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ABSTRACT

This study uses flow theory and the technology acceptance model (TAM) to provide new insight into the impact of enjoyment, one important dimension of flow, on user satisfaction, user beliefs, and behavioral intention to use. In addition, based on the propositions that knowledge results in an increased ability for activity and that flow is an emotional state of activity, this paper adopts a process view of knowledge to examine the role of knowledge in predicting enjoyment. The foregoing concepts are represented in a nomological network of enjoyment. Associated hypotheses are tested by using questionnaire responses of 253 online game players.

INTRODUCTION

Online games emerged in the electronic commerce vocabulary with the birth of the World Wide Web and the business of online games has grown quickly. It is estimated that the worldwide number of online game players reached 50 million by the year 2004 and it is expected to be 114 million in the year 2006 (DFC Intelligence, 2004). Meanwhile, the global revenues of online games reached $1.9 billion in the year 2003 and they are projected to increase to about $10 billion by the year 2009 (DFC Intelligence, 2004). Those who create, sponsor, and operate online games can benefit from an improved understanding of the behaviors of online game users (Park & Chen, 2007). Here, we introduce and empirically study a model that systematically links constructs of knowledge processes, flow experience, and consumer behavior in the context of online games.

A key issue facing electronic commerce practitioners and researchers has been understanding consumer behavior on the Web (Jarvenpaa & Todd, 1997; Koufaris, 2002; Loiacono & Lin, 2005; Mahatanankoon et al., 2007). As a subject of psychology and marketing research, flow experience is recognized as an important determinant of consumer behavior (Hsu & Lu, 2004; Novak et al., 2000). Flow, as a state of optimal experience, can affect the frequency and amount of time spent using online services or making online purchases through the development of customer loyalty (Choi & Kim, 2004; Jarvenpaa & Todd, 1997; Rice, 1997). Thus, knowing what conditions are conducive to online customers achieving optimal experience is critical to the success of an online vendor (Eighmey, 1997; Lee et al., 2003), be it in the gaming sectors or elsewhere.

Researchers find that knowledge results in an increased ability for activity (Akbar, 2003; Gronhaug & Olson, 1999; Roth, 2003). Because a flow experience is an emotional state of activity (Chou & Ting, 2003; Csikszentmihalyi, 1990), an important question is whether knowledge is useful in predicting flow experience. While one may intuitively believe that knowledge can affect flow, this important relationship has not been empirically tested. If it is an antecedent of flow experience in online games, knowledge may function as an effective lever for success in such e-business endeavors.

This research empirically examines the impact of knowledge on flow and the subsequent effects of flow in the context of online games. The theoretical underpinnings of this study rest on a process view of knowledge created to identify the lifecycle of knowledge (Davenport & Prusak, 1998; Lee et al., 2005), flow theory founded to examine state of mind (Csikszentmihalyi, 1990), and the technology acceptance model (TAM) developed to measure user acceptance of computer systems (Davis, 1989).

RESEARCH MODEL AND HYPOTHESES

As a basis for the research model introduced in this section, we begin with descriptions of relevant knowledge concepts and flow theory. These are linked into a TAM-like research model and nine hypotheses are developed about linkages in this model.

Knowledge Concepts

Emphasizing the view that knowledge is highly human-related, Davenport and Prusak (1998) define it as “a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers.” Knowledge is a product of human reflection and experience emphasizing understanding and sense making (why and how), while information is the awareness of something (who and what) such as patterns that individuals instill on data (Bennet & Bennet, 2003; Roth, 2003). In a related vein, knowledge is that which is conveyed in representations (e.g., linguistic, symbolic, digital, mental, behavioral and material patterns) that are usable to some processor (e.g., human mind) and can be categorized as being descriptive (characterizations of the state of some system – who, what and when, etc.), procedural (characterizations of how to do something), or reasoning (characterizations of logic or causality) (Holsapple, 1995, 2003, 2005).

A process view of knowledge indicates that knowledge is both used and embedded in various processes (i.e., in the behaviors of some processor, such as a person or organization). Nonaka (1994) presents a four-fold classification of knowledge processes: socialization, combination, externalization, and internalization. Socialization is the process of transferring tacit knowledge from a tutor or a more knowledgeable individual to an apprentice through observations, imitation, and practice while these two individuals work together. Combination is the process of creating new explicit knowledge through the combination of other existing explicit knowledge. Externalization is the process of converting tacit knowledge into explicit knowledge through metaphor that enables people to experience a new behavior by making inferences from the model of another behavior. Finally, internalization is the process of converting explicit knowledge into tacit knowledge through action or trial-and-error.

An alterative process view of knowledge includes following: knowledge generation, knowledge codification, knowledge sharing, and knowledge utilization (Davenport & Prusak, 1998; Lee et al., 2005). In this categorization, knowledge generation is conceived as involving knowledge creation and acquisition. Knowledge creation refers the development of new content or the replacement of existing content within the tacit and explicit knowledge (Pentland, 1995). It includes the activities of deriving and discovering knowledge (Holsapple & Joshi 2004). Knowledge acquisition refers to the intake or acceptance of knowledge from external sources (Davenport & Prusak, 1998). Even though nothing is "generated," this classification scheme treats acquisition as being part of the knowledge generation category. Knowledge codification refers to the translation of knowledge into representations such as documents, rules, and manuals for storage in a repository. Knowledge sharing refers to transfer of knowledge between individuals (Ford, 2003). Finally, knowledge utilization is the use of knowledge to solve practical problems.

Knowledge gives not only the capacity to conceptualize, but also the capacity to act (Davenport & Prusak, 1998; Nosek, 2004; Roth, 2003). To perform their activities appropriately, individuals must have knowledge about the purpose of the activities, how the various activities relate to each other, and how they relate to their goals (Gronhaug & Olson, 1999; Galup et al., 2004). Moreover, to fit their activities to an ever-changing environment, individuals also need the knowledge about the immediate situation in which they are embedded (Gronhaug & Olson, 1999). Therefore, knowledge can be viewed as a key to performing activities or to better performing activities in online gaming context, as well as many other settings.

Flow Theory

As the founder of flow theory, Csikszentmihalyi (1990) defines it as "the state in which people are so involved in an activity that nothing else seems to matter." Flow, characterized as a state of optimal experience, can be applied to almost any activity including making music, rock climbing, dancing, sailing, and playing chess (Csikszentmihalyi, 1990). The founder further argues that what makes these activities conducive to flow is that they make optimal experience easier to achieve, they have rules that require the learning of skills, they set up goals, they make control possible, and they provide feedback.

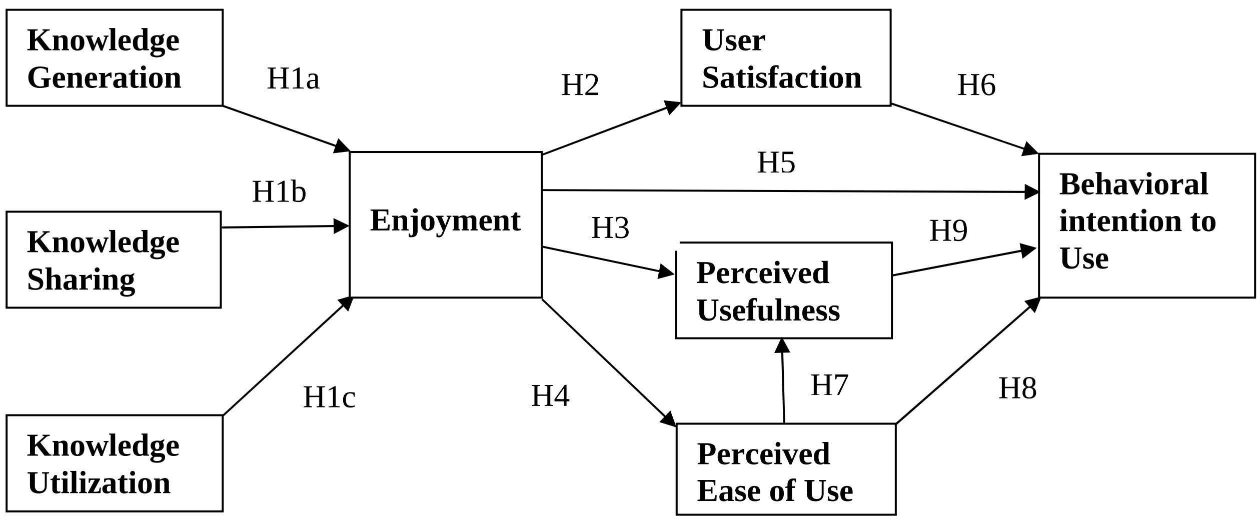
In order to better understand flow in the context of electronic commerce and technology usage, researchers have devoted considerable effort to finding answers to these three questions: what results in flow, what is the outcome of flow, and how flow can be measured. Novak et al. (2000) conceptualize flow on the World Wide Web as a cognitive state experienced during navigation that is determined by high levels of skill/control, high levels of challenge and arousal, and focused attention, and enhanced by interactivity and telepresence. The consequents of flow included in their model are consumer behavior variables that involve online shopping and Web use applications such as the extent to which consumers search for production information and participate in chat rooms. The most important construct of the model, flow experience, is measured with a three-item scale following a narrative description of flow. The findings of the research suggest that skill/control, challenge, and telepresence have positive effects on flow. Results of the impact of flow on consumer behavior variables are complex: the base model gives positive outcome, but the revised model does not.

In research grounded on the integrated theoretical framework of online consumer behavior, Koufaris (2002) argues that online consumer intention to return and their likelihood of making unplanned purchases can be influenced by the flow experience, as measured in three dimensions: shopping enjoyment, perceived control, and concentration/attention focus. Results of his questionnaire-based study confirm the positive association of shopping enjoyment with consumer intention to return, and the significant impact of product involvement, value-added search mechanisms, Web skills, and challenges on shopping enjoyment. Because in the study shopping enjoyment is the only measure of flow predicting consumer intention to return, Koufaris (2002) argues that given online consumers are not simply website users, a multidimensional flow construct might not be adequate to explain their behavior. Thus, he suggests using a simple construct such as shopping enjoyment to measure flow experience in online consumer behavior research.

In summary, past work related to flow in the context of electronic commerce and technology usage suggests that flow can be measured either in multiple dimensions with several different constructs (Koufaris, 2002) or a unique dimension with narrative description (Novak et al., 2000). Not surprisingly, the findings of all these studies confirm that flow experience can be significantly influenced by the variable of skill, and that flow experience can significantly impact online consumers' attitudes and behaviors toward technology use, electronic commerce, and online activity. We expect these findings to be applicable to the case of online gaming as well.

It has been suggested in online consumer behavior research that a single dimension with a simple construct like shopping enjoyment gives an adequate measure of flow experience (Koufaris, 2002). In accord with this suggestion, the research reported here measures flow experience in terms of one important and common dimension: enjoyment. As the emotional response of pleasure from an activity, enjoyment is critical to electronic commerce due to its significant impact on consumer attitude and belief toward using an online service or making an online purchase (Eighmey, 1997; Jarvenpaa & Todd, 1997). Enjoyment can occur not only in the course of physical activities, but also in the pursuit of mental activities such as playing chess and cyber-game. The research model illustrated in Figure 1 treats the enjoyment dimension of flow as its central construct.

Figure 1: Research Model.



The Impact of Knowledge on Flow

Individual skill defined as the Web consumer's capacity for action, is an important antecedent to flow (Koufaris, 2002; Novak et al., 2000; Trevino & Webster, 1992; Webster et al., 1993). On the other hand, knowledge is viewed as the capacity to act (Davenport & Prusak, 1998; Gronhaug & Olson, 1999; Larsen, 1980; Nosek, 2004; Roth, 2003). Based on this view, Koskinen (2003) argues that knowledge is the underlying basis of skill that allows people to act. Considering these findings, we are led to hypothesize that (similar to skill) knowledge may be another significant antecedent to flow.

Through the process of knowledge generation, new knowledge is created or acquired. New knowledge results in the development of new capabilities that form an underlying basis for the skill to conduct an activity (Koskinen, 2003). In an online game setting, new knowledge gives players the capability to solve puzzles, use controls, and understand game backgrounds. Therefore, with the presence of such capability as achievable through knowledge generation, players are expected to perceive greater control when involved in games and thus, are more likely to enjoy playing online games.

> **Hypothesis 1a**: In the context of online gaming, knowledge generation is positively related to enjoyment.

Knowledge sharing is a process which promotes diffusion of knowledge and allows individuals to obtain new thoughts, expertise, and ideas not available in their minds. Knowledge sharing creates new capabilities for an activity (Churchman, 1971). Such capabilities enable individuals to solve problems and find innovative solutions during an activity, thus reducing individuals' anxiety. Therefore, it is reasonable to believe that as more knowledge sharing occurs among online game players, it is more likely for them to have positive emotional responses to the online games they play.

Hypothesis 1b: In the context of online gaming, knowledge sharing is positively related to enjoyment.

As the process of applying knowledge to problems occurs in an activity, knowledge utilization directly leads to decisions or actions (Larsen, 1980). Such decisions or actions allow players to interact with an online game more effectively. Interaction has been recognized as one of the most important aspects related to flow experience with online games (Csikszentmihalyi, 1997; Lewinski, 2000; Mithra, 1998). Therefore, knowledge utilization is expected to facilitate a strong sense of involvement and fun by improving players' interactions with online games.

Hypothesis 1c: In the context of online gaming, knowledge utilization is positively related to enjoyment.

The Impact of Flow on Online Game User Satisfaction

Westbrook and Reilly (1983) define consumer satisfaction as the emotional response to the experiences provided by particular products or services purchased, retail outlets, patterns of shopping and buyer behavior, and the overall marketplace. Accordingly, online game user satisfaction can be viewed as the emotional response to all experiences related to playing online games. User satisfaction is important to the success of online game vendors because if users are not satisfied with the product or service on the Web, they will not use it and vendors will lose business.

To study the role of emotion in consumption, Oliver (1992) examines the dimensionality of satisfaction and its relationship with emotional experiences. Findings of his research indicate that enjoyment is highly correlated with satisfaction. Looking at a customer's commitment value and examining its relationships with the customer's satisfaction, Lee et al. (2003) find that shopping enjoyment, convenience in purchasing, and the product value contribute significantly to the attainment of customer satisfaction. They also argue that satisfaction can occur before and during the consumption, or during and after the purchase. In summary, prior research supports the hypothesis that flow could be a critical antecedent of user satisfaction (Halstead et al., 1994; Lee et al., 2003; Oliver, 1992, 1997).

Hypothesis 2: Enjoyment is positively related to online game user satisfaction.

The Impact of Flow on Perceived Usefulness, Perceived Ease of Use, and Behavioral Intention to Use

As one of the three constructs of the technology acceptance model (TAM), perceived usefulness is defined as the degree to which individuals believe that using a particular system would enhance their job performance (Davis, 1989). Perceived usefulness has been recognized as an important subsequent of flow experience (Agarwal & Karahanna, 2000). In an effort to explain why users behave in particular ways toward information technologies, Agarwal and Karahanna

(2000) posit cognitive absorption, which is the extended notion of flow, to be a proximal antecedent of perceived usefulness.

Perceived ease of use is defined as the degree to which individuals believe that using a particular system would be free of effort (Davis, 1989). In an anchoring and adjustment-based theoretical model, Venkatesh (2000) suggests that enjoyment would significantly impact perceived ease of use. At the same time, Agarwal and Karahanna (2000) provide empirical evidence that perceived ease of use is an important subsequent of flow experience in the context of using the World Wide Web. Based on these findings, it is likely that flow influences perceived usefulness and perceived ease of use in that online game players who achieve more optimal experience are more likely to perceive the online game website to be useful and easy to use.

Hypothesis 3: Enjoyment is positively related to perceived usefulness of an online game website.

Hypothesis 4: Enjoyment is positively related to perceived ease of use of an online game website.

Prior work suggests that flow experience has a direct effect on online customer loyalty (Choi & Kim, 2004; Dick & Basu, 1994; Oliver, 1997; Prichard & Howard, 1999). In addition, Chou and Ting (2003) find that consumers who have experienced flow are more likely to be addicted. On the other hand, empirical evidence also indicates that flow experience has a positive impact on the use of information systems (Agarwal & Karahanna, 2000; Trevino & Webster, 1992; Webster et al., 1993). Consistent with past research findings, it is expected that online game players who experience flow are more likely to intend to use online games.

Hypothesis 5: In the context of online gaming, enjoyment is positively related to behavioral intention to use.

The Impact of User Satisfaction on Behavioral Intention to Use

Previous studies also indicate that user satisfaction can significantly influence the behavioral intention to use information systems (Baroudi et al., 1986; DeLone & McLean, 1992, 2003). In an extended technology acceptance model, Shih (2004) examines the impact of user satisfaction on acceptance of e-shopping and finds that user satisfaction has a significant influence on the behavioral intent toward not only purchasing products, but also using an online service. A similar effect is expected in playing online games. Online game players who are satisfied with the service and product provided by the online game website are more likely to visit the website from time to time.

Hypothesis 6: Online game user satisfaction is positively related to behavioral intention to use that game.

Relationships among TAM Constructs

Prior work related to TAM confirms the impact of perceived usefulness and perceived ease of use on behavioral intention to use, and the impact of perceived ease of use on perceived usefulness (Davis, 1989; Hsu & Lu, 2004; Venkatesh, 2000). This study adopts TAM and argues that the same relationships among these three constructs are present in the context of using an online game website.

Hypothesis 7: Perceived ease of use is positively related to perceived usefulness of an online game website.

Hypothesis 8: Perceived ease of use is positively related to the behavioral intention to use an online game website.

Hypothesis 9: Perceived usefulness of an online game website is positively related to behavioral intention to use that site.

METHODOLOGY

Survey Instrument, Pilot Test, and Data Collection

To study the hypotheses, data were collected via a survey instrument. All research variables were measured using multi-item scales adapted from prior relevant studies. Survey items shown in Table 1 were answered on a seven-point Likert scale.

A pilot test of the survey instrument was conducted with 26 online game players to ensure that questionnaire items were clearly articulated. Comments and suggestions were obtained from the participants and the survey questions were modified accordingly.

Undergraduate students enrolled in three MIS courses, one management course, and one finance course in the University of Kentucky's College of Business served as survey subjects. To prevent possible bias due to repetitive responses, students who enrolled in more than one of those five courses were only allowed to answer the questionnaire once. A total of 392 non-repetitive responses were returned from the students who were present in classes on the days data was collected. Of these initial responses, 133 from respondents who had no prior experience with playing online games were discarded. From the 259 responses of online game players, 6 were discarded due to incompleteness. Consequently, a total of 253 valid responses are used for final data analysis of this study.

Table 2 summarizes the characteristics of these 253 respondents. In general, around 60% of the respondents are male. The average years of online game experience is 2.8 and home is the dominant location of playing online games.

Table 1: Survey Items.

Knowledge Generation (KNG)		Adapted from Lee et al. (2005)
KNG1	I obtain useful information and suggestions about playing online games from other players.	
KNG2	I search information to improve my skill of playing online games.	
KNG3	I read game guidance/introduction to help me play online games.	
Knowledge Sharing (KNS)		Adapted from Lee et al. (2005)
KNS1	It is important for online game players to share information and experience.	
KNS2	Online game players share information and experience necessary for playing online	
KNS3	Players improve their skills of playing online games by sharing information and	
Knowledge Utilization (KNU)		Adapted from Lee et al. (2005); Desouza (2003)
KNU1	I use information and knowledge to solve online game puzzles.	
KNU2	I can play online games efficiently by utilizing information and knowledge.	
KNU3	Knowledge utilization is important to online game players.	
Enjoyment (ENJ)		Adapted from Koufaris (2002)
ENJ1	Playing online games is exciting.	
ENJ2	I enjoyed playing online games.	
ENJ3	Playing online games gives me a lot of pleasure.	
User Satisfaction (SAT)		Adapted from Lee et al. (2003)
SAT1	I am satisfied with the story of the online game.	
SAT2	I am satisfied with the quality of the online game.	
SAT3	I am satisfied with the graphics of the online game.	
SAT4	I am satisfied with the sound of the online game.	
SAT5	I am satisfied with the length of the online game.	
Perceived Usefulness (PUF)		Adapted from Agarwal and Karahanna (2000); Heijden and Verhagen (2004)
PUF1	Playing games at online game website enhances my skill of playing game.	
PUF2	Online game website gives player a lot of useful information about online game.	
PUF3	Online game website provides product with high value.	
Perceived Ease of Use (PEU)		Adapted from Heijden and Verhagen (2004); Hsu and Lu (2004)
PEU1	It is easy to use online game website.	
PEU2	It is easy to learn how to play online game.	
PEU3	The user interface of online game website is easy to follow.	
Behavioral Intention to Use (BIU)		Adapted from Agarwal and Karahanna (2000);

BIU1	I will play online games frequently in the future.
BIU2	I intend to play online games.
BIU3	I will play online games for a long time.

Table 2: Characteristics of Respondent Students.

Measure	Category	Percent	Average
Gender	Male	60.5	
	Female	39.5	
Age (years)	<20	2.8	23.2
	21-25	83.4	
	>25	13.8	
Place of playing online games	Home	74.2	
	School	7.3	
	Office	15.7	
	Friend's	1.4	
	Other	1.4	
Years of online game experience	<1	16.2	2.8
	1-3	51.4	
	4-5	20.9	
	>5	11.5	
Hours per week playing online games	<1	11.9	3.2
	1-5	71.1	
	>5	17	
Times per week playing online games	1-3	83.4	2.6
	4-5	10.3	
	>5	6.3	

Psychometric Properties of Measures

Partial Least Squares (PLS) Graph Version 3.0, a structural equation modeling (SEM) tool, is employed to measure the reliability and validity of data, and to test the research model. Unlike a covariance-based SEM tool (such as LISREL) that uses a maximum likelihood function, the component-based PLS uses a least squares estimation procedure to obtain parameter estimates (Sasidharan et al., 2006; Yi & Davis, 2003). For this reason, PLS has the flexibility to represent both formative and reflective latent constructs, and places minimal demands on measurement scales, sample size, and distribution assumptions (Chin, 1998; Falk & Miller, 1992; Fornell & Bookstein, 1982; Lohmoller, 1989).

The psychometric properties of the measures for the eight latent constructs are evaluated in terms of the convergent and discriminant validity, and internal consistency reliability (ICR) of the constructs (Chin, 1998; Compeau et al., 1999). Two criteria can be used to assess the convergent and discriminant validity of latent constructs with reflective indicators. First, the standardized item loadings (similar to loadings in principal components) should be no less than .707, and the items should load more strongly on their respective constructs than on other constructs (Chin, 2001; Compeau et al., 1999). Second, the square root of average variance extracted (AVE) by a construct from its indicators should be no less than .707 (i.e., AVE should be no less than .50) and should be larger than the correlations between that construct and all other constructs (Fornell & Larcker, 1981).

Similar to Cronbach's alpha, ICR is also known as composite reliability and can be computed from the normal PLS output using the formula, ICR = $(\Sigma\lambda_i)^2/[(\Sigma\lambda_i)^2+\Sigma(1-\lambda_i^2)]$, where λ_i is the standardized component loading of an indicator on its construct (Chin, 1998). ICR is considered adequate if its value is no less than .70 (Barclay et al., 1995; Compeau et al., 1999).

Table 3 shows the loadings and cross-loadings calculated by correlating eight construct factor scores with all standardized item scores. All items, except for two items in perceived usefulness (PUF2 and PUF3) and one item in perceived ease of use (PEU3), exhibited high loadings (>.707) on their respective constructs, and no items loaded more strongly on the constructs they were not intended to measure. The three items whose loadings are less than .707 but larger than .6 are still acceptable because there exist additional high-loading item(s) measuring the same latent construct (Chin, 2001).

Table 3: Loadings and Cross-Loadings.

	KNG	KNS	KNU	ENJ	SAT	PUF	PEU	BIU
KNC1	**.862**	.711	.504	.488	.465	.400	.198	.422
KNC2	**.896**	.592	.536	.454	.372	.392	.135	.424
KNC3	**.774**	.606	.529	.361	.410	.392	.191	.361
KNS1	.758	**.913**	.567	.390	.494	.482	.184	.310
KNS2	.684	**.923**	.551	.353	.516	.470	.200	.271
KNS3	.577	**.864**	.561	.301	.499	.443	.108	.237
KNU1	.554	.497	**.881**	.549	.556	.405	.305	.497
KNU2	.579	.593	**.927**	.476	.562	.480	.374	.416
KNU3	.508	.581	**.867**	.429	.532	.439	.253	.323
ENJ1	.476	.372	.494	**.902**	.496	.391	.262	.743
ENJ2	.383	.259	.434	**.886**	.384	.293	.302	.682
ENJ3	.530	.409	.545	**.903**	.475	.368	.244	.672
SAT1	.377	.418	.463	.359	**.809**	.343	.273	.362
SAT2	.461	.502	.545	.485	**.836**	.484	.375	.454
SAT3	.344	.399	.463	.348	**.760**	.400	.283	.294
SAT4	.378	.448	.443	.305	**.752**	.358	.198	.233
SAT5	.356	.417	.492	.442	**.769**	.391	.305	.380
PUF1	.347	.403	.371	.364	.359	**.792**	.169	.355
PUF2	.309	.331	.341	.220	.324	**.640**	.363	.141
PUF3	.337	.363	.337	.226	.416	**.684**	.192	.207
PEU1	.172	.150	.266	.262	.261	.327	**.873**	.193
PEU2	.138	.094	.182	.182	.199	.241	**.807**	.130
PEU3	.169	.189	.373	.250	.427	.186	**.664**	.203
BIU1	.458	.303	.452	.706	.472	.356	.215	**.940**

BIU2	.426	.296	.462	.769	.438	.330	.237	**.951**
BIU3	.467	.263	.410	.724	.370	.295	.186	**.930**
Constructs in the model are all latent constructs with reflective indicators.								

Table 4 shows ICRs, square roots of AVEs, and correlations among latent constructs. All ICRs are larger than 0.75, exceeding the minimum reliability criterion (.70). The AVEs are computed from the normal PLS output using the formula, $AVE=\Sigma\lambda_i^2/[\Sigma\lambda_i^2+\Sigma(1-\lambda_i^2)]$ (Chin, 1998). All square roots of AVEs (on the diagonal in bold) are larger than .707, and in all cases larger than the correlations between that construct and all other constructs. Over all, these results provide strong evidence of convergent and discriminant validity, as well as reliability of the measurement instruments.

Table 4: ICRs, AVE Square Roots, and Correlations among Latent Constructs.

Latent Construct	ICR	AVE Square Roots (on-diagonal) and Correlations (off-diagonal)							
		KNG	KNS	KNU	ENJ	SAT	PUF	PEU	BIU
KNG	.882	**.846**							
KNS	.928	.754	**.900**						
KNU	.921	.615	.620	**.892**					
ENJ	.925	.519	.390	.549	**.897**				
SAT	.890	.491	.558	.617	.506	**.786**			
PUF	.750	.465	.517	.493	.393	.509	**.708**		
PEU	.827	.205	.186	.350	.299	.376	.327	**.786**	
BIU	.958	.478	.306	.470	.780	.454	.348	.226	**.940**

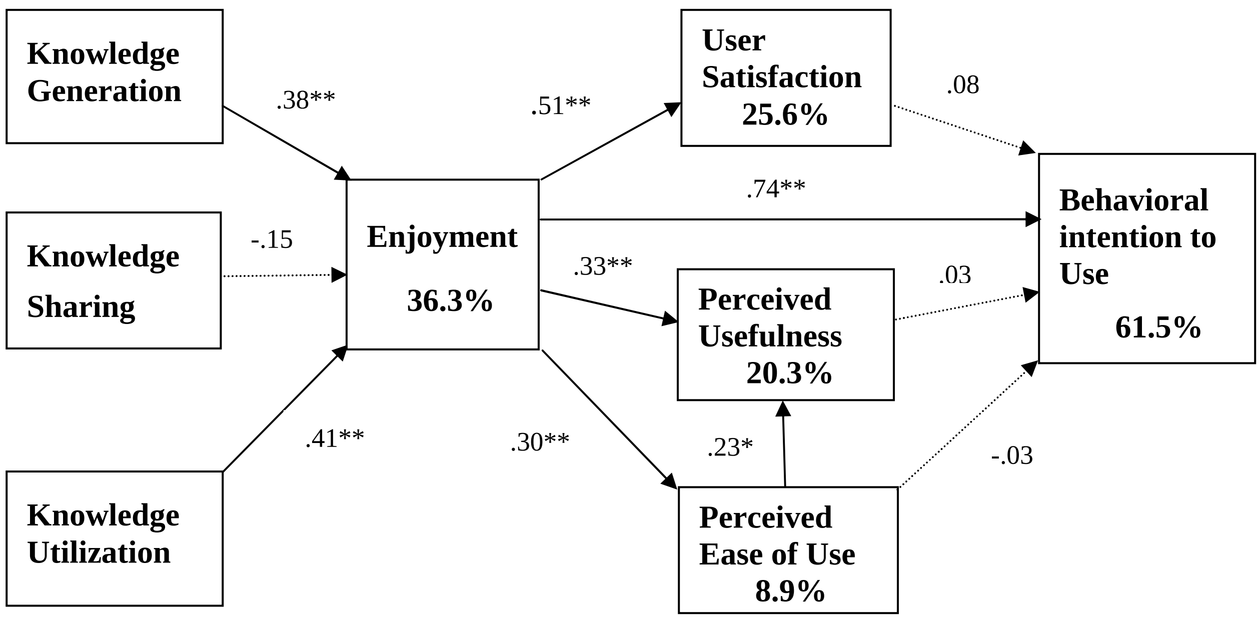
Test of Model and Hypotheses

The hypotheses are tested by examining path coefficients (similar to standardized beta weights in a regression analysis) and their significance levels in the PLS structural model. Bootstrapping with 500 resamples (Chin, 1998) is performed to obtain estimates of t-statistic values for examining the statistical significance of path coefficients.

Figure 2 shows the model-testing results with variances for each dependent construct, path coefficients, and significance levels for each hypothesis. Knowledge generation and knowledge utilization together explain 35.7% of the variance in enjoyment. The remaining variance in enjoyment, .6%, is attributed to knowledge sharing. Enjoyment alone explains 38.6% of the variance in behavioral intention to use, 25.6% of the variance in user satisfaction, and 8.9% of the variance in perceived ease of use. User satisfaction, perceived usefulness, and perceived ease of use together account for 22.9% of the variance in behavioral intention to use, and thus the total variance in behavioral intention to use explained by the model is 61.5%. Enjoyment and perceived ease of use together account for 20.3% of the variance in perceived usefulness.

Seven of the eleven hypotheses were supported. Knowledge generation has a significant effect on enjoyment, thus supporting hypothesis 1a. Inconsistent with hypothesis 1b, knowledge sharing has a non-significant negative effect on enjoyment. Hypothesis 1c, which posits that knowledge utilization has a significant effect on enjoyment, is supported. Consistent with the predictions, enjoyment has a significant effect on user satisfaction, perceived usefulness, perceived ease of use, and behavioral intention to use, thus supporting hypothesis 2, 3, 4, and 5. User satisfaction has no significant effect on behavioral intention to use. Thus, hypothesis 6 is not supported. Supporting hypothesis 7, perceived ease of use has a significant effect on perceived usefulness. Finally, both perceived ease of use and perceived usefulness have no significant effect on behavioral intention to use, and thus hypotheses 8 and 9 are not supported. Table 5 summarizes these results.

Figure 2: PLS Results.



*significant at .01
**significant at .001

Table 5: Summary of Hypothesis Test Results.

Hypothesis	T-Statistic	P-Value	Support
H1a: Knowledge Generation→Enjoyment	4.269	<.001	Yes
H1b: Knowledge Sharing→Enjoyment	1.806	>.05	No
H1c: Knowledge Utilization→Enjoyment	5.927	<.001	Yes
H2: Enjoyment→Satisfaction	8.312	<.001	Yes
H3: Enjoyment→Perceived Usefulness	5.622	<.001	Yes
H4: Enjoyment→Perceived Ease of Use	4.881	<.001	Yes
H5: Enjoyment→Behavioral Intention to Use	13.85	<.001	Yes
H6: Satisfaction→Behavioral Intention to Use	1.429	>.05	No
H7: Perceived Ease of Use→Perceived Usefulness	3.018	<.01	Yes
H8: Perceived Ease of Use→Behavioral Intention to Use	.636	>.05	No
H9: Perceived Usefulness→Behavioral Intention to Use	.528	>.05	No

DISCUSSION

Knowledge benefits individuals in terms of an increased ability for activity (Akbar, 2003; Gronhaug & Olson, 1999; Roth, 2003), but its influence on emotional state of activity, flow experience, remains unclear. The findings of this research indicate that two processes of knowledge, knowledge generation and knowledge utilization, help online game players achieve intrinsic enjoyment, which is known as a common measure of flow experience. This result is consistent with the prediction that knowledge, similar to skill, can also be a significant antecedent to flow.

The following arguments might explain why knowledge sharing has a non-significant negative impact on flow experience. First, knowledge sharing might not happen among online game players due to lack of communication channels. Players may depend on knowledge generation, rather than knowledge sharing, to obtain new knowledge related to playing online games. Second, online game players might be reluctant to share their knowledge with others. Prior research consistently find that knowledge sharing is positively related to such factors as trust (Rolland & Chauvel, 2000), strong ties (Wellman & Wortley, 1990), co-location (Kraut et al., 1990), and a history of prior relationship (Krackhardt, 1992). Without the presence of these factors, online game players may be unwilling to contribute knowledge and help strangers. On the other hand, as knowledge is associated with competitive edge, sharing knowledge is bound to be difficult (Cabrera & Cabrera, 2002). When online game players believe that knowledge can offer them the advantage helpful in competing with other players, knowledge sharing is likely to cease. Thus, to online game players, knowledge sharing may not play a role as important as knowledge generation and utilization do in the achievement of flow experience.

The results indicate that enjoyment has a significant impact on emotional response (satisfaction), behavior (behavioral intention to use), and beliefs (perceived usefulness and perceived ease of use). These results are also consistent with prior study in electronic commerce and technology usage settings, providing additional evidence that enjoyment is an important trigger for user satisfaction (Oliver, 1992, 1997; Wu & Liu, 2007), a strong motivator for playing online games (Hsu & Lu, 2004), and a critical predictor of beliefs (Agarwal & Karahanna, 2000). The results also confirm some prior research on the positive correlation between perceived ease of use and perceived usefulness. Online game players who perceive the online game website to be easy to use are more likely to perceive it as useful.

Directly contrary to predictions, the results suggest that user satisfaction, perceived ease of use, and perceived usefulness do not predict behavioral intention to use. Although many previous studies find that perceived ease of use and perceived usefulness can predict behavioral intention, this study suggests that this may not be the always the case. A possible reason, according to Hsu and Lu (2004), could be that when applied to studying entertainment technology such as online gaming, TAM may not be as powerful as it is in studying problem-solving technology such as word processing system. Moreover, according to the model, user satisfaction can be viewed as the mediators of the link between enjoyment and behavioral intention to use. By taking such a view, one can argue that a possible reason for the weak result could be the irrelevance of user satisfaction as the mediator of the link in online gaming situations. Thus, all of these indicate the need for future research to reexamine the roles played by user satisfaction, perceived ease of use, and perceived usefulness in predicting behavioral intention in online gaming context.

LIMITATIONS

When interpreting the results of a study with this complexity, readers should be cautious and aware of its limitations. Process view of knowledge indicates that knowledge can be classified into different processes (Davenport & Prusak, 1998; Lee et al., 2005; Nonaka, 1994). Given that playing online games is an individual level phenomenon and that knowledge generation, knowledge sharing, and knowledge utilization are more related to such phenomenon than other knowledge processes, this research only examined the impact of these three knowledge processes on flow experience. However, it remains possible that other process of knowledge such as knowledge codification may also play a role in predicting enjoyment.

Self-efficacy, known as the confidence in one’s ability to perform a particular task (Bandura, 1997), is recognized as an antecedent of perceived ease of use and perceived usefulness (Agarwal & Karahanna, 2000; Venkatesh & Davis, 1996). Though the main focus of this study is on the relationship between knowledge and flow experience in the online gaming context, it might be appropriate to have self-efficacy in the model to test whether the flow experience would still significantly impact user beliefs when self-efficacy is controlled.

Another potential limitation is the external validity of the study. When measuring the external validity of the study, researchers need to consider both the participants and the setting in which the study is conducted (Cook & Campbell, 1979). The participants of this study are business school undergraduates with an average age of 23 and the setting is an educational institution. Therefore, the generalizability of the model and its findings to a wide array of settings and populations might be limited.

Finally, three items in the model (PUF2, PUF3, and PEU3) exhibit low loadings (<.707) on their respective constructs. However, they are retained in the test because of the adequate ICRs of the constructs, their relative not-too-low loadings (>.6), and the fact that they loaded more strongly on their respective constructs than on other constructs. Further empirical tests of the model and hypotheses are necessary to determine whether the low loadings of these three items are one cause of the non-support of hypothesis 8 and 9.

IMPLICATIONS AND CONCLUSIONS

This study is motivated by an interest in understanding the role of knowledge in flow experiences and the role of flow experiences in user satisfaction, user beliefs, and behavioral intention in the context of electronic commerce and technology usage. A research model and hypotheses are presented and tested. Some implications for future research to refine and extend the model and its measures are as follows. First, future research can add other knowledge process such as knowledge codification to the model and test whether it is also positively related to flow experience. Second, future research can investigate the impact of flow experience on user beliefs with self-efficacy entering the model as control variable. This may be essential given the important role of self-efficacy in perceived ease of use and perceived usefulness. Third, future research can examine the generalizability of the model and findings other settings and broader populations. Finally, future research can develop more reliable and valid items to measure perceived usefulness and perceived ease of use. This is necessary especially in the light of insignificant results from testing hypothesis 8 and 9.

This study offers some key implications for practice. First, the results show that knowledge generation and knowledge utilization can predict enjoyment. Such findings indicate the desirability of 1) supporting knowledge generation processes to allow players to generate new knowledge necessary for solving puzzles, using controls, and understanding game backgrounds, and 2) supporting knowledge utilization processes to allow players to interact more effectively with an online game. Second, this study suggests that enjoyment is an important antecedent to behavioral intention to use, user satisfaction, and user beliefs. This implies that it is fundamental for online game vendors to provide players with truly enjoyable products. A final implication for managers relates to the design of an online game website. In this study, users who hold the belief that the online game website is easy to use are more likely to perceive it as useful. This indicates that online game vendors need to focus on designing an easy-use website to facilitate the creation of such user belief.

In conclusion, the purpose of this study is to empirically examine the impact of knowledge on flow and the subsequent effects of flow in the context of online games. Based on a survey experiment conducted at an educational institution, partial support is found for the prediction that knowledge, as the underlying basis of skill execution, can also be a significant antecedent to flow. The results of this study also confirm the significant impact of flow experience on user satisfaction, user beliefs, and behavioral intention, and the important role of perceived ease of use in perceived usefulness. The findings of this study indicate the need for continuing research efforts on knowledge and flow experience in the context of electronic commerce and technology usage.

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