aspects of post-adoptive use (besides user behavior) that make them difficult to group together	Ahuja & Thatcher 2005; Mangalaraj et al 2009; Al-Natour & Benbasat 2009

* Article fits in two categories

Technology Acceptance and Post-Adoption Model Fit to SNA

The technology acceptance stream of research informs our research question for several reasons. First, evidence supports the consistent stability of key pre-adoption constructs (perceived usefulness, behavioral intention, etc.) through continued system use after adoption (Davis & Venkatesh, 2004; Taylor & Strutton, 2010). Second, empirical studies suggest that past use is the primary predictor of future use (Davis & Venkatesh, 2004; Kim et al., 2005; Venkatesh & Davis, 2000). Third, post-adoption studies have used established Technology Acceptance Model (TAM) constructs successfully in their predictive models (Bhattacharjee, 2001; Wang et al. 2009).

There are two common themes with technology acceptance and Information Systems post-adoption models. The first is the context of system use within organizational settings, such as the workplace. The second is the purpose of the system, which is almost always for utility or productivity.

Subsequent mainstream versions and extensions of TAM have continued to investigate phenomenon within the context of the organization. Few studies, in comparison, have looked at technology acceptance outside the organizational setting. A significant question therefore is whether a SNA, which is generally utilized outside an organizational context, is accepted in the same manner and for the same reasons as technology within an organizational setting? To begin answering that question, it is fruitful to examine SNAs for similarities to organizational computer information systems. First, SNAs are similar in that they can be considered information systems or “combinations of hardware, software, and telecommunications networks that people build and use to collect, create, and distribute useful data” (Jessup & Valacich, 2006, p. 5). Second, in the area of functionality, SNAs enable communication with individuals or groups of individuals that are members of the SNA. In a similar manner, organizational information systems facilitate communication with members of the organization.

However, SNAs also enable personal expression of identity and creative representation of the individual, while most organizational information systems do not. SNAs are often utilized by individuals for diversion or entertainment (Bumgarner, 2007) or when they have time to waste (Pempek et al., 2009), while organizational information systems typically are not. Additionally, SNA use is typically considered a social activity (Boyd, 2008; DiMicco & Millen, 2007). While organizational information systems may have a social component, their primary purposes are characterized by utility or productivity (Hewitt, 1986; Huber, 1982).

A closer inspection of the origins of TAM reveals that the underlying theories (Theory of Reasoned Action, Theory of Planned Behavior) have no assumption of organizational context. Thus, there is also no compelling reason to believe that the efficacy of two main constructs, Perceived Usefulness (PU) and Perceived Ease Of Use (PEOU) must only refer to usefulness that is specific to job performance or another organization-specific or employment-specific idea. It is reasonable that constructs from the TAM models should not be prohibited from measuring technology in a non-organizational setting simply because of their theoretical background and development. A difficulty may be that the majority of research using the TAM models has been on technology within organizations, and thus the instruments used to measure aspects of usage within a typical business setting need to be carefully scrutinized for organizational bias.

There are some examples of the use of various versions of the TAM model in non-organizational settings, even though the volume of non-organizational research is low compared to the volume of organizational research. A typical non-organizational study will start with a version of TAM and add one or more contextually-oriented antecedents to key variables and test the model for fit (e.g., Gefen, Karahanna, & Straub, 2003; Hsu & Lin, 2008; Kwon & Chidambaram, 2000; Pikkarainen, Pikkarainen, Karjaluoto, & Pahlila, 2004; Vijayasarathy, 2004). Various new antecedents are added to each model, usually in the form of salient beliefs theorized to affect the intention to use the application. The results of these studies of TAM in non-organizational settings are similar to the TAM studies done in organizational settings. There is usually a good model fit and a reasonable amount of variance explained. Thus, successful studies of TAM use in non-organizational settings have been published and, because of this, there is not necessarily a barrier to fitting the various TAM models to the use of SNA technology. However, non-organizational studies must be careful not to assume that the purpose of the system is solely for utility or productivity.

Social Capital

The last category of our theoretical background section is social capital. Online communities and SNAs have a social aspect not found in many other types of information systems or online applications. One manifestation of the social facet of these applications is the presence of *social capital*. Social capital has been defined as “the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit” (Nahapiet & Ghoshal, 1998, p. 243). Another way to understand social capital is as the benefits realized through the relationships in which the individual participates. Social capital has been found in online communities (Chiu, Hsu, & Wang, 2006; Drentea & Moren-Cross 2005; Ryan 2010), digitally enabled teams (Robert, Dennis, & Ahuja, 2008), and in SNAs (Ellison, Steinfield, & Lampe, 2007; Joinson, 2008; Pfeil, Arjan, & Zaphiris, 2009; Steinfield, Ellison, & Lampe, 2008). Social capital’s close association with networked relationships makes it a likely candidate for inclusion as a motivational factor for continued SNA usage. On the individual level, social capital has been modeled as an antecedent of knowledge integration (Robert et al., 2008) and as an antecedent of affective feelings toward SNAs (Wu, Ryan, & Windsor 2009). Certain aspects of social capital have also been postulated to be gained through using SNAs (Ellison et al., 2007).

Social capital has been examined in a few SNA studies. Joinson (2008) found social capital manifested in maintained relationships on Facebook. Pfeil et al. (2009) found differences in social capital derived from SNAs between age groups. Donath & Boyd (2004) found that SNA use supports the formation and maintenance of weak relational ties.

Past research studies have conceptualized social capital in different ways. Ellison et al. (2007) found three dimensions of social capital (bridging, bonding, and maintained) among users of Facebook. *Bridging social capital* is related to developing and sustaining weak relational ties among networked individuals. Weak ties are considered loose or weak connections between people who may share useful information or new ideas and perspectives, but generally not emotional support (Granovetter, 1982). *Bonding social capital* typically is represented by the kinds of relationships found between family and close friends, and characterized by emotional closeness (Ellison et al., 2007). *Maintained social capital* refers to the degree to which individuals are able to keep in touch with a social network using SNAs after disconnecting from it physically (Ellison et al., 2007). Nahapiet and Ghoshal (1998) conceptualized social capital in a different way with three dimensions consisting of structural, relational, and cognitive social capital (notably used in Robert et al., 2008). Structural social capital refers to the properties of the social linkages in place and the properties of the network of relations. *Relational social capital* describes the personal relationships between people in a social network. *Cognitive social capital* concerns the shared systems of meaning (i.e., representations, interpretations, languages, etc.) between people in a social network.

The dimensional definitions of bridging, bonding, and maintained social capital were selected for this study primarily because they had been successfully operationalized, tested, and validated on users of Facebook, and also because Facebook acts as a sort of funnel that constrains some of the broader ideas of social capital that might be seen in less specific contexts. For example, the structural dimension of Nahapiet and Ghoshal's (1998) definition concerns the properties of the social system and the configuration of network linkages between individuals. Facebook as a social networking aid provides a framework for that structure in the form of limitations, network structure, and outreach. Limitations are things like the inability to connect with someone who does not have a Facebook account or is not using it actively. The network structure restricts the kinds of communication and the level of communication Facebook allows. Also outreach, or the ability to add new individuals to your network, is constrained by Facebook's limited communication channels outside of itself (e-mail or friend-of-a-friend if they happen to be on Facebook). Likewise, the cognitive dimension represents "shared representations, interpretations, and systems of meaning among parties" (Nahapiet & Ghoshal 1998), but all users of Facebook should be assumed to have a certain level of cognitive social capital due to all using the same interface, features, and terminology which is forced upon them by the specific medium.

The elastic nature of social capital makes it a complex construct. In the case of SNA usage it is suggested that social capital will likely be manifest as both a cause and an effect. For initial adoption and use of SNA technology, actual social capital will likely have little influence due to the lack of time to develop it. Indeed, anticipated social capital, if there is such a thing, could possibly be a motivating factor. However, after continued use, we argue that aspects of social capital will be experienced as a benefit by the user, which will serve as additional motivation for continued use.

Research Model and Hypotheses Development

A set of motivational factors was derived from the literature on SNA and technology adoption research. The literature on **motivations** for using SNAs discusses many factors including hedonic pleasure, social connection, utility, (Bumgarner, 2007), relationship maintenance, new relationship discovery (Dwyer et al., 2008), to strengthen weak ties in existing relationships (Lampe,

Ellison, & Steinfield, 2008), and engaging in interesting activities (Pempek et al., 2009). To cover these factors, we used the following motivating constructs: *social capital (SC)*, *hedonic enjoyment (HE)*, and *perceived usefulness (PU)*.

To model post-adoptive behavior, we drew on Bhattacharjee's (2001) Post-Acceptance Model of IS Continuance. Bhattacharjee's model was derived from the Expectation-Confirmation Theory (ECT) often used in consumer behavior research. His model uses *satisfaction* and *perceived usefulness* as the antecedents to *continuance intention (CI)*. Our research model incorporates the post-adoptive measure of *continuance intention*, *satisfaction*, and also includes *perceived usefulness* from Bhattacharjee's model as a motivational factor, as stated above.

Finally, an extended measure of system post-adoption use is established as the dependent variable for the model. The proposed research model, which we entitle the Social Networking Application Post-adoptive Use Model (SNAPUM), is shown in Figure 1. All the constructs appearing in the model are discussed below.

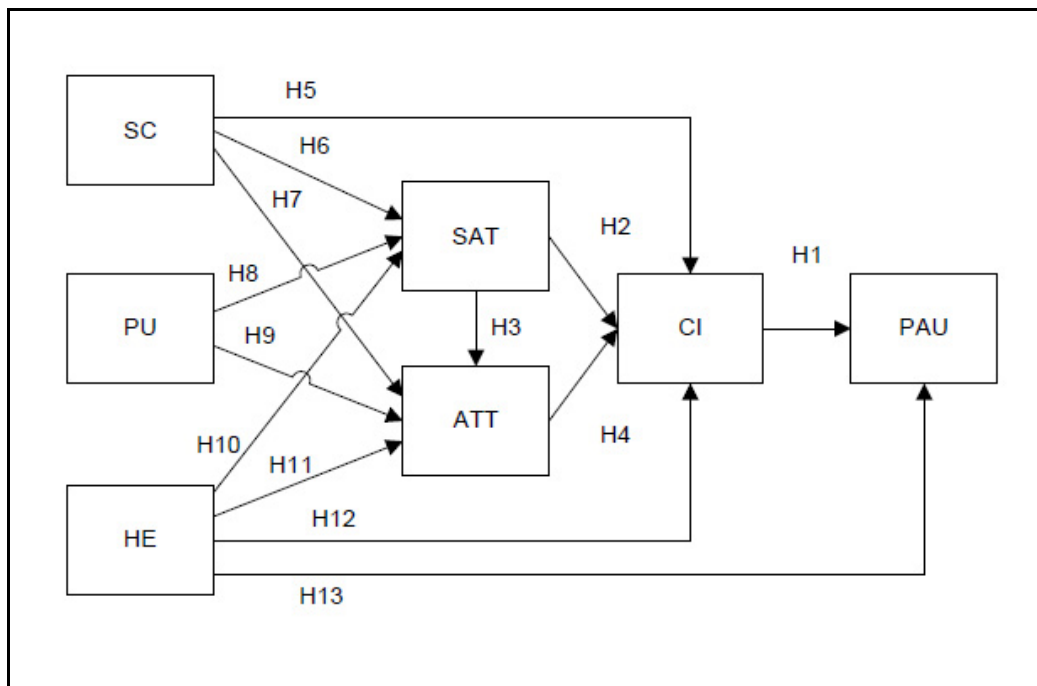


Figure 1: SNAPUM Model with Hypotheses

Post-Adoptive Use is especially important to the Information Systems community because the ultimate success of an information system depends on its “*continued* use rather than first time use” (Bhattacharjee (2001, p. 352). System usage, in general, has been a part of the user adoption literature since the earliest models. Recently a call has been made to refine what is meant by system usage as well as what is actually being measured. Traditional Information Systems studies have measured system use as an amount or frequency, which is a simplistic view of usage and one that has important shortcomings (Benbasat & Barki, 2007). System usage can be seen as a much more complex factor, and is able to be measured more precisely if the researchers desire (Burton-Jones & Straub, 2006; Jasperson et al., 2005).

The early TAMg studies measured self-reported use on a limited scale of frequency (Davis, 1986; Davis, Bagozzi, & Warshaw, 1989, Venkatesh & Davis, 2000). The United Theory of Acceptance and Use of Technology (UTAUT) measured actual system use using undisclosed system metrics (but there is no mention of time, frequency, intensity, features, etc.) (Venkatesh, Morris, Davis, & Davis, 2003). The follow up to UTAUT measured system usage through self-reported

measures of intensity, frequency, and duration (Venkatesh et al., 2008). It can be seen that the various TAM models have, over time, developed a more complex measure of system usage, albeit very slowly.

Burton-Jones & Straub (2006) delivered a reconceptualization of the system usage construct, identifying six types of richness for system usage measures. The first type, characterized as *very lean*, measures only use or non-use of the system. The second type, characterized as *lean*, measures duration and/or extent of use. The TAM and UTAUT models fall into this second category. The third type is characterized as *somewhat rich* and measures the breadth of use by the number of features used. The fourth type, characterized as *rich*, measures the extent to which the user employs the system, or intensity of use. The fifth type, also characterized as *rich*, measures the extent to which the system is used to carry out tasks, or the variety of use. The sixth type, characterized as *very rich*, measures the extent to which the user employs the system to carry out the task. Venkatesh et al. (2008) employed a usage measure that covered three aspects of system use: frequency, duration, and intensity. This can be seen to encompass parts of types 1, 2, and 4 and, therefore, can be classified between *somewhat rich* and *rich*, according to the Burton-Jones and Straub richness of measures scale.

The importance of the system use construct cannot be overstated. It has been the dependent variable for a steady stream of technology adoption studies for many years. The technology adoption studies have generally suffered from an underdeveloped system usage construct (Benbasat & Barki, 2007; Straub & Burton-Jones, 2007). In this study we will expand on the system usage construct used in Venkatesh et al. (2008) by adding items designed to measure the breadth of usage in addition to frequency, duration, and intensity, thus clearly moving the measurement of usage toward the rich category.

Continuance intention is derived from Bhattacharjee's (2001) post-adoptive model of IS continuance. *Continuance intention* in this study is the measure of a user's intention to continue using Facebook. We argue that intention should be positively associated with the measure of post-adoptive system use in the same way behavioral intention to use was found to be positively associated with pre-adoptive system use in many TAM studies. Thus:

H1: *Continuance intention* will have a positive effect on *post-adoptive use*.

The *satisfaction* construct also comes from the Expectation-Confirmation model established by Bhattacharjee for post-adoptive Information Systems use. User satisfaction has been theorized and validated as an important predictor of use intention (Bhattacharjee, 2001; Oliver, 1980, 1981). In Bhattacharjee's model, *perceived usefulness* was found to influence user *satisfaction*, which in turn influenced the user's intention to continue to use the information system. We posit here that user satisfaction will play a similar role in post-adoptive SNA use and that satisfied users will be more favorably disposed to continue to use Facebook. Additionally, satisfaction is expected to influence *attitude* toward using. Attitude will be discussed in more detail shortly, but both attitude and satisfaction are measures of emotional disposition. Attitude is considered to reflect a longer-term outlook than satisfaction, which tends to be based more on recent experiences. Therefore, we posit that short-term satisfaction will have an influence on the longer-term attitude. This relationship has been validated in other studies (Bearden & Teel, 1983; Oliver, 1980; Sivadas & Baker-Prewitt, 2000; Taylor & Hunter, 2003; etc.).

H2: User *satisfaction* will have a positive effect on the user's *continuance intention*.

H3: User *satisfaction* will have a positive effect on the user's *attitude* towards using.

Attitude is a relatively enduring affect that transcends experiences alone and reflects the emotional disposition of the user toward the technology (Hunt, 1977; Oliver, 1980, 1981). The attitude construct is a valuable measure that potentially accounts for salient beliefs other than those specifically measured in most acceptance instruments. *Attitude* has been theorized and validated in TAM-based studies as a significant predictor of intention to use (Davis et al., 1989; Karahanna, Straub, & Chervany, 1999; Taylor & Todd, 1995; etc.). In this study, it is positioned as an antecedent to *continuance intention* with three antecedents of its own (*perceived usefulness*, *social capital*, and *social influence*).

H4: *Attitude toward using* will have a positive effect on the user's *continuance intention*.

In this study *social capital* is hypothesized to affect *continuance intention* and *post-adoptive use*. The relationship between social capital and these core constructs is suggested by the social nature of Facebook. The reward of social capital is expected to be a driving influence for people to continue to use Facebook. Therefore the user's level of satisfaction will be increased by the amount of social capital experienced. The attitude toward using will be more positive according to the amount of social capital gained. The intention to continue using will be related to the expectation of a steady or increasing level of social capital experienced by the user. Therefore:

H5: *Social capital* will have a positive effect on the user's *continuance intention*.

H6: *Social capital* will have a positive effect on the user's *satisfaction*.

H7: *Social capital* will have a positive effect on the user's *attitude toward using*.

Perceived usefulness has been present in technology acceptance literature since the original TAM model and has persisted through many technology adoption studies of various and diverse technologies. In Bhattacharjee's Expectation-Confirmation model, it is supported as an antecedent to user *satisfaction* and it is expected to act the same in this study. Additionally, the early TAM models containing *attitude toward using* found support for *perceived usefulness* influencing the attitude construct, and that is also hypothesized here.

H8: *Perceived usefulness* will have a positive effect on user *satisfaction*.

H9: *Perceived usefulness* will have a positive effect on the user's *attitude toward using*.

Many studies of SNA usage point to the concept of entertainment or enjoyment as a benefit of using SNAs, and conversely, a motivational factor for continued use (Agarwal & Mital, 2009; Bolar, 2009; Bumgarner, 2007; DiMicco et al., 2008; Pempek et al., 2009; Subrahmanyam, Reich, Waechter, & Espinoza, 2008). This aspect of SNAs makes them at least in part a hedonic information system. Hedonic information systems are designed to provide enjoyment to the user, while utilitarian systems (of which organizational information systems are a part) are designed to provide instrumental value to the user (van der Heijden, 2004). The construct *perceived enjoyment* in van der Heijden's (2004) study was found to have more predictive power than perceived usefulness, which typically has a high predictive power. *Perceived enjoyment* (or *hedonic enjoyment* as it is called in this study) appears to be highly applicable to SNAs, and is expected to influence the user's satisfaction with using the system. Therefore:

H10: *Hedonic enjoyment* will have a positive effect on the user's *satisfaction*.

H11: *Hedonic enjoyment* will have a positive effect on the user's *attitude toward using*.

H12: *Hedonic enjoyment* will have a positive effect on user *continuance intention*.

H13: *Hedonic enjoyment* will have a positive effect on the user's *post-adoptive use*.

There are several constructs not included in this model that are worth noting. *Facilitating conditions* is a measure used in the UTAUT model and was in turn derived from a combination of constructs (*perceived behavioral control*, *facilitating conditions*, and *compatibility*) from several authors (Venkatesh et al., 2003, p. 453). *Facilitating conditions* can be seen as the degree to which an individual believes that conditions are in place to facilitate their ready, easy, and effective use of the system. The broad concept of *facilitating conditions* may be relevant for social networking systems in some contexts, but overall it is considered unlikely that there are any substantial limitations on the use of social networking applications for post-adoptive users. For example, as previously mentioned, SNAs are generally used outside of an organizational structure. Therefore the typical user has no need for an organizational infrastructure to support their use of their SNA. Also, the concept of *compatibility* with other systems used for work is not applicable to social networking systems which are not work systems.

Social influence was present in UTAUT, defined as “the degree to which an individual perceives that important others believe he or she should use the new system” (Venkatesh et al., 2003). In UTAUT it represented a combination of three factors: *subjective norm*, *image*, and *social factors*. However, the *social factors* concept in UTAUT is highly organizational and job-related, making it largely irrelevant to SNA use. The other two dimensions, *subjective norm* and *image*, are likely to overlap the *social capital* measure in some manner. In pilot studies, we found that *subjective norm* measured as a weak, negative relationship, suggesting that peer pressure to use SNAs is not as strong as what might be thought. Therefore, *social influence* by itself outside of *social capital* is not considered a strong motivator for SNA use.

Perceived ease of use has been present in technology acceptance research since the original TAM model. It has proved to be a very useful measure of capturing relevant beliefs in the context of information technology usage (Benbasat & Barki, 2007). *Perceived ease of use* has been well-established as an antecedent to *behavioral intention to use* in pre-adoption studies. However, some studies have found that *perceived ease of use* seems to diminish and become non-significant as users become more experienced with the system (Davis et al., 1989; Karahanna et al., 1999). It is reasonable to suspect that most *ease of use* issues will have been largely overcome by those who have adopted the system. Additionally, user comments from focus groups conducted on SNA usage have indicated SNAs have a very fast adoption rate and are considered easy to use. Therefore, we did not include *perceived ease of use* in our model as a motivational factor for post-adoptive use of SNAs.

There were a number of moderating factors introduced by the UTAUT model which were shown to influence various relationships in that model. *Age*, *gender*, *voluntariness of use*, and *experience* were hypothesized to affect the influence of several variables on others in the UTAUT model, including *performance expectancy* (*perceived usefulness* with a job-related context) on *behavioral intention to use*, *effort expectancy* (derived from *perceived ease of use*) on *behavioral intention to use*, and *social influence* on *behavioral intention to use*. Gender and age hypotheses were supported primarily by studies on working women and worker age (Venkatesh et al., 2003). However, outside of a job-related context, there is a lack of evidence at this time that gender will significantly affect SNA post-adoptive usage. Therefore gender will not be included as a moderator in the theoretical model. Experience is also not anticipated to be a significant modifier because of the context of post-adoption which entails that all users will have significant experience using the system due to their system use taking place beyond initial acceptance. *Voluntariness of use* is not applicable in a non-mandated use environment outside of the workforce. While there certainly exist those who must use Facebook as a part of their job or educational efforts, these

instances are likely to be few and far between. In the UTAUT model, *age* was shown to be a modifier of several construct relationships through its influence on *behavioral intention to use*. While these moderating relationships may hold for SNA usage, the expected sample population of students in our study is not expected to have enough variance in age ranges to make it a significant measure. Therefore, age will not be included as a moderator.

Research Methods

We employed a structured approach consisting of the following steps: 1) pilot surveys with user feedback, 2) survey data collection, 3) measurement validation, and 4) hypothesis testing.

Pilot Surveys

The survey instrument used was developed through a series of steps. First, a pilot survey was developed incorporating constructs and items from previously established instruments as well as modified constructs and items from established instruments and literature. The pilot survey was examined for content validity by two other researchers who have published research on the subjects of social networking applications and system usage. The pilot survey was itself tested by administration of a “pre-pilot” among 62 undergraduate students of a business course at a large Midwestern university. The pre-pilot respondents took the survey, commented on its clarity, and checked it for errors. Changes were made to the pilot survey based on comments and suggestions from the pre-pilot sample population.

The pilot study was then administered to a selection of four classes in the College of Business of a large Midwestern university in the United States with the permission of the instructors of the classes. Out of a total of 232 possible respondents, 118 participated in the pilot for a response rate of 51%. The sample was too small to use with structural equation modeling, but the constructs were examined using exploratory factor analysis for validity and Cronbach’s alpha for reliability.

Sample Survey

The sample surveyed consisted of undergraduate and Master’s students taking courses in the College of Business at a large Midwestern university. Students in particular have been shown to be heavy Facebook users as evidenced by their inclusion as sample populations in many studies (Hewitt & Forte, 2006; Lampe, Ellison, & Steinfield, 2006; Pempek et al., 2009; etc.). Facebook demographics reported for 2009 indicate that of the users that chose to specify, the majority were currently enrolled in college, and that over 40% of Facebook users were in the 18-24 age range (Corbett, 2009).

Measures

The items for each of the measures discussed below are listed in the Appendix.

Post-adoptive use in this study was initially adapted from Venkatesh et al.’s version of system usage, which measures three aspects of usage (with a single item each), duration, frequency, and intensity of use, which are cited as the three most common conceptualizations of system use (Venkatesh et al. 2008). The intensity of use measure was discovered to be confusing when applied to SNAs in a pilot study and thought to be problematically vague when checked for content validity by other researchers in the context of SNA use. The concept of intensity was operationalized for system usage in the Venkatesh et al. (2008) model and said to be synonymous with extent of use. In this study, intensity and extent of use are considered to be different measures of two separate usage aspects. The first aspect of usage intensity is operationalized as the concept of *involvement* or immersion in the use of the SNA, which is a type of *cognitive absorption*. This

usage measure is supported as an aspect of SNA usage by literature (Horowitz, 2009; Warr, 2008). The second intensity usage aspect, *extent*, represents the concept of breadth of use, or how much of the system is actually used, and is operationalized as a measurement of the degree of feature-usage by the individual, as suggested for richer usage measures by Burton-Jones and Straub (2006). Seven measurement items are used: one each for *duration* and *extent*, two for *frequency*, and three for *involvement*. This construct constitutes the first instance of this combination of system use measures that we are aware of.

Continuance intention is defined as the degree of an individual's intent or plan to continue to use the application after initial adoption or acceptance. This measure was taken from Bhattacharjee's (2001) ECM model. Three total items were used to measure this construct.

The *satisfaction* construct comes from Bhattacharjee's (2001) post-adoptive IS use model. It asks the users to disclose their level of satisfaction/dissatisfaction, pleasure/displeasure, contentment/frustration, and delight/non-delight with their overall experience using their current SNA. Four total items were used to measure this construct.

Attitude toward using was measured in UTAUT but theorized not to be a predictor of intention to use within the context of that study. The items used to measure attitude in UTAUT were a combination of attitude, affect, and intrinsic motivation. It included some items similar to those used to measure hedonic enjoyment. The attitude construct used in this study comes from Malhotra and Galletta's (1999) TAM extension, with an additional item from Nysveen, Pedersen, and Thorbjørnsen (2005). Five total items were used to measure this construct.

The social capital construct does not have a single established instrument. Many different measurement instruments have been used in recent studies, including but not limited to the following: Chiu et al., 2006; Drentea & Moren-Cross 2005; Ellison et al. 2007; Inkpen and Tsang 2005; Kuo, Lai, & Wang 2008; Lee & Sukoco 2007; Luk, Yau, Sin, Tse, Chow, & Lee 2008; Robert et al. 2008; Wah, Menkhoff, Loh, & Evers 2007. For this study, the social capital measurement instrument was adapted from Ellison et al. (2007), which draws on Putnam's (2000) distinction between bridging and bonding and was shown to be an effective social capital measure for Facebook. The social capital construct as operationalized in this study consists of three dimensions: bridging, bonding, and maintained. The measure for maintained social capital asks questions about the respondent's high school friends to determine if those relationships have been able to be maintained after starting college. Higher education signifies, in many cases, a break in the relationship both in terms of status and in physical location. The bridging dimension contains 4 measurement items, the bonding dimension contains 4 measurement items, and the maintained dimension contains 5 measurement items.

Perceived usefulness is a construct present in virtually all the TAM-related models. It is defined construct in related models. Three items were taken from the TAM model and two new items were created to match Facebook use according to the definition of the construct. Five total items were used to measure this construct.

The measures for *hedonic enjoyment* were derived from two constructs used in prior studies, one called hedonic enjoyment (Waterman, Schwartz, & Conti 2008) and the other perceived enjoyment (van der Heijden, 2004). One item was taken from Waterman et al. (2008), one item was taken from van der Heijden (2004), and two new items were created to match Facebook use according to the definition of the construct. Four total items were used to measure this construct.

To differentiate between pre-adoptive system usage and post-adoptive use, an effort was made to determine the length of continuous system usage required to transform a user from someone learning or trying out the product to an accomplished dedicated adopter. During the focus groups conducted prior to the main study, each participant was asked for their opinion regarding how

long it took from their first use of Facebook for them to adopt it as an application they regularly used and how long it took from their first use of Facebook before they would have called themselves a Facebook user. The answers to both questions were largely identical and averaged from 1 to 2 weeks, with no respondent naming a time longer than 3 weeks. Therefore, the period from initial use to “adoption” appears to be no longer than 21 days. However, in this study, to ensure that respondents were truly in the post-adoptive stage, we took a very conservative approach and required that respondents had at least 60 days of regular Facebook use and that they use Facebook currently and regularly.

Characteristics of the Survey Sample

Overall, a total of 2000 students had the potential to be surveyed (based on class enrollment at the time of survey administration), and 1430 total responses were recorded (this total does not include blank responses or extremely incomplete responses likely to be disconnections from the electronic survey tool). The response total yields an aggregate response rate of 71.5%, which is favorable. A response was kept only if it met the following criteria: (1) the user expressed that s/he had used a social networking application before, and that s/he was currently using a social networking application now; (2) the user supplied the name of the SNA s/he used most often as Facebook (users were instructed in the survey to answer questions in the context of the use of the SNA they used most often); (3) the user indicated s/he had more than two months of experience using their SNA. The total number of responses left after applying these criteria totaled 964.

Non-response bias has been addressed in past survey research by comparing early responses with late responses to determine if there are any differences between the two groups of respondents (Karahanna et al., 1999; Ryan, Harrison, & Schkade, 2002). This method was employed using the results from the electronically administered surveys that record the date and time of responses. Respondents were split into two groups, where the first group consisted of responses received during the first two weeks after the announcement that the electronic survey was available, and where the second group consisted of responses received during the last week the survey was active before it closed. T-tests were conducted to examine the differences between the two groups in regards to their responses to independent and dependent variables. The results showed no significant differences between the groups, suggesting that non-response bias is not a significant influence in this study.

Measurement Validation

The variables used in this study were measured using several items each in a survey instrument. The ability of the instrument to properly measure these variables is typically evaluated by assessing the construct validity and reliability of each variable (Hair, Black, Babin, Anderson, & Tatham, 2006; Kerlinger & Lee, 2000). A common indicator of construct validity is its unidimensionality, which can be evaluated using exploratory factor analysis (EFA) (Beatty, Shim, & Jones, 2001). Cronbach’s alpha is a common method for assessing reliability (Kerlinger & Lee, 2000).

The dimensionality of the items was examined using principal component factor analysis with a Varimax rotation. The resulting factors extracted were examined and analyzed according to the following two criteria. First, items having factor loadings of more than 0.5 on the construct on which they are expected to load can be considered to be a satisfactory measure of that construct. Second, items having factor loadings of more than 0.45 on constructs other than the one they are expected to load on are considered cross-loading items and are not dependable measures of the expected construct (Hair et al. 2006). Separate factor analyses were conducted for the independent, mediating, and dependent variable groups respectively rather than a single factor analysis for all variables at once, which would result in a correlation matrix of over 1900 and be of little value

(Gefen & Straub, 2000; Jones & Beatty, 2001). All EFA factor loadings were .726 or higher. The results are displayed in Tables 4 through 6.

Table 4 EFA on Independent Variables

Items	Components				
	1	2	3	4	5
SCM1	.740	.074	.271	.144	.290
SCM2	.797	.160	.129	.211	.209
SCM3	.789	.160	.141	.216	.187
SCM4	.795	.134	.243	.165	.099
SCM5	.816	.094	.151	.168	.171
PU3	.148	.871	.154	.138	.176
PU4	.146	.891	.161	.159	.122
PU5	.128	.806	.194	.092	.111
HE1	.258	.202	.820	.155	.180
HE2	.213	.211	.842	.171	.212
HE3	.254	.182	.800	.162	.178
SCBO1	.222	.097	.187	.849	.218
SCBO2	.240	.137	.164	.872	.177
SCBO4	.253	.210	.126	.745	.230
SCBR1	.240	.129	.162	.220	.846
SCBR2	.275	.149	.227	.224	.817
SCBR3	.266	.232	.222	.230	.734
Mean	5.327	4.631	5.277	4.989	5.041
Eigen.	3.715	2.57	2.504	2.487	2.422
Var. Expl'd.	21.85%	15.12%	14.73%	14.63%	14.25%
Alpha	0.912	0.888	0.901	0.894	0.896

SCM: Social Capital – Main-
tained

PU: Perceived Usefulness

HE: Hedonic Enjoyment

SCBO: Social Capital – Bonding

SCBR: Social Capital – Bridging

Table 5 EFA on Mediating Variables

Items	Components		
	1	2	3
ATT1	.792	.173	.127
ATT2	.795	.122	.197
ATT3	.828	.191	.142
ATT4	.825	.233	.198
SAT2	.239	.825	.352
SAT3	.214	.869	.275
SAT4	.218	.880	.204
CI1	.181	.270	.868
CI2	.171	.244	.861
CI4	.236	.250	.826
Mean	5.028	5.378	5.476
Eigen.	2.894	2.540	2.533
Var. Expl'd.	28.95%	25.40%	25.33%
Alpha	0.867	0.920	0.894

ATT: Attitude

CI: Continuance Intention

SAT: Satisfaction

Table 6 EFA on Dependent Variable

Items	Component
PAUD	.778
PAUFR1	.738
PAUFR2	.851
PAUI1	.906
PAUI2	.902
PAUI3	.901
PAUE	.726
Mean	4.008
Eigen.	4.849
Var. Expl'd.	69.27%
Alpha	0.924

PAUI: Post-Adoptive Use (Intensity)

PAUFR: Post-Adoptive Use (Frequency)

PAUD: Post-Adoptive Use (Duration)

PAUE: Post-Adoptive Use (Extent)

Test of the Measurement Models

The structural equation modeling tool LISREL was used to create measurement models for the constructs and a model to test the proposed hypotheses. As a first step, the multi-dimensional variables for *social capital* was reduced to a single measurement item for each second-order factor by averaging the values for each item into a composite score (Lee & Xia, 2010; Yi & Davis, 2003). Thus, the three remaining items that measured *bonding* were averaged to form one value to serve as one of three measurements. The same was done with *bridging* and *maintained*, so that *social capital* is now measured by three items and acts as a first-order construct. The same process was performed for the two multi-dimensional aspects of the dependent variable, *post-adoptive use*.

Measurement models were created for the exogenous and endogenous variables. Each measurement model describes the relationship of observed variables to their corresponding latent variables. This is accomplished by assessing the reliability and validity of the measures (Komiak & Benbasat, 2006; Tenenhaus, Vinzi, Chatelin, & Lauro, 2005). Convergent validity can be assessed by examining the composite reliability and the average variance extracted (AVE) of the constructs (Barclay et al., 1995; Hu, Lin, Whinston, & Zhang, 2004; Komiak & Benbasat, 2006) in the models. The AVE represents the amount of variance explained by the indicators of a construct relative to the amount of variance captured as a result of the measurement error (Chin, 1998; Hu, Lin, Whinston, & Zhang, 2004; Komiak & Benbasat 2006). The results of the item loadings and the AVE values for each construct are shown in Tables 7 and Table 8. Recommended AVE values should be greater than 0.5 for an adequate measurement model. All AVE scores show as greater than 0.6 which is above the recommended value.

Table 7 CFA for All X Model

	Completely Stan- dardized Loading	t-statistics	Average Variance Extracted	Composite Reliability
PU			0.741	0.894
P3	0.90	34.66		
P4	0.94	36.80		
P5	0.73	25.72		
HE			0.756	0.903
H1	0.87	33.15		
H2	0.92	36.34		
H3	0.81	29.92		
SC			0.614	0.826
S1	0.75	25.42		
S2	0.82	28.54		
S3	0.77	26.23		

Table 8 CFA for All X Model

	Completely Standardized Loading	t-statistics	Average Variance Extracted	Composite Reliability
CI			0.751	0.900
C1	0.91	35.23		
C2	0.86	32.37		
C3	0.83	30.49		
ATT			0.623	0.868
A1	0.73	25.29		
A2	0.74	25.54		
A3	0.81	29.29		
A4	0.86	31.96		
SAT			0.755	0.902
T2	0.80	29.11		
T3	0.91	35.13		
T4	0.90	34.48		
PAU			0.632	0.872
D1	0.77	27.16		
D2	0.84	30.55		
D3	0.86	31.74		
D4	0.70	23.68		

Composite reliability is a way to measure internal consistency of constructs. The recommended composite reliability value for an adequate model is 0.7 or higher per construct (Barclay et al. 1995; Chin, 1998; Fornell & Larcker, 1981; Komiak & Benbasat 2006). All composite reliability scores for all constructs were higher than 0.826.

The results of the discriminant validity assessments are shown in Table 9 and Table 10. The tables show that the square root of AVE for all constructs is greater than the correlations among the constructs where the square root of the AVEs is found on the diagonal line (Chin, 1998; Fornell & Larcker 1981; Gefen & Straub 2000; Komiak & Benbasat 2006). Thus, adequate discriminant validity between constructs exists.

Table 9 Discriminant Validity for All X Model

	Composite Reliability	AVE	PU	HE	SC
PU	0.894	0.741	0.861		
HE	0.903	0.756	0.490	0.869	
SC	0.826	0.614	0.470	0.590	0.784

(Square root of AVE is on the diagonal)

Table 10 Discriminant Validity for All Y Model

	Composite Reliability	AVE	CI	SAT	ATT	PAU
CI	0.900	0.751	0.866			
SAT	0.868	0.623	0.530	0.789		
ATT	0.902	0.755	0.500	0.480	0.869	
PAU	0.872	0.632	0.430	0.320	0.360	0.795

(Square root of AVE is on the diagonal)

Full Structural Model - SNAPUM

With the measurement models completed, a full structural model was run using the LISREL structural equation modeling tool, including both endogenous and exogenous variables. The path diagram of the full model run is shown in Figure 2.

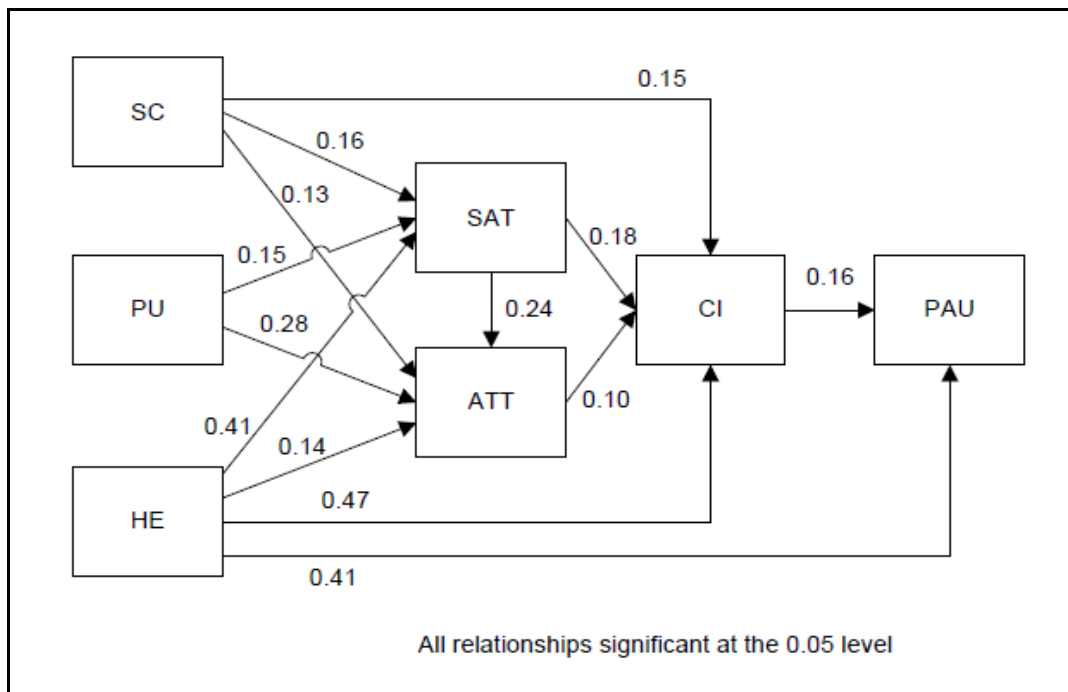


Figure 2: SNAPUM Model with LISREL Standardized Path Co-Efficients

The fit indices and other relevant statistics regarding the model fit were examined. Table 11 shows the fit indices of the full structural model run as well as the recommended statistical values for good model fit established by published and cited works. Additionally, the research model was compared with additional models similar to the TAM and UTAUT models for model fit. Overall, the research model is a better fit for the data than the alternate models resembling UTAUT and TAM.

Table 11 Comparative Fit Indices for Full SNAPUM Structural Model

	SNAPUM	TAM*	UTAUT*	Recommended	Source
χ^2/df	2.904	3.941	3.554	≤ 3.0	Simon and Paper 2007
RMSEA	0.044	0.055	0.051	≤ 0.1	Byrne 2001
GFI	0.95	0.95	0.96	$\geq .90$	Gefen et. al 2000
AGFI	0.93	0.93	0.94	$\geq .80$	Gefen et. al 2000
CFI	0.99	0.98	0.96	$\geq .90$	Simon and Paper 2007
NFI	0.98	0.97	0.98	$\geq .90$	Gefen et. al 2000
NNFI	0.99	0.98	0.98	$\geq .90$	Simon and Paper 2007
PGFI	0.73	0.69	0.69	$\geq .50$	Chang et. al, (n.d.)
IFI	0.99	0.98	0.98	$\geq .90$	Bollen, 1990

*Note: For consistency in comparison and in line with our research objectives, continuance intention and post-adoptive use were used instead of the initial acceptance variables of intention and usage in the TAM and UTAUT models. Also, moderators present in UTAUT were not included for the same reasons they are not part of the research model as described earlier.

The chi-square value for the full model is 615.66 with 211 degrees of freedom. In many circumstances, the chi-square value divided by the degrees of freedom can serve as a fit indicator, with values less than or equal to 3 indicating adequate model fit (Simon & Paper, 2007). The chi-square divided by the degrees of freedom is 2.904 in the full model, below the recommended threshold of 3, indicating adequate fit. Overall the fit indicators indicate a good model fit.

Results

All paths were hypothesized to yield positive associations. All hypothesized relationship paths reflected positive and significant associations between latent constructs at an alpha of 0.05. The results of the relationships are detailed in Table 12.

Table 12 Hypothesis Support

Hyp. #	Relationship	T-statistic	p-value	β	Supported?
H1	CI -> PAU	3.12	0.00103	0.18	Yes
H2	SAT -> CI	4.96	0.00000	0.18	Yes
H3	SAT -> ATT	5.80	0.00000	0.19	Yes
H4	ATT -> CI	2.95	0.00177	0.12	Yes
H5	SC -> CI	3.97	0.00005	0.15	Yes
H6	SC -> SAT	3.68	0.00015	0.17	Yes
H7	SC -> ATT	2.98	0.00161	0.10	Yes
H8	PU -> SAT	4.15	0.00002	0.13	Yes
H9	PU -> ATT	7.44	0.00000	0.19	Yes
H10	HE -> SAT	9.52	0.00000	0.41	Yes
H11	HE -> ATT	3.12	0.00103	0.11	Yes
H12	HE -> CI	11.99	0.00000	0.45	Yes
H13	HE -> PAU	8.20	0.00000	0.46	Yes

Discussion

This study proposed and empirically tested a model of factors influencing the post-adoptive use of Facebook. Thirteen hypotheses were proposed, and all were supported. The data show that continuance intention and hedonic enjoyment are directly and significantly related to post-adoptive use. This confirms that an individual's intention to use an SNA, along with the pleasure from using it, significantly impact the duration, intensity, and frequency of use. Four factors influence continuance intention: social capital, satisfaction, attitude, and hedonic enjoyment. In terms of social capital, the results show that SNA users believe that the benefits they realize through their SNA relationships are significant. In addition, satisfaction, attitude, and hedonic enjoyment influence their intention to continue to use it. Furthermore, perceived usefulness is an antecedent to both satisfaction and enjoyment. These findings further substantiate Cohen's (2009) contention that psychological factors have a bearing on what information clients perceive, how they assess that information, and, ultimately, what information they decide to act upon.

Facebook, like other informing systems, consists of an informing environment, a delivery system, and a task completion system. The informing environment which services the informers is made up of the Facebook interface which is easy to use (technically, just the parts that allow for content sharing). The delivery system bestows the ability to share information through both manual and automated means, distribute the application throughout the world, as well as make it available on a wide range of Internet-connected devices. The task completion system allows the clients to act upon the information received. We note, however, that in Facebook there is not a distinct divide between informers and clients. For example, an informer may share a news article or image with their friends. If a friend clicks the 'Like' icon relating to that post, are they a client or an informer? In one sense, they have simply acknowledged the receipt of that information, yet in another sense they have informed the original poster that their offering was appreciated. A Facebook poster therefore has the ability to assess the impact of his or her information by how many "likes" it receives (a lack of people liking their post may mean people haven't seen it, or that they simply do not find it worthwhile – there is no "dislike" button).

Thus, the roles of informer and client are blurry in Facebook. The SNAPUM model illustrates that social capital, hedonic enjoyment, and perceived usefulness all have a role in why people continue to use Facebook, but these motivational factors must necessarily be different for each person and for each role that person values. It is likely that not every Facebook user maintains a balance of roles in the manner in which they use the system. We do not know, for example, which factor is most important for those who primarily value Facebook as a source of information and, therefore, whose preferred role is that of the client. Usefulness may be the dominant factor for this type of person, but that supposes the social benefit of knowing the information is less important than the practical aspect of knowing it. Conversely, those that post a lot and thus primarily act as informers could be doing so out of a sense of self-worth they experience through informing others, which is social capital. This does not preclude, however, those same posters appreciating the usefulness of a system that allows them to communicate the same thing to many friends at once in an interactive format. There is also the question of what is truly enjoyable (hedonic) to a specific Facebook user, whether it is informing others, reading the statuses of others, or a balance of both.

Limitations

As is common with all sample surveys, this study is subject to sampling error (Braverman, 1996). This study sampled university students in a class-based setting that resulted in the respondents being from a narrow age range and from primarily business-oriented majors. The population was further limited to being from primarily a North American English-speaking culture, and the sur-

veys were all administered in English only. This population is not representative of all SNA users, and caution should be taken when generalizing the results to any other population.

Common methods bias (CMB) may also exist, due to the same method being used to collect data from the population. Common methods bias was assessed through three methods: Harman's one-factor test (Podsakoff & Organ, 1986), confirmatory factor analysis (Bock, Sabherwal, & Qian 2008), and the common method factor test (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In Harman's one-factor test, all the measuring items were entered together into a principal components factor analysis and the results yielded 10 factors, with the first factor explaining 36.1% of the variance and supports the contention that common method bias was not an issue (Podsakoff & Organ, 1986). No general factor was apparent in the unrotated factor solution. In the second test, confirmatory factor analysis was performed in LISREL including all measuring items, with each latent construct linked to the items measuring it. The square root of the average variance extracted for each construct was found to exceed the correlation with other constructs. The final test was the common method factor test performed in LISREL. In this test, a single latent variable was added to the model, and all measurement items mapped as indicators of the added latent variable. The model with the common method factor would not converge without a reduction of paths, indicating that it was not a better fit than the full structural model and that common method bias was not an issue. The results of all three tests suggest that common methods bias was not a significant problem in this study.

Future Research

In the spirit of the philosophy of informing science (Cohen 2009), the results of this study should have transdisciplinary implications for future research, especially in the fields of information systems, communication, and the behavioral sciences.

Future research building on this study should include a continuous refinement process by which the instrument is made more parsimonious through fewer scale items, which contributes to the goal of making it more effective in measuring the constructs it purports to measure. During the study process, several of the initial measurement items that performed poorly were dropped to facilitate parsimony and more reliable measures. Applying the survey instrument to users of other SNAs beside Facebook may result in a further reduction in measurement items.

Another application of this study that will further knowledge on SNAs is to administer the survey to other groups of respondents. There is a demographic of SNA users that are older persons who use SNAs to communicate with family, and many people of college age who are working in industry also use SNAs while at work. Testing the survey's predictive power on different groups of respondents may reveal whether or not there are effective moderators that should be added, or whether there are missing constructs that might offer more explanatory power over the existing instrument. Besides age, other factors of interest include location (region, country, etc.), culture, organizational environment, gender, level of income, and educational background.

The post-adoptive usage construct was designed to reflect a greater degree of usage (i.e. "deep usage") than previous studies have used. Yet it is still in the middle of the Burton-Jones and Straub (2006) usage continuum. Developing an even richer measure of system usage would enhance the accuracy of future versions of this model.

Another opportunity to further knowledge would be to identify and classify the roles in SNA usage from the perspective of the client/informer. As previously mentioned, it is simplistic to assume that those posting content on Facebook are always the informers and those reading the content are always the clients. Facebook users have all seen posts designed to solicit other posts, stimulate reaction or steer conversation toward something the poster wants to participate in, suggesting that these roles are not as clear-cut as might be supposed.

Models always simplify and reduce the relationships they are built to emulate. The motivation to utilize a SNA is likely influenced by many factors that are not represented in our model. It is intriguing to imagine what unmeasured factors might result in significant change in SNA usage behavior. For example, are there instances where Facebook users move to a new stage in life (i.e., get married, graduate and look for a job, etc.) and change their usage behavior due to their new situation? Or for that matter, what about users from different cultures with less freedom of expression? Do these factors influence the users of SNAs, either toward a different level of use, or even a cessation of use? These are all good questions for future studies.

Conclusion

This study began with the goal of addressing the following research question: What factors contribute to users continuing to use Facebook after adopting it? To begin to answer this question, we first reviewed and synthesized prior adoption and post-adoptive use studies and examined these studies' applicability to a new context, that of social networking applications. Drawing upon information systems, marketing, psychology, and communications literatures, this research proposed a theoretical model for predicting social networking application post-adoptive use (SNAPUM), and tested it through a sample survey of Facebook users. The results show the transdisciplinary SNAPUM model is a better fit for SNA data than the TAM and UTAUT model structures which are well-tested models for studying information technology use. The thirteen hypotheses proposed by this model were all supported. The results show that the user's *satisfaction* with their SNA, their *attitude* toward their SNA, the user's *hedonic enjoyment* of the SNA, and *social capital* were significantly related to the user's intention to continue using their SNA.

Social capital is a critical factor in our model. We believe the importance of social capital in technology is signaling a paradigm shift (e.g., Fichman, 2004) in the informing environment, and in how people interact with each other, and is a key driver for both online and offline relationships. Social networking applications, and social media, in general, are pervasive in society and have become a significant part of users' everyday lives. In addition, an increasing number of businesses are tying social media into their customer portals as well as using these types of tools internally for collaboration. It is becoming clear that social capital derived from these relationships will play a significant part in technological innovations and informing science for the foreseeable future. Most textbook definitions of information systems include "people" as an important component. In the past, the person involved in the operation of an information system could usually be counted on to use the system the way it was intended and did not expect much more than usability and appropriateness for the task. We are now becoming entrenched in an era in which social media interactions are the norm. People are growing up accustomed to being able to follow their friends', co-workers', and families' lives in a semi-transparent way that had not been imagined when information systems were first defined. We see the inclusion of social capital in technology as more than just a growing trend. Social capital should be considered for inclusion in many of our future transdisciplinary research models. The ubiquity of mobile devices and accessibility to a myriad of innovative connection and communication applications have enabled users to interact socially in tandem with their other activities, thus making traditionally non-social activities potentially social. We expect a key contribution of our research to be an increase the use of social capital in future Informing Science studies.

Another important contribution of our work is the development of an instrument (see Appendix) that was tested for validity and reliability through the process of this research. The items detailed in the instrument can be used immediately to study similar phenomena or adapted according to the research needs of investigators of related phenomena. Over the years, system use has been the dependent variable for a continuous stream of technology adoption studies. However, many have deemed its measurement as inadequate because the lack of richness (e.g., Benbasat and Barki

2007, Straub and Burton-Jones 2007). In this study we further develop the system usage construct used in Venkatesh et al. (2008) by adding items designed to measure the breadth of usage in addition to frequency, duration and intensity, thus notably advancing the measurement of usage toward the rich category. This is especially important to Information Systems literature because usage is a key dependent variable that often reflects the success of an information system.

This study's contributions to industry practice include the establishment of the full structural model, which can serve as a first step toward understanding the relationships between the factors that influence post-adoptive usage of SNAs. This may be important for organizations that are pursuing commercial utilization of online social networking with their customers and within their organization. Our findings that user attitude and satisfaction are important predictors of usage intention suggest that organizational managers should periodically survey users with the purpose of improving the probability of continued future usage.

Organizations that desire to understand things such as why their employees gravitate toward using SNAs at work, or how much a factor like social capital might influence the usefulness of a proposed new system, should find the results of this study useful. A potential use of this study in an organizational setting might be to help develop an understanding of the degree to which the various factors are positively associated with other factors and using that understanding to increase usage of internal systems. For example, the model reveals that social capital has an influential relationship with satisfaction and continuance intention and that hedonic enjoyment has a very strong relationship with continuance intention, satisfaction, and post-adoptive use. Organizations desiring to utilize social networking applications to increase collaboration or a sense of community among their employees should recognize from the results of this study the importance of cultivating particular aspects of social capital and overall enjoyment in order to increase the level of satisfaction experienced by the users of the system.

In summary, this study set out to provide a predictive model for post-adoption of social networking applications. Through the lens of a transdisciplinary approach, a predictive model was formulated and tested and was found to have predictive power among SNA users. This study demonstrates that the critical factors of social capital, hedonic enjoyment, perceived usefulness, satisfaction, and attitude all influence a user's intention to continue using a social networking application, which in turn influences the user's post-adoptive use of SNAs. These support Cohen's (2009) assertion that psychological issues influence how clients notice, evaluate, and act on information provided.

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Appendix

Measurement Scales and Items

IMAGE

- (IMG1) People who use my SNA have more prestige than those who do not. (7 point scale, hereafter abbreviated to “7pt”; strongly agree, agree, somewhat agree, neither agree nor disagree, somewhat disagree, disagree, strongly disagree, hereafter abbreviated to “sa/sd”)
- (IMG2) Using my SNA enhances my reputation. (7pt; sa/sd)
- (IMG3) People who use my SNA are held in higher regard than those who do not. (7pt; sa/sd)
- (IMG4) Using my SNA enhances a person's status. (7pt; sa/sd)

SUBJECTIVE NORM (INFLUENCE)

- (SNI1) People who are important to me encourage the use of my SNA. (7pt; sa/sd)
- (SNI2) People whom I admire encourage the use of my SNA. (7pt; sa/sd)
- (SNI3) People whom I respect encourage the use of my SNA. (7pt; sa/sd)
- (SNI4) People who have an influence on me encourage the use of my SNA. (7pt; sa/sd)

ATTITUDE

- (ATT1) Fill in the blank in the following sentence: Using my SNA is a(n) ____ idea (7pt.; “extremely foolish” to “extremely wise”)
- (ATT2) Fill in the blank in the following sentence: Using my SNA yields ____ results. (7pt; “extremely negative” to “extremely positive”)
- (ATT3) Fill in the blank in the following sentence: Using my SNA is _____. (7pt; “extremely harmful” to “extremely beneficial”)
- (ATT4) Fill in the blank in the following sentence: Using my SNA is a(n) ____ idea (7pt; “extremely bad” to “extremely good”)

PERCEIVED USEFULNESS

(PU3) Using my SNA allows me to accomplish the things I use it for quicker than if I did not use a SNA at all. (7pt; sa/sd)

(PU4) Using my SNA allows me to accomplish the things I use it for more effectively than if I didn't use a SNA at all. (7pt; sa/sd)

(PU5) Using my SNA allows me to do things I couldn't do if I did not use a SNA at all. (7pt; sa/sd)

PERCEIVED EASE OF USE

(PEOU3) I find my SNA easy to use. (7pt; sa/sd)

(PEOU4) Learning to operate my SNA interface is easy for me. (7pt; sa/sd)

HEDONIC ENJOYMENT

(HE1) My SNA is fun to use (7pt; sa/sd)

(HE2) Using my SNA gives me a sense of enjoyment (7pt; sa/sd)

(HE3) Using my SNA makes me feel good (7pt; sa/sd)

FACILITATING CONDITIONS

(FC4) I have access to people or online resources that assist me with learning how to operate and use my current SNA. (7pt; sa/sd)

(FC5) I have access to people or online resources that assist me with technological difficulties with my current SNA. (7pt; sa/sd)

(FC6) If I need help using my current SNA, I have access to people or online resources that are effective in assisting me. (7pt; sa/sd)

CONTINUANCE INTENTION

(CI1) I intend to continue using my current SNA rather than discontinue its use (7pt; sa/sd)

(CI2) I plan to continue using my current SNA rather than replace it with an alternative non-SNA application, such as e-mail, voice telephony, etc. (7pt; sa/sd)

(CI4) I would like to continue using my current SNA for the foreseeable future. (7pt; sa/sd)

SATISFACTION (How do you feel about your overall experience of using your current SNA?)

(SAT1) Very satisfied / Very dissatisfied (7pt.)

(SAT2) Very displeased / Very pleased (7pt.)

(SAT3) Very frustrated / Very contented (7pt.)

(SAT4) Absolutely disgusted / Absolutely delighted (7pt.)

SOCIAL CAPITAL (BONDING)

(SCBO1) There is someone on my SNA I can turn to for advice about making very important decisions. (7pt; sa/sd)

(SCBO2) There are people on my SNA I trust to help solve my problems. (7pt; sa/sd)

(SCBO4) The people I interact with on my SNA would help me fight an injustice. (7pt; sa/sd)

SOCIAL CAPITAL (BRIDGING)

(SCBR1) Interacting with people on my SNA makes me curious about places other than where I live. (7pt; sa/sd)

(SCBR2) Interacting with people on my SNA makes me interested in what people who are different than me are thinking. (7pt; sa/sd)

(SCBR3) Interacting with people on my SNA makes me feel like part of a larger community. (7pt; sa/sd)

SOCIAL CAPITAL (MAINTAINED)

(SCM2) If I needed to, I could ask a high school classmate to do a small favor for me. (7pt; sa/sd)

(SCM3) I would be able to find information about a job or internship from a high school acquaintance. (7pt; sa/sd)

(SCM4) It would be easy to find people to invite to my high school reunion. (7pt; sa/sd)

(SCM5) I'd be able to stay with a high school acquaintance if traveling to a different city. (7pt; sa/sd)

POST-ADOPTIVE USE (duration, frequency, involvement, extent)

(PAU) On average, how many hours do you use your current SNA each week? (7pt; "0-1" to "20+")

(PAUFR1) On average during a one-week period, how many times do you access or use your current SNA? (7pt; "0-1" to "50 or more")

(PAUFR2) How often would you say you use your SNA? (7pt; "not very often" to "very often")

(PAUI1) How would you classify the intensity of your involvement experience with your SNA during a typical usage session? (7pt; "very low involvement" to "very high involvement")

(PAUI2) How would you classify the intensity of your immersion into the world of your SNA in a typical usage session? (7pt; "very low immersion" to "very high immersion")

(PAUI3) How would you classify the intensity of your engagement with your SNA in a typical usage session? (7pt; "very low engagement" to "very high engagement")

(PAUE) How many of the available features of your SNA would you say you use? (7pt; "very few features" to "very many features")

Biographies



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