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An Investigation in to Virtual World Adoption

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ABSTRACT

Virtual worlds are emerging in importance as more multinational firms are investing heavily in these emerging communities. Although much excitement has been built up around the idea of virtual worlds, a gap exists between those who sign up and those who engage in the virtual world. Our analysis of the gap between those who initiate an action and have signed up to join a virtual world and those who follow through and ultimately engage the community on a regular basis derives from a lack of adoption. Through the use of a subject matter expert study, we identified 35 factors to explain adoption, which then explain through the use of seven psychological theories. After discussing and integrating these seven factors, we test our model through a test of 223 new users of Second Life. The results from our empirical test of these seven theories are presented, and we conclude by discussing the theoretical and practical implications of understanding virtual world adoption.

Keywords

Virtual worlds, IT Adoption, Second Life, Structural Equation Modeling, Subject Matter Expert Study.

INTRODUCTION

> ***BRANDWEEK:*** *"As Web-marketing VP for Lenovo, you have been a vocal critic of Second Life, writing on your blog: 'There is nothing to do in Second Life except, pardon my bluntness, try to get laid.' Why are you so down on it?"*
>
> ***DAVID CHURBUCK:*** *"Let me answer the question with a question: When was the last time you logged onto Second Life?"*

What market is growing at 35% per month, has an average consumer age of 33, is based on an established economy, yet has no taxes, minimal regulation, no marginal cost of production, and low "entrance" expenses? The answer is Second Life. From homebuilders and architects to fashion, education, entertainment, and all manner of products and services, Second Life is an active marketplace with an ideal demographic: "Residents now exchange about $1.8 million per week for digital cash—a number that's growing up to twenty percent a month" (ASTRALCOM, 2007).

The growth in virtual worlds is further evidenced in the number of multinational firms that are developing places in this world. Starwood Hotels constructed a huge model of its latest Aloft hotel on an island, complete with an übermodern lounge and a deluxe pool. In addition, IBM purchased a large space it employs for company and industry meetings (Enright, 2007). More money is flowing into Second Life, and researchers are responding by

devoting additional attention into understanding the role of the virtual world. Experts have gone so far as to declare that virtual worlds are the future of the Internet.

The news and entertainment industries in particular have taken interest and action: "Because just watching TV is so passé, CSI creator Anthony Zuiker is taking his television show franchise to a whole new level this fall" (Rizzo, 2007). In Second Life—an Internet-based, open-ended virtual world that is shaped by its residents using different tools—fans will soon be able to explore the CSI: NY crime lab without supervision. Additionally, CNN has opened a news bureau dedicated to the virtual world that has millions addicted. With the news blog, which CNN dubs, "SL I-Reports: Your news of a virtual world," CNN is inviting SL members to file their own reports at a news desk located in the polygonal alternative universe, iReport.com/secondlife (Fruhlinger, 2007).

Research exploring the attraction, adoption, and behavioral intentions toward virtual worlds is gaining attention in the IS field as more organizations (e.g., Cisco, American Apparel, Disney, American Cancer Society, Avnet Technology Museum, Coca Cola, Wells Fargo, and Dell) heavily invest in online worlds. While previous IS research (Van der Heijden, 2004; Sun and Zhang, 2006; Atkinson and Kydd, 1997) has empirically investigated the impact of behavioral intention within hedonic systems broadly (or a system deployed with a primary use of enjoyment), the question of the adoption process for individuals in virtual worlds has not received similar attention from the academic community.

Although much excitement has been built up around the idea of virtual worlds, and it appears that many organizations are jumping on the virtual world bandwagon, a potential problem is beginning to emerge – that is, a problem of user adoption. Critics are now questioning the premise of virtual worlds as well as why there has been a failure to see users commit to high levels of usage. For instance, Raz Schionning, the Web director of the first real-world clothing retailer to establish a shop in Second Life, was recently quoted as saying that Second Life "may be more interesting as a concept than a reality at this time" said (Enright, 2007). And, although success of a virtual world is dependent upon people actually visiting their sites (Lin, 2008; Ahn, 2004), it is questionable whether initial users of virtual worlds continue to engage with the technology. Estimates are that around 50 million people have signed up for Second Life (Bennett, 2008); however, of those 50 million, only approximately 463,000 use the virtual community on a regular basis (Linden Research, Inc. 2008). Thus, following Churbuck's question: when was the last time that you logged on to Second Life, a gap clearly exists between those who sign up and those who engage in (or adopt) Second Life. It is our conclusion that the skepticism from the critics and the gap between those that sign up for the virtual community and those that engage the world on a regular basis is a problem of adoption and it is this adoption gap that provides the motivation for the current work. We assert that the virtual world adoption gap is a significant problem facing the future of immersive environments. We therefore propose that additional research is needed to understand individuals who have an initial experience with a virtual world and their future intent to continue utilizing the technology.

We will approach our work as follows. First, we will present a high-level overview of the traditional explanations for technology adoption. We will then argue that our traditional approaches are not particularly well-suited to understanding immersive environments and pursue a methodology to explore explanations for adoption. Next, we will present the results of an expert study and suggest seven theories that can be used toward understanding virtual world adoption. The results from our empirical test of these seven theories will be presented, and we will conclude by discussing the theoretical and practical implications of understanding virtual world adoption.

TRADITIONAL EXPLANATIONS FOR TECHNOLOGY ADOPTION

Traditional explanations for understanding technology adoption are derived from the "proxy view" of technology (Orlikowski and Iacono, 2001). According to this perspective, understanding how an individual perceives technology will explain the degree to which the technology is adopted. Within this view are different models to understanding the different perceptions (e.g. UTAUT, TAM, PCI); yet, fundamentally, each perspective seeks to understand the salient beliefs that drive individuals to adopt a particular technology.

We suggest that adoption research has traditionally relied upon on a relatively narrow set of user's perceptions of the technology to explain adoption decisions. While some researchers have begun to propose broadening the scope of salient perceptions related to the adoption decision (e.g. Schwarz and Chin, 2007), we suggest that relatively few factors outside the scope of a user's perceptions of the technology have been incorporated in the current adoption models. While some adoption models include "facilitating conditions" (i.e. UTAUT) and externalities that facilitate the adoption decision, these contextual variables are largely external to the use of the specific technology being studied. For instance, in the case of subjective norm, the pressure to adopt derives from those who are important to

the individual, and while it has not been specified, we would argue that the traditional understanding of the concept is that this pressure is brought to bear outside of the boundaries of the technology (as opposed to pressure to adopt occurring within the technology itself). Therefore, our first critique of the traditional approach to understanding technology adoption in a virtual community is that, unlike the technologies studied in the development of our current models, a virtual community has embedded communities that exert pressure within the technology. An individual using a virtual world might befriend another avatar or form a social group within the technology and, through the use of that technology, be motivated (or, in some cases decide not) to adopt the technology. We suggest that our current approaches to adoption neglect to incorporate these within-technology interactions that occur in virtual worlds and that we need a new perspective to understand the role of user interactions within the technology on the adoption process.

Our next critique of current adoption work is that it assumes a common objective for all users. The faithfulness of appropriation approach (Chin and Salisbury, 1997) has long argued that facilitating faithful use of technology is the objective of IT use. However, what if every individual defines faithful use (and what they need from the technology) differently? In other words, in the case of a virtual world, each individual entering the world has different needs and objectives for embracing the virtual community, yet fundamentally our current approaches assume homogeneity of needs. Specifically, we argue that the fundamental assumption guiding IT acceptance research is faithful usage, and by faithful usage, we mean that the usage is consistent with organizational goals. Therefore, if faithful usage is the desired outcome, by extension, the need that is being met by the technology is the fulfillment of that outcome. In the case of a virtual world, every individual enters the virtual world with a different need and has a different outcome that they desire—whether it be the formation of a social relationship, need advancement, the escape of reality, etc., and that virtual worlds represent a technology where there is a heterogeneity of needs from the user population—an approach not conceived of in our current approach to understanding technology adoption.

Although each virtual world is strategically positioned within a different market niche, each user within that niche remains unique. Consistent with the recent attempts to better understand how individual differences (e.g. PIIT, the Big Five, personality types, etc) influence IT adoption, we also argue that our current approaches have not fully integrated the role of individual characteristics. We therefore suggest that an understanding of virtual world adoption should explicitly include the role of individual differences.

Our critique of traditional approaches to technology adoption is three-fold: (1) a lack of understanding within-technology interactions; (2) an assumption of need homogeneity; and (3) a need to explicitly theorize the role of individual differences. We do not believe that any of the elements we have described can explain adoption in isolation. For instance, we do believe that technology perceptions are important; if an individual does not perceive that the technology is easy to use, then adoption will not occur even if the community offers exactly what the user needs. Rather, it is a set of factors both within and external to the technology that can explain adoption. In order to determine the set of factors that predict adoption of virtual worlds, we employed a subject matter experts study among virtual world experts. We will discuss our approach next.

A SUBJECT MATTER EXPERT STUDY OF VIRTUAL WORLD ADOPTION

The objective of a Subject Matter Expert Study is to gather data from those with an expert opinion, with the judgments and estimates being made by people who have spent much of their lives working on a particular subject. Simon and Burstein (1985) distinguish between the use of expert opinion as the final data on which a researcher bases their conclusions, and its use as a source of general guidance and clues for getting started in the right direction on a particular topic, which is the case in this study.

Consistent with the methodology proposed by Simon and Burstein (1985), we defined the objective of our subject matter experts study as two-fold. First, we wanted to empirically validate the 4P Approach—did our 4P Approach capture all of the variables suggested by our experts? Second, we sought to identify whether the variables suggested by the experts could be theoretically justified and empirically studied. With these variables, we then could build a theoretically-based research model to understand user adoption of virtual worlds.

To conduct our expert study, we first identified 135 participants from a recent virtual world conference held in the Southeastern United States. Our list of participants included the name of the individual and his or her affiliation. Using the name and affiliation information, we identified the e-mail addresses for those who we could locate, yielding an expert list of 73 potential respondents.

Theory	Explanation	Factors Identified by Experts
Cognitive Absorption Theory	A user who is involved (cognitively) in the technology is engrossed in the technology and is therefore absorbed in the technology	Cost
		Incentives
		Investment in the character (whether time or money)
		Involvement
		Time
		Time
		Quality of user interface
Diffusion of Innovation Theory	The extent to which a technology is perceived to be easy to use is encapsulated by diffusion of innovation theory	Ease of use and navigation
		Easy to learn
Escape Theory	An individual who is negative about their own world will seek to escape this in a virtual world – theorized by escape theory	Conditions in real life
		Current "physical" social network
		Identity relative to virtual world
		Lack of activities in their real lives (thus needing the virtual world to replace such lackthereof)
Hedonistic IS Theory	The degree to which an individual views the technology as "fun" is captured by hedonic IS use.	Entertainment
		Fun factor
		Game mechanics that incent people to keep going.
		Sense of fun
Perceived Sense of Community	The extent to which an individual is connected to the community opportunities can be theorized through their perceived sense of community	A connection with a set of individuals, whether a guild (in MMORPGs), or a set of friends that chat together (in non-RPG virtual worlds, such as Second Life)
		Community
		Community
		Group norms
		Group trust
Self-Determination Theory	The degree to which there is an extrinsic motivation pull from the virtual world can be understood from self-determination theory	Interest in what is offered in the virtual world (networking, sites, lectures in world)
		Interest in the development of a story line (in MMORPGs) or in the development of the world/economy itself (such as in Second Life)
		Type(s) of experience available (e.g. social, educational, etc.)
Social Presence Theory	The extent to which an individual has positive relationships with those in the virtual community can be theorized through social presence	Becoming involved in personal relationships
		If friends can play
		Importing relationships that then need to be maintained
		One participates in activities in which his/her friends participate
		Social ties
		Socialization
Various differences	These differences were eliminated from consideration for theoretical parsimony	Educational level
		Ignorance
		Intelligence
		Creativity

Table 1. Results of Subject Matter Expert Study

Following the proposed methodology of Simon and Burstein (1985), these experts were sent an invitation to participate in our Subject Matters Experts study. Seventeen experts agreed to participate in the study and were sent a URL directing them to the web-based location of the survey. Nine respondents completed the survey.

The survey prompted each expert: "We want to know which factors that you think will make an individual decide whether or not to assimilate into a virtual world. Please list all factors that you think are important." The experts

were provided with an open text box to discuss their list of factors, and they were encouraged to list all possible factors that they believed would explain the assimilation decision. For our experts, we used the term assimilate to refer to the decision whether or not to continue using a virtual world after an initial experience (consistent with the definition we offered above of adoption). Our reliance upon the word assimilation (versus adoption) was that we wanted to focus our experts on the post-usage decision as opposed to the initial decision of whether to create an account and experiment with the virtual world.

The experts listed 37 factors. We eliminated two factors from the list that dealt with accessibility to the technology, as this factor is assumed to be a given in most adoption studies. The third author grouped the remaining 35 factors according to our four particulars. The results of this analysis confirmed the 4P approach, as all 35 factors fell within the four particulars. We therefore met the first objective of our critical incidents study. Next, we further analyzed the 35 factors to (a) group common factors together, (b) theoretically understand the rationale for why each would drive the adoption decision, and (c) locate a theoretical lens that could be used to understand the factors.

TRIANGULATION

We employed Denzin's (1978) concept of theory triangulation, which utilizes multiple perspectives to interpret results. By implementing this approach, we were able to better secure an in-depth understanding of the complex phenomenon (Denzin and Lincoln, 2005) of virtual world adoption. We identified seven theories to explain the 35 factors. Our analysis is included in Table 1.

These seven theories provided us with the justification to proceed with an empirical investigation of the virtual world technology adoption decision. However, what do we mean by the technology adoption decision? We are specifically defining adoption as the post-usage decision to continue to use the technology after an initial usage period. Consistent with prior work on continuance/discontinuance (Bhattacherjee, 2001), we are interested in understanding adoption as an intention to continue use. Also extending prior work in adoption (e.g. TRA), we theorize that attitude is a driver of intention. Therefore, we propose that each of the theories has a two-pronged outcome: (1) shaping the attitude towards the virtual world and (2) predicting the intention to use. We have depicted this pictorially below in Figure 1 below.

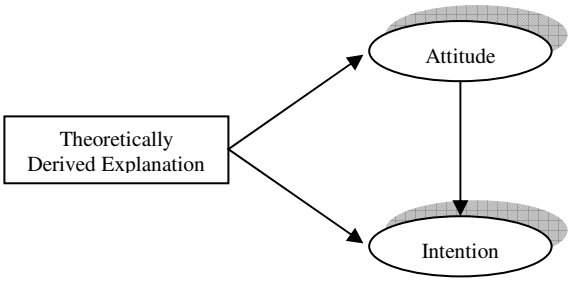

Figure 1. The Technology Adoption Decision

In the next section, we will present each theory and apply our discussion of the theory to the context of virtual worlds. From this review, we will derive a research model that we will empirically test with virtual world users. Each theory will be presented under the particular within which it was grouped. First, we will discuss technology particulars.

TECHNOLOGY PARTICULARS

Technology particulars are defined as a user's positive or negative perceptions of the virtual world. Our subject matter experts identified relevant variables and subsequent analysis identified three related theories that aid in our understanding of virtual world adoption: hedonistic IS theory, diffusion of innovations theory, and cognitive absorption theory. We will discuss each of these theories and their application to virtual worlds next.

Hedonistic IS Theory

Merriam-Webster (2008) defines hedonism as a derivative of the word hedonic, having to do with pleasure. Hedonics stem from the branch of psychology dealing with pleasant and unpleasant feelings. Its most commonly recognized doctrine is that pleasure and/or happiness in terms of the individual is the principal good and the proper direction of action. Thus, hedonistic theory explains that a person always acts in such a way as to seek pleasure

rather than pain. Hedonistic information systems are identified as fulfilling the self-indulgent pursuit of pleasure as a way of life by individuals using such information systems. Examples of such systems include the World Wide Web, computer-based gaming, computer-based gambling, computer-based dating, online social networking, and virtual worlds.

The principal paradigm in user acceptance of information systems is entrenched in the technology acceptance model (TAM) (Davis 1989; Davis et al. 1989), which posits that user acceptance can be explained by two attitudes: perceived usefulness and perceived ease of use. Subsequently, a third belief was introduced into the TAM model identified as perceived enjoyment (Davis et al. 1992), "the extent to which the activity of using the computer is perceived as enjoyable in its own right, apart from any performance consequences that may be anticipated" (Davis et al. 1992, p. 1113).

Previous research shows the importance of perceived enjoyment, hence hedonism, for the acceptance and usage of information systems (Ayyagari 2006; Loeber and Cristea 2003; Van der Heijden 2004). An example is website design. The value of a website can be utilitarian or hedonistic. Hedonic systems aim to provide self-fulfilling value to the user in contrast to utilitarian systems, which aim to provide instrumental value to the user. The consumer behavior literature demonstrates that what specifically determines intention to consume depends on the utilitarian or hedonic nature of the product (Babin et al. 1994; Holt 1995; Venkatraman and Macinnis 1985). The objective of a utilitarian information system is to increase the end-user's productivity and encourage efficiency. The dominant design objective is productive use. In contrast, the value of the hedonic system is to have a pleasurable fun experience when using the system. Prolonged use is encouraged as the dominant design objective.

Within the context of motivational theory (Deci, 1975) user acceptance of an information system is determined by two fundamental types of motivation: extrinsic and intrinsic. Extrinsic motivation is driven by the expectation of some reward or benefit external to the system-user interaction, whereby intrinsic motivation is driven by benefits derived from the mere interaction with the system. We concur with earlier research that perceived usefulness, an external motivator, is expected to be the dominant predictor of intentions to use a utilitarian system. Similarly, for hedonic IS systems we can expect perceived enjoyment, an intrinsic motivator, to strongly predict intentions to use a virtual world system. Extending the work of Van der Heijden (2004), hedonic IS theory suggests that perceived enjoyment and ease of use are therefore two factors that determine the adoption of hedonic systems. Parallel research has also suggested that the extent to which the hedonic system was fun to play with (i.e. perceived playfulness) explained the assessment of the ease of use of the technology (e.g. Huang 2005; Moon and Kim, 2001). Based upon hedonic IS theory, we therefore isolate three key factors in explaining the adoption of virtual worlds: perceived enjoyment, ease of use, and playfulness.

Diffusion of Innovations Theory

Diffusion of Innovations Theory is perhaps one of the communication field's most celebrated contributions. It is appropriate for this research because it puts into perspective the rational for the adoption and continued use of (virtual worlds) information technology. Rogers (1962) defines diffusion as the process by which an innovation is communicated through certain channels over time among the members of a social system (p. 5). He contends that it is a special type of communication, in that the messages are concerned with new ideas or innovations. An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption (p. 11).

Communication, according to Rogers (1983), is a process in which participants create and share information with one another in order to reach a mutual understanding. This definition implies that communication is the process of convergence (or divergence) as two or more individuals exchange information in order to move toward each other (or apart) in the meanings that they ascribe to certain events (p. 5). Diffusion and/or dissemination resembles social change and the process by which alteration occurs in the structure and function of a social system. For the purpose of this research, the virtual world culture and the Second Life community in particular is referred to as a system. Rogers posits that when new ideas are invented and diffused subsequent adoption or rejection occurs; these particular actions lead to certain consequences and social change.

Rogers makes two important observations about the nature of innovations. First, he identifies five characteristics that will influence the speed and ease of their adoption: (1) Relative advantage, or the degree to which an innovation is perceived as better than the idea it supercedes; (2) Compatibility, or the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters; (3) Complexity, or the degree to which an innovation is perceived as difficult to understand and use; (4) Trialability, or the degree to which an innovation may be experimented with on a limited basis; and (5) Observability, or the degree

to which the results of an innovation are visible to others. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it.

Moore and Benbasat (1991) extended the work of Rogers by arguing that these five characteristics are perceived. In addition, they extended the list to eight characteristics, terming these the Perceived Characteristics of Innovations. We suggest that not all of these eight factors are relevant to explaining virtual world adoption. We specifically theorize that complexity is a significant driver of the adoption decision and that the extent to which the virtual world is perceived to be complex will influence (a) the perceived ease of use of the world and (b) the affective evaluation of the technology.

Cognitive Absorption Theory

According to Agarwal and Karahanna (2000), Cognitive Absorption Theory is founded on three different research trends: (1) the absorption dimension of the personality trait; (2) the state of flow; and (3) the cognitive engagement notion. The dimension of absorption refers to a state of deep engagement and attention in an experience. One of the first conceptualizations of this notion is offered by Tellegen and Atkinson (1974). They describe absorption as an individual disposition or trait that leads to situations where the individual is completely focused; all resources needed to maintain attention are utilized by the experience or situation at hand. The Absorption construct has been conceptualized and measured using the Tellegen Absorption scale (TAS). This scale contains nine different dimensions: responsiveness to engaging stimuli, responsiveness to inductive stimuli, thinking in images, an ability to summon vivid and suggestive images, an ability to become absorbed in one's own thoughts and imaginings, a tendency to have episodes of expanded awareness, an ability to experience altered states of consciousness, and an ability to re-experience the past. This construct has been further developed by researchers to distinguish between the state and trait notions of absorption (Dixon et al.1996; Kumar et al. 1996).

The state of flow described by Csikszentmihalyi (1990) refers to a state in which people are so involved in an activity that nothing else seems to matter (p.7). The state of flow is also a multidimensional construct that refers to intense concentration, a sense of being in control, a loss of self-consciousness, and a transformation of time. Building on Csikszentmihalyi's work, Trevino and Webster (1992), and Webster et al. (1993) linked this state of flow with individual's attitude and use of technology. Ghani and Deshpande (1994) and Ghani et al. (1991) further developed the flow construct by stating that perceived control and challenge as antecedents of their definition of flow. Hoffman and Novak (1996) contrarily stated that some of the previous dimensions of flow were not dimensions in fact but antecedents of flow. Finally, Cognitive Engagement was first described by Webster and Ho (1997). This new construct utilized the previous flow idea but without the dimension of control. It was still presented as a multi-dimensional construct but only with interest, curiosity, and attention focus.

Agarwal and Karahanna argue that there has been extensive research on the holistic experiences with technology that show that absorption and flow are important explanatory variables in theories about behavior, but even though it has been studied extensively, there is no clear conceptualization of the construct in the technology domain. Hence, they describe Cognitive Absorption as "a state of deep involvement with software that is exhibited through five dimensions: (1) temporal dissociation, or the inability to register the passage of time while engaged in interaction; (2) focused immersion, or the experience of total engagement where other attentional demands are, in essence, ignored; (3) heightened enjoyment, capturing the pleasurable aspects of the interaction; (4) control, representing the user's perception of being in charge of the interaction; and (5) curiosity, tapping into the extent the experience arouses an individual's sensory and cognitive curiosity " (p. 678). Their research provides support for all five dimensions of the construct in addition to adding support for playfulness and personal innovativeness as precedents of Cognitive Absorption. Furthermore, they found support for the construct as a predictor of both perceived usefulness and perceived ease of use. There was also support for a direct predictor path from Cognitive Absorption to Behavioral Intention. Drawing upon cognitive absorption theory, we suggest that cognitive absorption is a key technology particular factor and include all five sub-dimensions to explain the adoption decision and position cognitive absorption as an antecedent to ease of use (with support from Agarwal and Karahanna).

Cognitive Absorption theory aids in our understanding of virtual worlds by pointing out specific technology particulars that will affect the adoption of these virtual worlds. In fact, the five dimensions described by Agarwal and Karahanna can be clearly present in the user's experience and perception of the virtual worlds. The enjoyment, temporal disassociation, immersion, control, and curiosity are basic principles that describe the level of cognitive absorption experienced by a virtual worlds user. Basically, if the user is enjoying the pleasurable aspects of the interaction with the virtual world, the level of cognitive absorption experienced by the user will be higher. If the user does not enjoy the interaction with the technology, the level of cognitive absorption will be reduced. At the

same time, an active user of virtual world's experience of temporal disassociation may occur in two different ways. First, by enjoying being immersed in a virtual world (VW), the time in the real world (RW) ceases to matter. The user may spend RW hours immersed in the VW, but these hours may feel as minutes in VW time. Second, the time inside the VW is "virtually created." In the VW Second Life (SL), time is set according to the internal world clock ("Second Life time"). Appointments, meetings, and other social issues are scheduled following this Second Life Time. Both the enjoyment and the different time clock utilized make the user live in two different sets of time, which may increase the user's disassociation with real world time, increasing the level of cognitive absorption experienced by the virtual world user. In the same line of thought, "focused immersion" in a virtual world refers to the fact that the user may completely forget any and all real world needs or requirements. The experience in the virtual world may become so genuine that the real world falls into a second line of sight where needs and requirements are mostly forgotten, and conversely, the needs and requirements of the virtual world become the most important ones. When this situation happens, the level of cognitive absorption experienced by the user increases. Moreover, these virtual world needs and requirements are sustained by the perceived total control that the user experiences in the virtual world. In a virtual world, the user perceives that all his or her actions and interactions with the technology are under his/her control as opposed to the real world where actions and interactions may or may not be under the virtual world user's control. This feeling of control over all interactions in the virtual world also facilitates an increase in the level of cognitive absorption experienced by the virtual world's user. Finally, in an enjoyable virtual world where the user is in control, can fulfill any needs and requirements, and time seems to disappear, curiosity also plays an important role. For the user, the technology may provide a gateway to new experiences that impact the senses in a way that challenge the real world. Virtual worlds may help the user experience situations that are difficult to achieve in the real world, satisfying, as such, the level of curiosity of the user.

Technology Particulars and the Adoption Decision

We have presented each of the theories that we have drawn upon to identify the specific factors to study, and we next seek to integrate these factors within a model to study the specific technology particulars that explain the virtual world adoption decision. In Figure 3 below, we present our integrated technology particulars model and will now explain the rationale (and support) for each of the elements in our figure. First, we theorize that cognitive absorption is the antecedent driver within the technology particulars framework of the 4P approach. We hypothesize that cognitive absorption influences the assessment of the ease of use of the technology (supported by Agarwal and Karahanna, 2000). Drawing upon the work of hedonic systems, we further posit that playfulness influences both cognitive absorption and ease of use (drawing support from Van der Heijden, 2004; Huang 2005; and Moon and Kim, 2001). Next, we hypothesize that assessments of complexity will shape perceptions of the ease of use of the technology so that the more complex an individual perceives the technology, the less it will be viewed as easy to use. Furthermore, drawing from UTAUT, we posit that intrinsic motivation to use the technology influences the resulting affective evaluation of the technology, which in turns shapes the attitude. All of these arguments result in Figure 2 below.

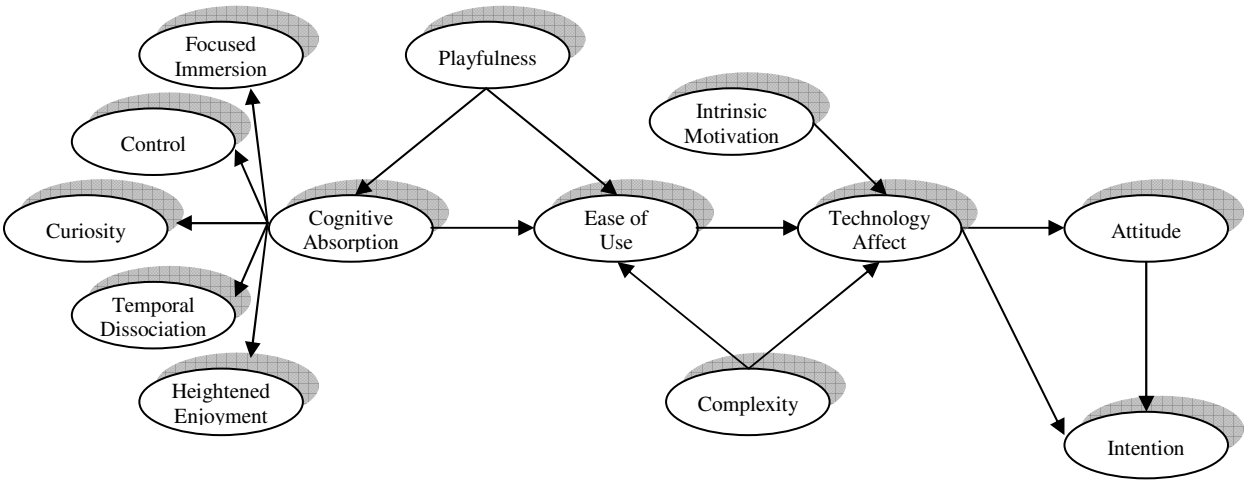

Figure 2. Proposed Technology Particulars Research Model

USER PARTICULARS

User particulars are defined as the emotional and thought processes that differ between individuals. The subject matter experts identified relevant variables and subsequent analysis identified two related theories that aid in our understanding of virtual world adoption: escape theory and personal characteristics. For the purpose of parsimony, we eliminated personal characteristics from consideration and selected escape theory as the sole user particular theory.

Escape Theory

Drawing upon theories of self-awareness, Heatherton and Baumeister (1991) proposed Escape Theory. Escape Theory posits that an individual who has perfectionist standards for him/herself and becomes aware that he/she is failing to meet these ideals is likely to experience a negative affect (or a negative view of him/herself) (Duval and Wicklund, 1972). In an attempt to reduce this negative affect, this individual will engage in behaviors designed to escape from this reality and raise their affect. Escape Theory has been applied to a variety of behaviors, including binge eating (Baumeister & Scher, 1988; Heatherton & Baumeister, 1991), sexual masochism (Baumeister, 1990) and suicide (Heatherton & Baumeister, 1991).

Prior work has suggested that each of the elements of Escape Theory are not sole drivers (e.g. perfectionist standards themselves to not lead an individual to escape) of behavior. Similarly, the negative affect itself does not lead to the Escape Theory. Rather, the escape is a method of an individual engaging in cognitive narrowing, or focusing attention on specific behaviors that are likely to raise the negative affect.

It is our thesis that an individual that has a negative affect (i.e. a negative view toward the current state of their life) will seek to focus on behaviors that will reduce this affect (which we support as a basic tenant of Escape Theory from Heatherton and Baumeister, 1991). While multiple options exist to reduce this affect (e.g. binge drinking), we theorize that one option is to escape in to a virtual world where the individual can become anonymous and escape the negative confines of their "first" life. The negative affect will then lead an individual to find a virtual community to escape in to and thereby leading that person to continue seeking the virtual world to continue to repress the negative affect in their life.

User Particulars and the Adoption Decision

Escape Theory has not previously been used in technology adoption research as we would argue that the theory is not germane to all technologies. We have selected to focus on the negative affect element of Escape Theory, which is the degree to which the individual perceives his/her life to be close to the ideal. We are therefore conceptualizing the life affect as the comparison between the individual's current situation and the ideal, with the theory suggesting that an individual with a gap between the ideal and the current situation will have a positive view towards Second Life, as he/she will view the use of this virtual world as an escape from their current situation. Further, the individual will intend to continue using the community as an escape. We have depicted these relationships pictorially below in Figure 3.

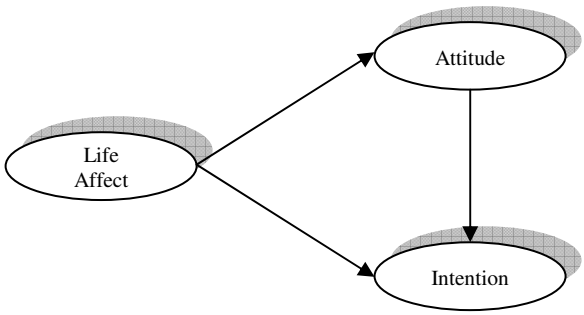

Figure 3. Proposed User Particulars Research Model

USER BASE PARTICULARS

User base particulars are defined as the nature of the social relationships between avatars in a virtual world. The subject matter experts identified relevant variables and subsequent analysis identified two related theories that can

aid in our understanding of virtual world adoption: social presence theory and perceived sense of community. We will discuss these theories and the application to virtual worlds next.

Social Presence Theory

Short et al. (1976) investigated a sense of being together with others in a mediated environment and called it social presence. More specifically, Short et al. defined social presence as the degree of salience of the other people in the interaction. Social presence is essentially a sense stemming from human interaction. The sense of being together with someone may be affected by the quality of human interactions in a mediated environment. Persistent group interaction can increase the level of social presence (Carlson and Zmud 1999), and the quality of other people's feedback can also affect the level of social presence (Jung 2008). Social presence, on the other hand, is based on the capability of a medium to facilitate awareness of the others' existence (Fulk et al. 1990). For instance, users may feel a higher social presence in a virtual community allowing a synchronous chatting and Bulletin Board System (BBS) than a virtual community offering only BBS because the former offers a better environment for awareness among members. Thus, social presence is the concept which is based on the quality of both medium and human interaction (Gunawardena and Zittle 1997).

Social presence has repeatedly appeared in research which deals with a computer-mediated communication (CMC) environment. Several studies found that the level of social presence is significantly associated with group polarization (Sia et al. 2002) and majority influence (Zhang et al. 2007). Social presence is particularly relevant to the context of virtual communities in that social interaction among users is their foundation. Rich and rapid responses among members develop a high-trust atmosphere which enhances the perception of human connection (Ridings et al. 2002). Currently supporting an avatar-based communication and 3-dimensional interface, many virtual communities offer a better technological environment to increase social presence. Social presence can be enhanced by a visible manifestation of the communication partner depending on non-verbal cues, such as facial expression, gesture, and clothing (Short et al. 1976; Sia et al. 2002). Thus, avatars, even if limited, can provide these non-verbal cues, and some studies have demonstrated that avatars significantly affect social presence in a mediated environment (Bente 2004; Kang 2006).

Social presence has been considered an important factor in explaining web users' adoption behavior. As shown in Table 2, social presence has been demonstrated to significantly affect users' adoption in various web contexts. Fortin and Dholakia (2005) investigated an influence of social presence on consumers' adoption in web advertisement. The authors show that social presence affects consumers' arousal and involvement in web advertisements which subsequently have an influence on purchase consideration and attitude toward the advertisement and the brand. Also, social presence has a significant association with trust in websites, particularly online shopping. Gefen and Straub (2004) have empirically demonstrated that the perception of human touch (i.e., social presence) that affects trust in e-vendors though actual human interaction is typically tenuous in websites. Hassanein and Head's (2005) results are also consistent with Gefen and Straub's work. Further, Hassanein and Head confirm a critical role of social presence in online shopping as revealing its effect on perceived usefulness and enjoyment.

Reference	Context	Output
Fortin & Dholakia (2005)	Online advertisement	Involvement, arousal
Gefen & Straub (2004)	Online shopping	Trust
Gunawardena & Zittle (1997)	Teleconferencing	Satisfaction
Karahanna & Straub (1999)	Email	Perceived usefulness
Khalifa & Shen (2004)	Virtual community	
Kumar & Benbasat (2002)	Website	Evaluation of a website
Pavlou et al. (2007)	Online shopping	Information privacy & security concern
Sia et al. (2002)	CMC group	Group polarization
Spencer (2001)	Online learning	Perceived learning
Valacich et al. (1994)	CMC group	Innovative idea production
Zhang et al. (2007)	FtF and CMC group	Majority influence

Table 2. Outputs of social presence in computer-mediated environments

Although there is little empirical work on a direct relationship of social presence to attitude or intention, some studies propose a direct connection. Simon (2001) maintains that rich information of websites which induce social presence encourages consumers' purchases, and Cry et al. (2007) empirically demonstrate that social presence directly affects consumers' loyalty in e-service environments. In the context of virtual worlds, Jung (2008) shows a direct influence of social presence on users' logging-in intention in the context of a virtual world. The author finds a rationale of the connection from the nature of a virtual world; that is, social interaction among users is prominent in a virtual world, and thus, it is straightforwardly assumed that a high social presence provokes users to log in a virtual world.

Perceived Sense of Community

Sense of Community (SOC), indicating the member's psychological attachment to a community, has been popularly studied in the community psychology field since 1960s, and currently there exists considerable debate over SOC (Obst and White 2004). SOC has been considered to induce positive psychological outcomes (Brodsky et al. 1999). For example, Burroughs and Eby (1998) examined a role of SOC in work organizations and found that SOC increases job satisfaction and organizational citizenship behavior, and McMillan and Chavis (1986) claimed that SOC raises members' satisfaction and involvement in community activities.

The most widely cited framework of SOC is McMillan and Chavis' (1986) four-dimensional model of SOC or the Sense of Community Index (SCI). They regarded SOC as a concept consisting of four dimensions: membership, influence, needs fulfillment, and emotional connection. Membership means the member's feeling of belonging to the community. It depends on a boundary and common symbols of the community. A narrow boundary of the community can increase membership, and common symbols (e.g., ritual, language) can also reinforce membership. Influence is a member's feeling of how he or she can have influence on and is influenced by the community. Highly consensual community norms and justice can enhance influence. Needs fulfillment indicates the degree to how community resources meet both collective and individual needs. Lastly, emotional connection implies the member's feeling of sharing history, experiences, and ethos. A great deal of research on SOC has tried to validate McMillan and Chavis' model. García et al. (1999) and Obst and White (2004) empirically examined the validity of SCI, and Zaff and Devlin (1998) found that SOC can be raised by frequent interaction between members.

SOC is applicable to communities of interest where membership is rooted in members' interactions rather than co-location (Blanchard and Markus 2004). Therefore, SOC can be a highly relevant framework for understanding members' behavior in virtual communities (Obst and White 2004). In fact, several virtual community researchers think of SOC as a critical factor in understanding members' behavior in virtual communities. Koh and Kim (2004) show that leader's enthusiasm, offline activities, and enjoyability are significant antecedents to SOC in virtual communities. Blanchard and Markus (2004) revise SOC and propose sense of virtual community (SOVC) which consists of recognition of members, exchange of support, attachment obligation, self identity and others' identification, and relationship with specific members.

Literature has shown that SOC leads to diverse consequences. For example, there are many empirical studies on a significant relationship between SOC and political participation, such as campaigning, voting, and taking political issues (Davison and Cotter 1989). Many virtual community studies employing SOC, however, use SOC as a dependent variable and have no clear explanation of the relationship between SOC and virtual community members' attitude or intention (see Blanchard and Markus 2004; Koh and Kim 2004). Nevertheless, based on prior literature, we can assume that SOC affects the members' behaviors in virtual communities as in physical communities. Yoo et al. (2002) empirically demonstrated the impact of SOC on virtual community members' participation which is measured by participation in community operation, subgroup or event, regular message boards, and chatting or e-mailing other members. In addition, SOC may have an influence on social presence in virtual communities; that is, the member's psychological attachment on the virtual community may enhance the perception of the other members. The perception of association with the other members, which comes from membership, mutual influences, and emotional exchanges, may make members better recognize the others. Jung (2008) reveals that other members' responsiveness, or part of the others' influence, significantly affects social presence in a virtual world.

User Base Particulars and the Adoption Decision

Drawing from the research in Perceived Sense of Community (extending arguments made by Yoo et al., 2002) and Social Presence Theory (with support from Jung, 2008), we suggest that each of these factors independently explain

user adoption of a virtual world. However, we further hypothesize that the extent to which an individual perceives the sense of community, the more that the individual will perceive their social presence in the virtual world. We have depicted these relationships below in Figure 4.

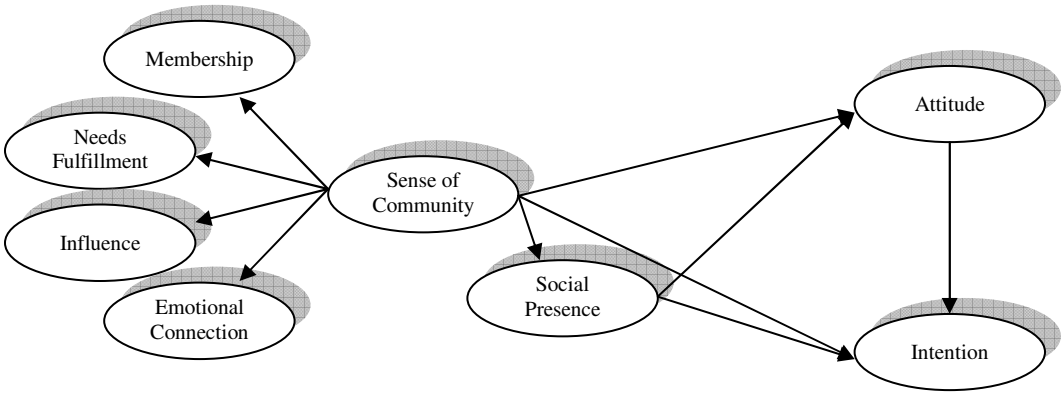

Figure 4. Proposed User Base Particulars Research Model

COMMUNITY PARTICULARS

Community particulars are defined as the perceived structural characteristics of the virtual world. Our subject matter experts identified relevant variables and subsequent analysis identified one related theory that aids in our understanding of virtual world adoption: Self-Determination Theory. We will discuss this theory and the application to virtual worlds next.

Self-Determination Theory

According to Ryan and Deci (2000a), Self Determination Theory (SDT) addresses those factors, both intrinsic and extrinsic, that facilitate or undermine motivation. It is concerned with the development and functionality of individual personality in social contexts. It is focused on how individuals approach their actions with or without a full sense of choice. SDT has evolved into a set of four dimensions or mini-theories: cognitive evaluation (focused on intrinsic motivation), organismic integration (focused on extrinsic motivation), causality orientation (focused on individual differences), and basic needs theory. This last mini-theory, basic needs, states that the needs for competence, autonomy, and relatedness must be satisfied fully for people to enhance their well-being (Deci & Ryan, 2000).

Along with the basic needs, one of the dimensions of intrinsic motivation is the idea of autonomy. According to Deci and Ryan (1980; 2000a; 2000b), autonomy refers to a sense of volition or willingness when doing a task. Increasing the sense of choice also increases autonomy and as a result, increases intrinsic motivation. The reverse is also true; if the sense of choice is diminished, the autonomy feeling is decreased, and the intrinsic motivation decreases. In a virtual world situation, the user is not constrained by pre-determined roles or situations. Autonomy and choices are the basis for the virtual world experience.

A second factor related to intrinsic motivation and basic needs theory is a sense of competence. Competence refers to a need for challenge and feelings of effectance (White, 1959; Deci, 1975). Intrinsic motivation is increased when competence is enhanced by new skills or abilities, challenges, or positive feedback.

Intrinsic motivation is also affected by a sense of presence (Lombard & Ditton, 1997). According to Lombard et al. (2000), presence is the illusion of non-mediation: a person behaves, evolves, and responds to a particular experience inside a medium as if the medium were not there.

In gaming situations, the satisfaction of basic needs is also affected by the degree to which the individual thinks that the game controls are intuitive or not. According to Ryan, Rigby, and Przybylski (2006), intuitive controls increase motivation because they enhance freedom and control and, ultimately, improve the sense of competence. As in gaming situations, intuitive controls play an important role in the freedom and control experienced by a virtual world user. If the controls are intuitive, then they will decrease the level of attention and learning needed to

successfully navigate the virtual world, and, as a result, enhance freedom, control, and ultimately the user's perception of competence.

Finally, the third psychological need that enhances motivation and well-being is relatedness. For a user to feel relatedness, he or she has to feel connected with others through the shared game experience (La Guardia, Ryan, Couchman, & Deci, 2000; Ryan & Deci, 2001). In a virtual world, this is achieved through the sense of virtual community and social interactions experienced by the user. Ryan, Rigby, and Przybylski (2006) posit that game features that conduce to increased perceptions of autonomy, competence, and relatedness enhance motivation to play. Moreover, these increased feelings of basic needs will, in turn, increase presence and changes in well-being.

Community Based Particulars and the Adoption Decision

From Self-Determination Theory, we understand that autonomy, competence, and relatedness increase motivation to experience a situation. In a virtual world, the user has complete autonomy; the user decides when, how, and with whom to experience the virtual world. Moreover, if this experience is paired with intuitive game controls, the user will feel less oppressed by the technology and freer to experience the virtual world. With intuitive controls, the real world actions needed to navigate through the virtual world become second nature and may even cognitively disappear. Finally, if the user connects socially with the other members of the virtual world to the point that experiences are shared, then the level of relatedness increases.

Yet, there are many needs that an individual seeks to meet in a virtual world. Yee (1995) enumerates these needs as follows: advancement, mechanics, competition, socializing, relationships, teamwork, discovery, role playing, and customization. We have selected this conceptualization and view the needs as a second order factor including each of these needs. Based upon these arguments, we hypothesize that if the needs of an individual are met, then the individual will adopt the virtual world. We have depicted this below in Figure 5.

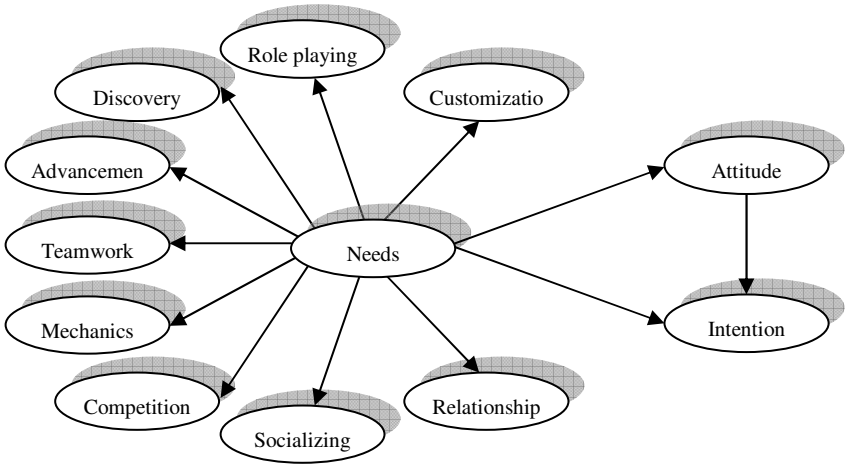

Figure 5. Proposed Community Particulars Research Model

PROPOSED INTEGRRATED RESEARCH MODEL

Based upon our discussion of each of the 4P's and the theories corresponding to the particulars, we propose the integrated research model presented in Figure 6 below. This integrated model will serve as the basis for our empirical study and represents a theoretically grounded model of virtual world adoption. We will now turn to our discussion to the data collection approach.

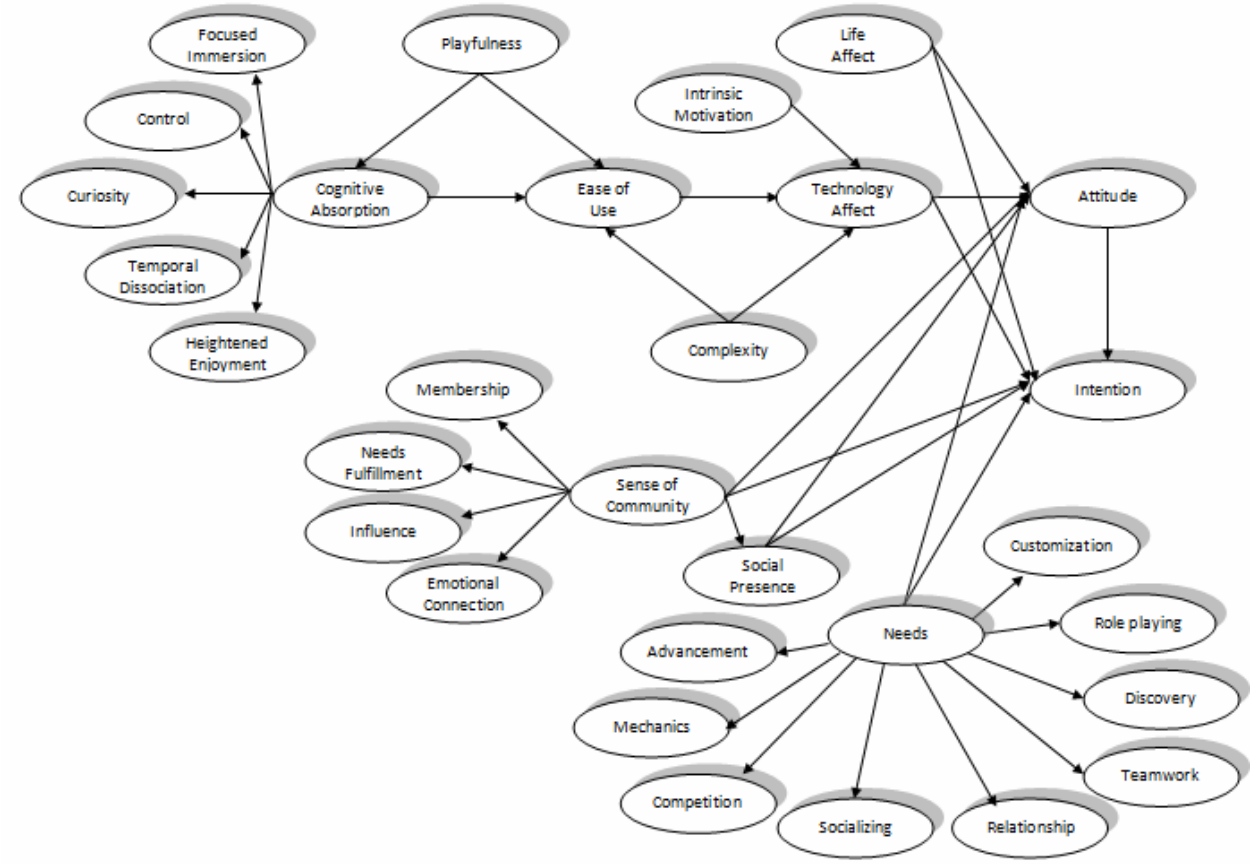

Figure 6. Integrated Research Model

METHODOLOGY

Measurement

With the proposed research model in mind, our next step was to clarify the definition of the constructs. We summarize each of our proposed constructs in Appendix A. To measure the constructs, we generated items that corresponded to the definitions and reflected the proposed theoretical model. For each construct, we selected items previously validated within the literature, only changing the wording to reflect a virtual world environment.

Pilot Study

Our research objective is to understand the users adoption decision after an initial period of use. To meet this objective, we needed (a) individuals who had never used a virtual world before and (b) a research context. As our research context, we selected the use of Second Life, the most popular online virtual world, and we used students as our research subjects.

We employed convenience sampling, a nonprobability process of case selections also referred to as accessible, volunteer, or expedient sampling. Nonprobability sampling is prevalent in sociobehavioral research (Pendhazur and Schmelkin, 1991). While convenience samples lack the virtues of generalizability (Kerlinger, 1986), this sampling technique was selected based on considerations of economic and feasibility constraints (Pendhazur and Schmelkin, 1991).

After selecting our context and our population, we conducted a pilot study to determine how long it takes for an individual to make the adoption decision. Without prior work in the area to guide our thinking, we instead chose to conduct an empirical study. In the Fall of 2007, one hundred and four (104) undergraduate students enrolled in a junior-level introduction to MIS course in a university in the southeastern United States were required as part of the course to participate in the research project. The students were required to either download Second Life to their

home computers or, if the home computer was unable to accommodate the software, use a Second Life lab consisting of two PCs for at least one hour per week. Each week, the students answered a series of qualitative and quantitative questions about their experiences with Second Life during that week. Our focus during this initial pilot study was not on the specific items that we intended to measure but rather to determine at what point the students solidified their adoption decision.

The first researcher conducted informal interviews with the students each week, and by four weeks of experience, there was evidence that attitudes had solidified, and the students had decided that they were either going to continue or discontinue the use of the technology. Examples of quotations from students who decided not to continue using the technology include:

> • "I hated almost everything about Second Life. I find it to be a nuisance and quite boring... I would never download second life to another computer. I don't understand why this is even in existence because it is very similar to SIMS, just with creepy real people."
>
> • "I personally find it kind of pointless and lame. I'm not a big virtual world type of person"
>
> • "I just don't enjoy anything about it. I'm not very interested"

These three quotes are exemplars of those subjects who had solidified their attitudes and made the decision to discontinue using the technology. Alternatively, those who were open to continuing to use the technology made comments such as:

> • "[My favorite part was] by far the amount of freedom. I have always thought it would be cool to have a video game where you can interact with almost everything imaginable, and in Second Life this is almost true—at least the closest I have ever seen."
>
> • "I liked how many different things there were to do. It took a while to realize all the events, etc., going on, but there are endless things to do in Second Life."
>
> • "[I enjoyed] the interaction I had with people and learning how to use new technology in a fun and interesting way. The overall experience was a good one."
>
> • "It was fun to become another 'person' through Second Life. I didn't ever really get into communicating with others, but I think if I would have, then I would've enjoyed that. I think it's neat that businesses are thinking about going on there in the future."
>
> • "I like the community that is based around it."
>
> • "[I liked] being able to talk to people all around the world. I also enjoyed the flexibility of what your SL [avatar] could look like and where he could go."
>
> • "[I enjoyed] all the fun activities you can participate in (outdoors)...and hanging out with the other people and friends on Second Life"
>
> • "The thing I enjoyed most about it was being surprised about the amount and degree of things a user can do. I liked interacting with others and trying out things from the companies in the virtual world."

These eight quotations are representative of the respondents that had solidified a positive attitude toward Second Life and had expressed an interest in continuing to use the technology. The quotations also provide a validation of the 4P model, as each of the quotations reflects one of the particulars. Finally, these interviews provide us with guidelines for the length of time that it takes for attitudes to be solidified and for the adoption decision to be made.

Adoption Study in Second Life

In Spring 2008, 91 students who were enrolled in an introduction to MIS course at a university in the southeastern United States were required as part of the course to participate in the adoption study inside Second Life. The students were required to either download Second Life to their home computer or, if the home computer was unable to accommodate the software, use a Second Life lab with two PCs for at least one hour per week. Similar protocols to the pilot study from the Fall 2007 semester were used, with one exception. We utilized the snowball sampling technique, a process of chain referral: when members of the target population are located, they are asked to provide names and address of other members of the target population. Each student was offered extra credit to recruit additional study participants (with a maximum of five friends per individual). A basic assumption of the snowball

technique is that members of the target population often know each other (Singleton and Straits, 1999). The requirements for the additional participants were as follows: each participant (a) could have no prior experience with Second Life; (b) was a student at the university (ensuring homogeneity of the sample); (c) had to participate in all study requirements (i.e. spend one hour in Second Life per week and fill out all of the surveys); and (d) had to complete an IRB waiver for the research study. This technique has been used to create sampling frames (Sudman and Kalton, 1986) and most applications involve nonprobability methods of selection (Biernacki and Waldorf, 1981). Therefore, the snowball technique fit our sampling approach. The students in this study recruited an additional 186 potential users for an initial sample size of 277. Two hundred and twenty three (223) users completed all of the required surveys, giving us our final sample size.

Each week, the students answered a series of qualitative and quantitative questions about their experiences with Second Life during that week. Each student was given a random five digit research identification number, ensuring anonymity of their responses and for us to aggregate their answers across all four data collection points. An outline of the questions asked is below in Table 3, including both the qualitative and quantitative questions asked. The repetition of the qualitative questions allowed us to ensure that the participants were engaging in new behaviors within Second Life and to track their progress. Next, we will turn to an analysis of our quantitative research model.

<table>
<tr><th>Week</th><th>Qualitative Question</th><th>Quantitative Construct</th></tr>
<tr><td>1</td><td>• What avatar name have you selected?
• What are your initial impressions of Second Life?
• How long did you spend in Second Life this week?
• What did you do in Second Life this week?
• What did you find in Second Life this week that you thought was interesting?</td><td>None</td></tr>
<tr><td>2</td><td rowspan="3">• How long did you spend in Second Life this week?
• What did you do in Second Life this week?
• What did you find in Second Life this week that you thought was interesting?</td><td rowspan="2"></td></tr>
<tr><td>3</td><td>Negative Affect</td></tr>
<tr><td>4</td><td>Remaining quantitative elements</td></tr>
</table>

Table 3. Research Question Schedule

ANALYSIS

We analyzed the data using structural equation modeling. Under the umbrella of structural equation modeling are two main approaches: covariance-based (which is found in software such as LISREL, AMOS, and EQS), and partial least squares (PLS, which is found in software such as PLS-Graph). Given the number of indicators in our model, we were unable to use a covariance-based approach (MacCallum and Browne 1993) and thus selected the PLS approach, specifically PLS-Graph (version 3.00, build 1126) software. Whereas Anderson and Gerbing (1988) and Gerbing and Anderson (1985) suggest a two-step process and analysis of sample size for covariance-based approaches, we were unable to use this approach given our data size and complex structural model; thus, we instead selected the PLS approach.

MEASUREMENT MODEL RESULTS

The first step in a PLS analysis is the analysis of the measurement (or outer) model. First, we examined the adequacy of the measures to ensure that the items measured the constructs as they were designed. As a guideline, Chin (1998: 325) states, "Standardized loadings should be greater than 0.707 [. . . .] But it should also be noted that this rule of thumb should not be as rigid at early stages of scale development. Loadings of .5 or .6 may still be acceptable if there are additional indicators in the block for comparison basis." Furthermore, Barclay, Higgins, and Thompson (1995) state that when scales developed for a particular research context are used in a different context, the items may exhibit low loadings. Based upon the initial analysis of the measurement model, we eliminated twelve items [one from Negative Affect (NA5); two from Affect (AFF3 and AFF5); two from playfulness (CPS1 and CPS6); one from heightened enjoyment (HE4); one from focused immersion (FI4); one from control (CNT3); one from PSOC Needs Fulfillment (PSOCN2); one from PSOC Involvement (PSOCI3); one from Needs: Mechanics (NDCOM3); and one from intent (INT3)]. All of the remaining elements met the requirements as Chin (1998) prescribed, which indicates that the measures were adequate in their individual reliabilities.

Variable	Weight	Loading	Variable	Weight	Loading	Variable	Weight	Loading	Variable	Weight	Loading
Negative Affect			Social Presence			Needs: Advancement			Needs: Customization		
NA1	0.2989	0.9003	SP1	0.2289	0.879	NDADV1	0.284	0.8869	NDCUS1	0.3991	0.9009
NA2	0.3144	0.8811	SP2	0.2792	0.9512	NDADV2	0.2917	0.915	NDCUS2	0.3312	0.8961
NA3	0.2649	0.9009	SP3	0.279	0.9174	NDADV3	0.2532	0.8058	NDCUS3	0.372	0.9239
NA4	0.2669	0.8065	SP4	0.3039	0.9121	NDADV4	0.3106	0.8922	Attitude		
PEOU			Temporal Dissociation			Needs: Mechanics			ATT1	0.2493	0.906
PEOU1	0.1635	0.8774	TD1	0.2156	0.8755	NDMEC1	0.5084	0.9265	ATT2	0.2644	0.9217
PEOU2	0.187	0.9426	TD2	0.2244	0.9058	NDMEC2	0.5625	0.9404	ATT3	0.3004	0.9362
PEOU3	0.1809	0.9394	TD3	0.2285	0.9286	Needs: Competition			ATT4	0.2751	0.9058
PEOU4	0.1881	0.918	TD4	0.2205	0.915	NDCOM1	0.5003	0.84	Intent		
PEOU5	0.1837	0.8938	TD5	0.2164	0.8963	NDCOM2	0.3235	0.8926	INT1	0.5031	0.985
PEOU6	0.1876	0.9249	Focused Immersion			NDCOM3	0.3299	0.8822	INT2	0.5119	0.9855
Complexity			FI1	0.2724	0.9006	Needs: Socializing					
CMPX2	0.3072	0.8624	FI2	0.2919	0.932	NDSOC1	0.3853	0.9351			
CMPX3	0.3414	0.8886	FI3	0.2948	0.929	NDSOC2	0.3925	0.9494			
CMPX4	0.4667	0.925	FI5	0.2505	0.833	NDSOC3	0.3147	0.8485			
Affect			Control			Needs: Relationship					
AFF1	0.3937	0.9025	CNT1	0.5189	0.9475	NDREL1	0.3578	0.8957			
AFF2	0.4016	0.9347	CNT2	0.5347	0.9506	NDREL2	0.367	0.9602			
AFF4	0.3229	0.834	Curiosity			NDREL3	0.3517	0.9302			
Playfulness			CUR1	0.3643	0.9521	Needs: Teamwork					
CPS2	0.2067	0.8667	CUR2	0.3553	0.9507	NDTMW1	0.3799	0.9088			
CPS3	0.2593	0.9115	CUR3	0.3437	0.9174	NDTMW2	0.3418	0.8255			
CPS4	0.2385	0.8853	PSOC: Membership			NDTMW3	0.3969	0.9388			
CPS5	0.2255	0.8656	PSOCM1	0.3475	0.9265	Needs: Discovery					
CPS7	0.2145	0.8307	PSOCM2	0.366	0.9688	NDDIS1	0.3192	0.8245			
Heightened Enjoyment			PSOCM3	0.3482	0.9286	NDDIS2	0.4082	0.9235			
HE1	0.3433	0.9498	PSOC: Needs Fulfillment			NDDIS3	0.4111	0.8752			
HE2	0.3514	0.9619	PSOCN2	1	1	Needs: Role Playing					
HE3	0.3533	0.9508	PSOC: Influence			NDRP1	0.2789	0.841			
Intrinsic Motivation			PSOCI1	0.5426	0.9063	NDRP2	0.2984	0.8887			
IM1	0.3583	0.9415	PSOCI2	0.5576	0.9115	NDRP3	0.2751	0.8884			
IM2	0.3505	0.9388	PSOC: Emotional Connection			NDRP4	0.283	0.904			
IM3	0.3526	0.9461	PSOCE1	0.6271	0.9126						
			PSOCE2	0.4986	0.8577						

Table 4. Item Loadings and Weights

Second, to determine whether the items loaded on other constructs, as well as on their theorized construct, we computed cross-loadings (see Appendix B). For cross-validated items to be included in the finalized data set, the loading must be larger on the intended construct than on any other constructs. Consequently, on determining that none of the items loaded higher on any construct other than the intended construct, we included all the items.

Using the loadings from the constructs in the model, we created composite reliabilities for the variables in the model. Appendix C shows the composite reliabilities for each construct. The results indicate that all the variables met the recommended value of .80 and thus are reliable. Appendix C also presents average variance extracted and the correlations between the constructs. A comparison of the square root of the average variance extracted (i.e., the diagonals in Appendix C representing the overlap of each construct with its measures) with the correlations among constructs (i.e., the off-diagonal elements in Appendix C representing the overlap among constructs) indicates that, on average, each construct is more highly related to its own measures than to other constructs (Chin 1998). This is also consistent with Fornell and Larcker's (1981) recommendation that the average variance extracted should be larger than the square of the correlations (i.e., equivalent to a monotonic power transform of numbers in the table). Moreover, all average variances extracted were well above the .50 recommended level (Chin 1998; Fornell and Larcker 1981). In summary, these results support the convergent and discriminant validity of our constructs.

STRUCTURAL MODEL RESULTS

Figure 7 presents the results of the data analysis using PLS-Graph. The results, which we interpreted similarly to standardized regression betas, indicate that types of usage predict performance differentially and that routinization and infusion have different drivers. Note that the significance of the path coefficients is computed by applying bootstrapping

procedure with a sample size of 500, as Chin (1998) recommended. Figure 8 provides the R-squares and path coefficients, along with their respective significance levels.

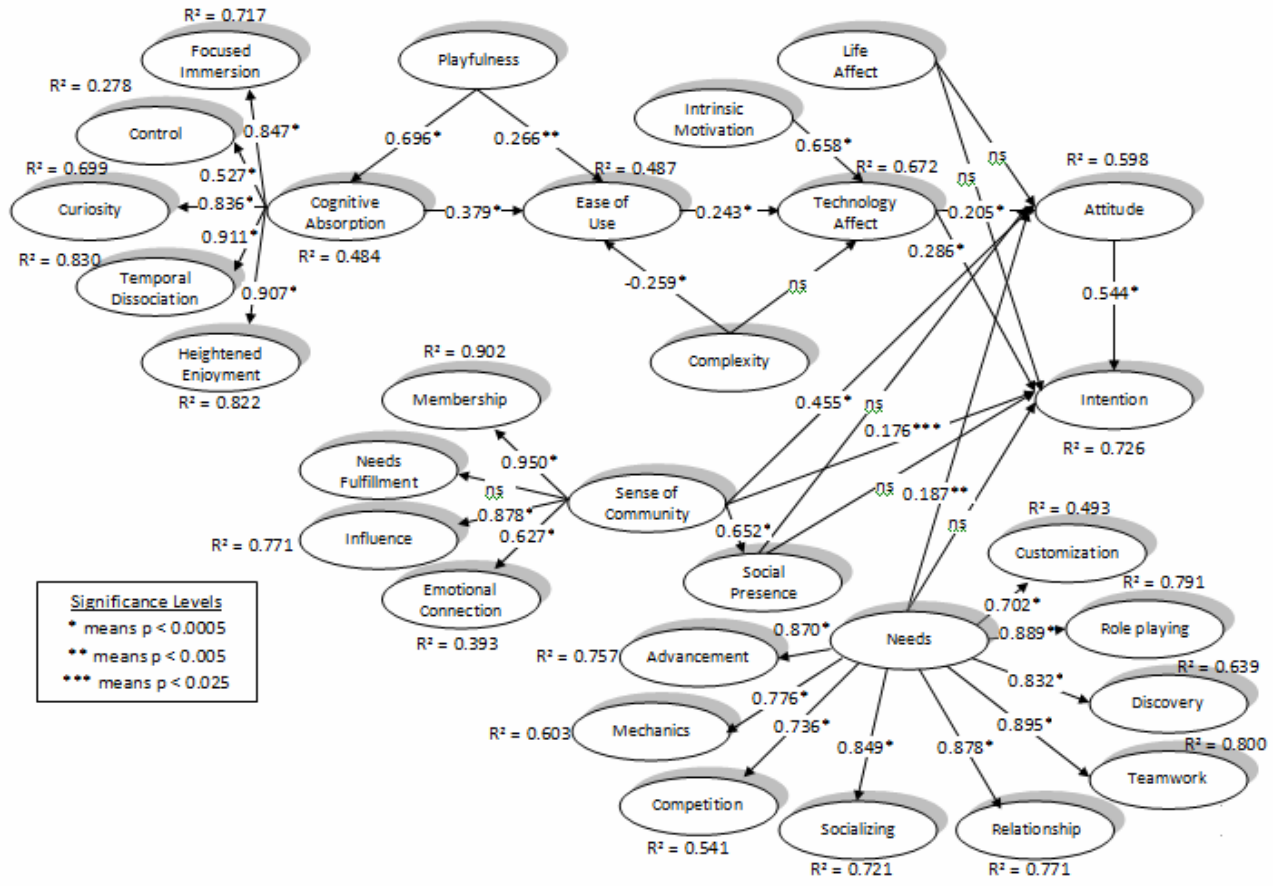

Figure 7. Research Results

DISCUSSION

Examining the research model, all of the paths that are significant are at levels of $p < 0.025$. The strength of the path relationships indicate that the strength of the empirical support for our research model. These findings, combined with the r-squares indicate that the proposed model explains a significant amount of variance in Second Life adoption.

Beginning with the final dependent variable, the model explains 72.6% of the variance in intention to continue using Second Life. The strongest driver of intention was attitude (0.544), a finding that parallels previous work in adoption. Following attitude, only technology affect (0.286) and perceived sense of community (0.176) were significant. Combined with the strength of the attitude-intention relationship, this finding suggests that intention is driven by a combination of the technology and community particulars and that a visitor needs to formulate a positive perception of the virtual community and become embedded in the community to formulate a strong intention to continue use the technology.

Yet, the strength of attitude cannot be neglected, and other factors drive the formation of attitude. Similar to intent, sense of community (0.455) and technology affect are significant (0.205), yet the needs of the individual are also a significant driver (0.187). These three factors are the sole drivers of attitude formation and intent, as life affect and social presence were insignificant drivers of either.

Each of the proposed particulars was confirmed by the empirical analysis. The results validated the proposed technology particulars model; playfulness predicted both absorption (0.696) and ease of use (0.266), highlighting the hedonic nature of the technology. Each of the five elements of cognitive absorption was also significant in the second-order construct, with the drivers (in rank order) including heightened enjoyment, temporal dissociation, focused immersion, curiosity, and control. The r-squared of 0.484 for cognitive absorption indicates that playfulness is a significant driver of these factors. Ease of use was impacted by cognitive absorption (0.379), playfulness (0.266), and complexity (-0.259) and, similar to cognitive

absorption, had nearly half the variance explained (48.7%). As a result of the ease of use, a technology affect was formed (0.243), yet the strength of ease of use in explaining the affect was less than that that derived from intrinsic motivation (0.658). While complexity was non-significant (instead only influencing ease of use), 67.2% of the technology affect was explained.

The user base particulars were also a significant driver of attitude and intention. Three of the four dimensions of sense of community were validated, with needs fulfillment being the only non-significant factor. While social presence had previously been highlighted as a driver of attitude and intention in the literature, we found that sense of community did impact social presence, but that social presence alone did not have a role in the adoption decision.

The user particulars had no impact on the adoption decision. Despite the suggestion that virtual worlds represented an escape, we found no relationship between a negative life affect and adoption. A negative life affect explained neither a positive relationship toward the virtual world or an intention to continue.

Finally, the community particulars influenced attitude but not intention. The degree to which the individual perceived that the virtual world would meet the needs of the user, the more likely that the user would have a positive attitude toward the virtual world. However, this positive assessment did not result in an intention to adopt the technology. This finding reflects the problem identified in the introduction with virtual worlds that community alone does not translate into loyalty, but that it only explains the individual's positive view of the technology.

Taken together, these findings validate 3 of the 4 proposed particulars in our efforts to increase understanding of virtual world adoption. While the user particulars were not found to be significant, we cannot discount the role that individual differences play in the adoption decision. Rather, our interpretation is that other individual differences are germane in the decision. Therefore, we would call for further research into this broad topic. In this study, the remaining 3 particulars were found to be significant (either for attitude or intention or both), thus validating our approach.

Beyond our proposed 4P approach and defining the particulars that influence the adoption decision, our findings also highlight the importance of attitude formation in explaining the continuance intention. While the importance of attitude has been increasingly questioned in the adoption literature, our findings that attitude is the key driver of intent suggests that additional work is needed to investigate the conditions under which attitude assists in the shaping of the adoption decision.

IMPLICATIONS FOR RESEARCH

In this paper, we have outlined a 4P approach to understanding virtual world adoption. While we have relied on a subject matter approach and seven theories to identify factors corresponding to each of these particulars, we are not suggesting that these drivers represent a comprehensive list. We call on others to expand our initial investigation in to the particulars to continue to identify the technology, community, user base, and user particulars that influence the adoption decision. However, our paper has contributed by providing a framework for others to build upon to investigate how users make their choice.

Beyond this, we have challenged current work that approaches the technology adoption decision by conceptualizing the perceptions of the technology and have suggested a broadening of our approach to include externalities unrelated to the technology (and beyond the facilitating conditions in UTAUT). We encourage other researchers to leverage our arguments to examine other factors within these particular dimensions that could influence the adoption decision. We posit that the argument about the limitations of adoption work in approaching a hedonic system could also be made about non-hedonic systems and urge others to continue in this line of work.

Next, while we have proposed seven factors, we also recognize that these seven factors are not the sole drivers of the adoption decision. We encourage others to extend our work to determine additional factors that influence an individual's attitude and intention to use. Other factors (e.g. creativity) may also have a role in the decision, as well as possible inter-relationships between the factors beyond those that we have proposed.

Finally, we have found support for the inclusion of attitude in the adoption decision. We urge other researchers to begin investigating the role of attitude and the circumstances under which attitude has a significant role (versus those when attitude does not act as a mediator). We believe that more needs to be done in order to understand how evaluations are made.

CONCLUSION

The adoption of virtual worlds merits attention from the academic community. Given the adoption gap and the limitations of our current approach to understanding the decision (i.e. relying upon conceptualizing adoption from the technology particulars lens alone), we have sought to contribute to the body of knowledge by proposing the 4P approach to virtual world

adoption. We then defined the particulars within these particulars by relying upon seven psychological theories and tested our integrated model using new Second Life users. We concluded that the technology and community particulars were the two chief drivers of the adoption decision.

As stated in the introduction, virtual worlds technology, even at its genesis, is experiencing a crisis. While around 50 million people have signed up for Second Life (Bennett, 2008), only approximately 463,000 use the virtual community on a regular basis (Linden Research, Inc. 2008). If this trend continues, then the viability of the virtual worlds model may be called into question and the potential for this technology may never be realized. According to Raz Schionning, the Web director of the first real-world clothing retailer to establish a shop in Second Life, "we haven't quite figured out how to make good use of [Second Life], and I'm not sure anybody has" (Enright, 2007). At this point, even the Second Life businesses are unsure of how to leverage this new phenomenon and convince users to continue utilizing the technology. By applying the findings from the rich research area of adoption in combination with seven different theories, we have sought to increase our understanding of adoption in a virtual worlds environment. This research enables us to better comprehend an individual's decision to continue or discontinue use of virtual worlds technology, so that there will be no pause when you are next asked, "When was the last time you logged onto Second Life?".

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Appendix A. Measurement Items

Escape Theory			
Life Affect	NA1	In most ways, my life is close to my ideal	Pavot and Diener, 1993
	NA2	The conditions of my life are excellent	
	NA3	I am satisfied with my life	
	NA4	So far, I have gotten the important things I want in life	
	NA5	If I could live my life over, I would change almost nothing	
Diffusion of Innovations Theory			
PEOU	PEOU1	Learning to operate Second Life was easy for me	Davis, 1989
	PEOU2	I found it easy to get Second Life to do what I wanted it to do	
	PEOU3	My interaction with Second Life was clear and understandable.	
	PEOU4	I found Second Life to be flexible to interact with	
	PEOU5	It was easy for me to become skillful at using Second Life	
	PEOU6	I found Second Life easy to use	
Complexity	CMPX1	Using Second Life takes too much time from my normal life.	Thompson, et al 1991
	CMPX2	Working with Second Life is so complicated; it is difficult to understand what was going on.	
	CMPX3	Using Second Life involves too much time doing mechanical operations	
	CMPX4	It took too long to learn how to use Second Life to make it worth the effort.	
Affect	AFF1	I like working with Second Life	Compeau and Higgins, 1995
	AFF2	I look forward to those times of day when I use Second Life	
	AFF3	Using Second Life is frustrating for me [R]	
	AFF4	Once I start working on Second Life, I find it hard to stop	
	AFF5	I get bored quickly when using Second Life [R]	
Hedonic IS Theory			
Playfulness	CPS1	When using Second Life I am Spontaneous	Agarwal and Prasad, 1998
	CPS2	When using Second Life am Imaginative	
	CPS3	When using Second Life am Flexible	
	CPS4	When using Second Life am Creative	
	CPS5	When using Second Life am Playful	
	CPS6	When using Second Life am Original	
	CPS7	When using Second Life am Inventive	
Heightened Enjoyment	HE1	I have fun interacting with Second Life	Agarwal and Karahanna, 2000
	HE2	Using Second Life provides me with a lot of enjoyment	
	HE3	I enjoy using Second Life	
	HE4	Using Second Life bores me [R]	
Intrinsic Motivation	IM1	I find using Second Life to be enjoyable	Davis et al, 1992
	IM2	The actual process of using Second Life is pleasant.	
	IM3	I have fun using Second Life.	
Social Presence Theory			
Social presence	While visiting Second Life, my interaction with the other users was:		Short et al. 1976
	SP1	Personal	
	SP2	Warm	
	SP3	Close	
	SP4	Humanizing	
Cognitive Absorption Theory			
Temporal	TD1	Time appears to go by very quickly when I am using the Second Life	Agarwal and

Dissociation	TD2	Sometimes I lose track of time when I am using Second Life	Karahanna, 2000
	TD3	Time flies when I am using Second Life	
	TD4	Most times when I get on to Second Life, I end up spending more time that I had planned.	
	TD5	I often spend more time on Second Life than I had intended.	
Focused Immersion	FI1	While using Second Life I am able to block out most other distractions	Agarwal and Karahanna, 2000
	FI2	While using Second Life, I am absorbed in what I am doing	
	FI3	While on Second Life, I am immersed in the task I am performing	
	FI4	When on Second Life, I get distracted by other attentions very easily	
	FI5	While on Second Life, my attention does not get diverted very easily	
Control	CNT1	While I was on Second Life, I could choose freely what I wanted to see.	Agarwal and Karahanna, 2000
	CNT2	I felt that I had a lot of control over my visiting experiences at Second Life.	
	CNT3	While surfing Second Life, I had absolutely no control over what I can do on the site [R]	
Curiosity	CUR1	Using Second Life excited my curiosity.	Agarwal and Karahanna, 2000
	CUR2	Interacting with Second Life made me curious.	
	CUR3	Using Second Life aroused my imagination.	
Heightened Enjoyment	See Hedonic IS Theory		
Perceived Sense of Community Theory			
PSOC	PSCOM1	I think Second Life is a good virtual world for me to live [Membership]	Adapted from Obst and White, 2004
	PSCOM2	I feel at home in Second Life [Membership]	
	PSCOM3	It is important to me to live in this particular virtual world [Membership]	
	PSCON1	People in Second Life do not share the same values [Needs Fulfillment] [R]	
	PSCON2	Very few of the other avatars in Second Life know me [Needs Fulfillment] [R]	
	PSOCI1	My Second Life friends and I want the same thing from this virtual world [Influence]	
	PSOCI2	I care about what my Second Life friends think about my actions [Influence]	
	PSOCI3	I have almost no influence over what this virtual world is like [Influence] [R]	
	PSOCE1	If there is a problem in this virtual world, people who live here can get it solved [Emotional Connection]	
	PSOCE2	The people who live in this virtual world get along well [Emotional Connection]	
Needs Theory			
Needs	NDADV1	Acquiring rare items that most other avatars will never have [Advancement]	Adapted from Yee, 1995
	NDADV2	Becoming powerful [Advancement]	
	NDADV3	Accumulating resources, items or money [Advancement]	
	NDADV4	To be well-known in Second Life [Advancement]	
	NDMEC1	To know about the mechanics behind the virtual world [Mechanics]	
	NDMEC2	To know how to build structures in the virtual world [Mechanics]	
	NDMEC3	To know how to customize your avatar [Mechanics]	
	NDCOM1	Competing with others in the virtual world [Competition]	
	NDCOM2	Provoking or irritating others in the virtual world [Competition]	
	NDCOM3	Doing things that annoy others in the virtual world [Competition]	
	NDSOC1	Getting to know other avatars [Socializing]	
	NDSOC2	Helping other avatars [Socializing]	
	NDSOC3	Chatting with other avatars [Socializing]	
	NDREL1	Having meaningful conversations with other avatars [Relationship]	
	NDREL2	Talking with avatars about personal issues [Relationship]	
	NDREL3	Getting support from other avatars when you have real life problems	

		[Relationship]	
	NDTMW1	To be part of a team with other avatars [Teamwork]	
	NDTMW2	Being self-sufficient [Teamwork]	
	NDTMW3	To work with others in a group in the virtual world [Teamwork]	
	NDDIS1	Exploring Second Life just for the sake of exploring it [Discovery]	
	NDDIS2	Finding areas of Second Life that most people do not know about [Discovery]	
	NDDIS3	Exploring every zone in Second Life [Discovery]	
	NDRP1	Trying out a new personality with your avatar [Role playing]	
	NDRP2	Being immersed in the virtual world [Role playing]	
	NDRP3	Making up stories and histories for your avatar [Role playing]	
	NDRP4	Role playing with your avatar [Role playing]	
	NDCUS1	Spending a lot of time customizing my avatar [Customization]	
	NDCUS2	Making sure my avatar's outfit matches [Customization]	
	NDCUS3	Making my avatar look different from other avatars [Customization]	
Dependent Variables			
Attitude	ATT1	Using Second Life is a good idea	Davis et al. 1989; Fishbein and Ajzen 1975; Taylor and Todd 1995a, 1995b
	ATT2	Using Second Life is a wise idea	
	ATT3	I like the idea of using Second Life.	
	ATT4	Using Second Life is pleasant	
Intent	INT1	I intend to continue using Second Life rather than discontinue its use	Bhattacherjee, 2001
	INT2	My intentions are to continue using Second Life	
	INT3	If I could, I would like to discontinue my use of Second Life [R]	

Appendix B. Cross-Loading Analysis

	Negative Affect	PEOU	Complexity	Affect	Playfulness	Heightened Enjoyment	Intrinsic Motivation	Social Presence	Temporal Dissociation	Focused Immersion	Control	Curiosity	PSOC: Membership	PSOC: Needs Fulfillment
NA1	**0.900**	0.044	0.103	0.195	0.122	0.175	0.149	0.148	0.170	0.103	0.121	0.172	0.075	-0.039
NA2	**0.881**	0.065	0.011	0.198	0.121	0.210	0.199	0.128	0.158	0.144	0.104	0.164	0.048	-0.055
NA3	**0.901**	0.066	0.037	0.189	0.117	0.193	0.166	0.132	0.153	0.116	0.154	0.166	0.057	-0.019
NA4	**0.806**	0.036	0.131	0.115	0.102	0.120	0.096	0.116	0.120	0.123	0.078	0.138	0.033	0.037
PEOU1	-0.012	**0.877**	-0.402	0.511	0.474	0.528	0.507	0.409	0.401	0.332	0.372	0.419	0.403	0.131
PEOU2	0.086	**0.943**	-0.369	0.619	0.527	0.604	0.601	0.441	0.493	0.403	0.400	0.470	0.516	0.164
PEOU3	0.076	**0.939**	-0.347	0.599	0.531	0.598	0.581	0.454	0.462	0.353	0.397	0.463	0.491	0.122
PEOU4	0.078	**0.918**	-0.335	0.621	0.549	0.624	0.623	0.446	0.527	0.421	0.345	0.480	0.536	0.129
PEOU5	0.025	**0.894**	-0.328	0.591	0.553	0.621	0.601	0.431	0.514	0.393	0.405	0.503	0.475	0.074
PEOU6	0.074	**0.925**	-0.342	0.613	0.545	0.625	0.615	0.439	0.526	0.420	0.369	0.491	0.525	0.134
CMPX2	0.095	-0.295	**0.862**	-0.142	-0.141	-0.161	-0.164	-0.043	-0.096	-0.063	-0.196	-0.080	0.014	-0.064
CMPX3	0.093	-0.313	**0.889**	-0.182	-0.163	-0.202	-0.239	-0.048	-0.090	-0.022	-0.190	-0.096	-0.003	-0.110
CMPX4	0.039	-0.402	**0.925**	-0.289	-0.198	-0.324	-0.353	-0.147	-0.152	-0.183	-0.228	-0.199	-0.204	-0.183
AFF1	0.263	0.670	-0.362	**0.903**	0.629	0.780	0.762	0.544	0.668	0.495	0.447	0.689	0.643	0.112
AFF2	0.177	0.584	-0.238	**0.935**	0.594	0.756	0.753	0.581	0.644	0.505	0.342	0.657	0.682	0.242
AFF4	0.082	0.464	-0.009	**0.834**	0.453	0.627	0.612	0.488	0.681	0.496	0.227	0.564	0.573	0.132
CPS2	0.073	0.433	-0.138	0.522	**0.867**	0.554	0.512	0.469	0.447	0.385	0.301	0.625	0.394	-0.015
CPS3	0.165	0.588	-0.197	0.643	**0.911**	0.665	0.635	0.527	0.567	0.485	0.435	0.614	0.493	0.140
CPS4	0.156	0.530	-0.159	0.569	**0.885**	0.597	0.568	0.462	0.524	0.457	0.445	0.585	0.409	0.140
CPS5	0.031	0.470	-0.188	0.495	**0.866**	0.569	0.531	0.421	0.503	0.448	0.419	0.635	0.379	0.035
CPS7	0.143	0.488	-0.148	0.514	**0.831**	0.542	0.552	0.373	0.428	0.399	0.317	0.599	0.437	0.086
HE1	0.177	0.653	-0.262	0.794	0.677	**0.950**	0.878	0.569	0.714	0.605	0.462	0.730	0.659	0.045
HE2	0.206	0.638	-0.229	0.809	0.642	**0.962**	0.891	0.617	0.748	0.630	0.470	0.724	0.708	0.158
HE3	0.192	0.588	-0.281	0.727	0.610	**0.951**	0.880	0.544	0.750	0.670	0.444	0.721	0.625	0.091
IM1	0.182	0.612	-0.295	0.763	0.625	0.893	**0.942**	0.539	0.682	0.637	0.448	0.734	0.652	0.144
IM2	0.157	0.620	-0.274	0.746	0.576	0.835	**0.939**	0.533	0.704	0.635	0.406	0.696	0.641	0.138
IM3	0.161	0.587	-0.271	0.751	0.619	0.887	**0.946**	0.564	0.725	0.657	0.420	0.716	0.632	0.059
SP1	0.102	0.352	-0.050	0.485	0.427	0.469	0.447	**0.879**	0.425	0.406	0.339	0.419	0.480	0.034
SP2	0.155	0.446	-0.107	0.560	0.509	0.583	0.543	**0.951**	0.531	0.465	0.409	0.494	0.537	0.108
SP3	0.096	0.429	-0.092	0.555	0.440	0.535	0.528	**0.917**	0.479	0.425	0.324	0.444	0.558	0.168
SP4	0.188	0.499	-0.102	0.602	0.513	0.610	0.585	**0.912**	0.583	0.490	0.394	0.519	0.601	0.090

TD1	0.204	0.507	-0.131	0.659	0.504	0.684	0.653	0.531	**0.875**	0.602	0.409	0.590	0.557	-0.114
TD2	0.157	0.524	-0.083	0.689	0.496	0.709	0.701	0.483	**0.906**	0.644	0.357	0.638	0.611	-0.052
TD3	0.169	0.509	-0.166	0.680	0.553	0.712	0.697	0.526	**0.929**	0.671	0.359	0.636	0.551	-0.061
TD4	0.143	0.445	-0.099	0.678	0.512	0.697	0.673	0.489	**0.915**	0.671	0.305	0.568	0.534	0.026
TD5	0.111	0.426	-0.113	0.644	0.510	0.692	0.653	0.487	**0.896**	0.662	0.299	0.546	0.544	0.032
FI1	0.127	0.376	-0.128	0.488	0.452	0.575	0.578	0.437	0.630	**0.901**	0.366	0.521	0.458	0.010
FI2	0.142	0.401	-0.111	0.536	0.495	0.627	0.673	0.454	0.686	**0.932**	0.342	0.590	0.479	0.015
FI3	0.102	0.414	-0.078	0.541	0.483	0.640	0.655	0.476	0.702	**0.929**	0.296	0.611	0.511	0.043
FI5	0.133	0.327	-0.088	0.435	0.363	0.549	0.542	0.392	0.560	**0.833**	0.300	0.499	0.495	-0.067
CNT1	0.145	0.377	-0.217	0.360	0.400	0.447	0.410	0.394	0.357	0.346	**0.948**	0.319	0.272	-0.011
CNT2	0.103	0.412	-0.222	0.374	0.442	0.466	0.446	0.369	0.368	0.341	**0.951**	0.353	0.275	0.054
CUR1	0.198	0.502	-0.147	0.715	0.650	0.737	0.723	0.501	0.647	0.588	0.354	**0.952**	0.516	0.075
CUR2	0.190	0.457	-0.113	0.658	0.645	0.712	0.734	0.497	0.620	0.591	0.313	**0.951**	0.514	0.106
CUR3	0.127	0.494	-0.164	0.648	0.681	0.693	0.684	0.455	0.591	0.568	0.331	**0.917**	0.522	0.166
PSOCM1	0.107	0.537	-0.129	0.712	0.509	0.703	0.680	0.586	0.622	0.553	0.357	0.567	**0.927**	0.037
PSOCM2	0.043	0.524	-0.107	0.674	0.471	0.668	0.659	0.573	0.597	0.507	0.290	0.541	**0.969**	0.095
PSOCM3	0.025	0.458	-0.023	0.624	0.393	0.595	0.584	0.530	0.528	0.464	0.167	0.445	**0.929**	0.184
PSOCN2	-0.024	0.137	-0.142	0.184	0.093	0.103	0.121	0.112	-0.038	0.003	0.023	0.122	0.112	**1.000**
PSOCI1	0.027	0.425	-0.087	0.524	0.310	0.524	0.558	0.533	0.562	0.500	0.198	0.431	0.672	-0.061
PSOCI2	-0.021	0.330	-0.057	0.552	0.295	0.449	0.469	0.534	0.459	0.396	0.119	0.377	0.712	0.161
PSOCE1	0.147	0.297	0.000	0.305	0.343	0.381	0.372	0.439	0.399	0.396	0.344	0.267	0.466	-0.054
PSOCE2	0.135	0.293	-0.027	0.271	0.277	0.371	0.359	0.329	0.407	0.384	0.314	0.237	0.322	-0.211
NDADV1	0.024	0.347	-0.018	0.525	0.375	0.512	0.491	0.528	0.459	0.431	0.262	0.476	0.563	0.174
NDADV2	0.028	0.377	-0.018	0.511	0.413	0.499	0.475	0.472	0.481	0.465	0.257	0.454	0.537	0.145
NDADV3	-0.014	0.289	-0.041	0.426	0.370	0.424	0.409	0.362	0.404	0.395	0.258	0.390	0.452	0.039
NDADV4	0.064	0.344	0.032	0.493	0.380	0.468	0.467	0.428	0.474	0.430	0.172	0.397	0.567	0.192
NDMEC1	0.011	0.265	-0.039	0.413	0.238	0.394	0.398	0.362	0.377	0.396	0.146	0.361	0.522	0.212
NDMEC2	0.002	0.285	-0.015	0.458	0.295	0.421	0.421	0.351	0.410	0.407	0.172	0.379	0.529	0.216
NDCOM1	0.100	0.242	0.003	0.369	0.307	0.394	0.372	0.331	0.365	0.381	0.139	0.347	0.464	0.146
NDCOM2	-0.051	0.136	0.138	0.284	0.196	0.197	0.188	0.150	0.273	0.239	-0.060	0.181	0.329	0.135
NDCOM3	-0.089	0.139	0.151	0.261	0.198	0.193	0.193	0.166	0.274	0.268	-0.055	0.167	0.331	0.121
NDSOC1	0.044	0.294	0.084	0.430	0.289	0.415	0.409	0.456	0.436	0.378	0.234	0.316	0.462	0.015
NDSOC2	0.087	0.359	-0.017	0.479	0.369	0.444	0.454	0.473	0.454	0.388	0.227	0.367	0.466	0.088

NDSOC3	0.060	0.283	-0.012	0.402	0.286	0.364	0.373	0.326	0.397	0.332	0.206	0.332	0.347	0.019
NDREL1	0.137	0.314	-0.001	0.460	0.321	0.421	0.433	0.472	0.403	0.352	0.224	0.345	0.443	0.083
NDREL2	0.046	0.294	0.025	0.415	0.289	0.363	0.379	0.451	0.342	0.335	0.186	0.307	0.510	0.193
NDREL3	0.042	0.247	0.002	0.388	0.255	0.336	0.349	0.422	0.320	0.328	0.131	0.291	0.515	0.219
NDTMW1	0.127	0.283	0.003	0.417	0.301	0.365	0.387	0.415	0.339	0.366	0.155	0.319	0.488	0.211
NDTMW2	0.115	0.292	-0.050	0.384	0.369	0.482	0.449	0.377	0.403	0.459	0.281	0.419	0.457	0.028
NDTMW3	0.087	0.309	0.034	0.463	0.313	0.419	0.441	0.429	0.398	0.361	0.141	0.373	0.506	0.135
NDDIS1	0.169	0.265	-0.033	0.339	0.328	0.428	0.395	0.293	0.446	0.426	0.253	0.386	0.356	-0.060
NDDIS2	0.165	0.285	-0.040	0.460	0.324	0.513	0.516	0.392	0.504	0.440	0.189	0.450	0.497	-0.030
NDDIS3	0.028	0.385	0.000	0.478	0.322	0.490	0.493	0.374	0.486	0.445	0.206	0.444	0.545	0.083
NDRP1	-0.003	0.308	0.055	0.456	0.309	0.466	0.470	0.366	0.437	0.425	0.111	0.409	0.488	0.037
NDRP2	0.021	0.365	-0.055	0.574	0.362	0.540	0.530	0.483	0.520	0.450	0.226	0.448	0.577	0.120
NDRP3	-0.023	0.364	-0.017	0.472	0.307	0.408	0.415	0.449	0.460	0.393	0.079	0.374	0.545	0.129
NDRP4	0.013	0.353	0.025	0.453	0.308	0.429	0.425	0.470	0.451	0.385	0.148	0.387	0.550	0.105
NDCUS1	0.129	0.228	0.070	0.387	0.266	0.474	0.444	0.380	0.429	0.382	0.166	0.426	0.392	-0.073
NDCUS2	0.051	0.101	0.085	0.245	0.185	0.285	0.263	0.325	0.353	0.246	0.119	0.164	0.290	-0.106
NDCUS3	0.057	0.141	0.031	0.326	0.263	0.365	0.349	0.348	0.419	0.348	0.209	0.327	0.324	-0.111
ATT1	0.065	0.386	-0.105	0.547	0.465	0.577	0.580	0.398	0.551	0.515	0.272	0.532	0.585	0.030
ATT2	0.107	0.433	-0.101	0.584	0.506	0.646	0.642	0.449	0.612	0.545	0.306	0.565	0.629	0.073
ATT3	0.085	0.448	-0.159	0.672	0.542	0.707	0.690	0.494	0.658	0.550	0.274	0.631	0.716	0.067
ATT4	0.145	0.459	-0.158	0.625	0.495	0.705	0.683	0.459	0.647	0.518	0.343	0.581	0.673	0.028
INT1	0.066	0.428	-0.167	0.668	0.472	0.674	0.672	0.509	0.618	0.529	0.266	0.562	0.711	0.115
INT2	0.110	0.437	-0.175	0.708	0.498	0.694	0.681	0.532	0.627	0.546	0.287	0.579	0.713	0.102

Appendix C. Discriminant Validity Analysis

	Composite Reliability	AVE	PEOU	Attitude	Intent	Complexity	Affect	Playfulness	Heightened Enjoyment	Intrinsic Motivation	Social Presence	Curiosity	Control	Temporal Dissociation	Focused Immersion	Cognitive Absorption	PSOC: Membership	PSOC: Involvement	PSOC (2^{nd} order)	Needs: Advancement	Needs: Mechanics	Needs: Community	Needs: Socializing	Needs: Relationship	Needs (2^{nd} order)	Needs: Teamwork	Needs: Discovery	Needs: Role Playing	Needs: Customization	Negative Affect	PSOC: Emotional Connection	PSOC: Needs Fulfillment
PEOU	0.969	0.84	0.917																													
Attitude	0.955	0.842	0.471	0.918																												
Intent	0.985	0.971	0.44	0.817	0.985																											
Complexity	0.921	0.796	-0.385	-0.144	-0.174	0.892																										
Affect	0.92	0.795	0.648	0.665	0.698	-0.241	0.892																									
Playfulness	0.941	0.761	0.579	0.549	0.492	-0.192	0.632	0.872																								
Heightened Enjoyment	0.968	0.91	0.656	0.721	0.694	-0.27	0.813	0.674	0.954																							
Intrinsic Motivation	0.96	0.888	0.644	0.709	0.686	-0.297	0.8	0.644	0.926	0.942																						
Social Presence	0.954	0.838	0.477	0.492	0.528	-0.098	0.605	0.519	0.605	0.579	0.915																					
Curiosity	0.958	0.884	0.515	0.632	0.579	-0.15	0.717	0.7	0.76	0.759	0.515	0.940																				
Control	0.948	0.901	0.416	0.326	0.281	-0.231	0.387	0.443	0.481	0.451	0.402	0.354	0.949																			
Temporal Dissociation	0.957	0.818	0.534	0.675	0.632	-0.131	0.741	0.57	0.773	0.747	0.556	0.659	0.382	0.904																		
Focused Immersion	0.944	0.809	0.424	0.58	0.546	-0.112	0.558	0.501	0.666	0.683	0.49	0.619	0.362	0.719	0.899																	
Cognitive Absorption	0.963	0.607	0.615	0.737	0.69	-0.199	0.803	0.696	0.907	0.881	0.626	0.836	0.527	0.911	0.847	0.779																
PSOC: Membership	0.959	0.886	0.538	0.712	0.723	-0.092	0.712	0.486	0.696	0.681	0.598	0.55	0.288	0.619	0.539	0.679	0.941															
PSOC: Involvement	0.905	0.826	0.415	0.626	0.666	-0.079	0.592	0.333	0.535	0.565	0.587	0.444	0.174	0.561	0.492	0.571	0.762	0.909														
PSOC (2^{nd} order)	0.914	0.612	0.533	0.727	0.728	-0.085	0.695	0.48	0.688	0.687	0.652	0.54	0.314	0.658	0.585	0.703	0.95	0.878	0.782													
Needs: Advancement	0.929	0.767	0.388	0.585	0.554	-0.011	0.559	0.438	0.544	0.527	0.513	0.49	0.268	0.52	0.492	0.579	0.607	0.544	0.615	0.876												
Needs: Mechanics	0.931	0.871	0.295	0.49	0.417	-0.028	0.468	0.287	0.437	0.439	0.381	0.397	0.171	0.423	0.43	0.472	0.563	0.487	0.567	0.66	0.933											
Needs: Community	0.905	0.76	0.211	0.432	0.385	0.096	0.362	0.282	0.325	0.311	0.269	0.287	0.032	0.362	0.356	0.365	0.448	0.383	0.436	0.696	0.554	0.872										
Needs: Socializing	0.937	0.832	0.343	0.469	0.459	0.022	0.48	0.346	0.449	0.453	0.464	0.37	0.244	0.471	0.402	0.486	0.47	0.494	0.515	0.661	0.565	0.507	0.912									
Needs: Relationship	0.95	0.863	0.307	0.457	0.484	0.009	0.453	0.31	0.402	0.417	0.483	0.338	0.195	0.382	0.364	0.422	0.527	0.548	0.563	0.736	0.638	0.559	0.8	0.929								
Needs (2^{nd} order)	0.972	0.553	0.386	0.611	0.575	0.014	0.571	0.413	0.558	0.553	0.529	0.487	0.235	0.554	0.514	0.596	0.633	0.606	0.662	0.87	0.776	0.736	0.849	0.878	0.744							
Needs: Teamwork	0.921	0.796	0.33	0.488	0.453	-0.003	0.473	0.365	0.47	0.475	0.457	0.413	0.211	0.424	0.439	0.49	0.542	0.532	0.568	0.739	0.698	0.6	0.782	0.84	0.895	0.892						
Needs: Discovery	0.908	0.766	0.359	0.579	0.486	-0.027	0.493	0.369	0.547	0.539	0.407	0.489	0.242	0.548	0.498	0.588	0.541	0.508	0.585	0.661	0.661	0.575	0.667	0.625	0.832	0.703	0.875					
Needs: Role Playing	0.933	0.776	0.395	0.583	0.573	0.001	0.557	0.366	0.525	0.524	0.503	0.46	0.162	0.531	0.47	0.555	0.614	0.597	0.635	0.74	0.657	0.657	0.676	0.744	0.889	0.734	0.719	0.881				

Needs: Customization	0.933	0.823	0.177	0.445	0.413	0.068	0.357	0.265	0.419	0.394	0.389	0.346	0.183	0.444	0.363	0.448	0.373	0.363	0.408	0.5	0.473	0.389	0.631	0.522	0.702	0.539	0.63	0.61	0.907			
Negative Affect	0.928	0.762	0.061	0.11	0.09	0.079	0.201	0.133	0.201	0.177	0.151	0.184	0.13	0.173	0.139	0.2	0.062	0.003	0.074	0.031	0.007	0.004	0.07	0.081	0.072	0.122	0.133	0.003	0.09	0.873		
PSOC: Emotional Connection	0.879	0.784	0.332	0.418	0.332	-0.013	0.326	0.353	0.424	0.412	0.439	0.285	0.373	0.453	0.44	0.478	0.453	0.39	0.627	0.321	0.309	0.189	0.309	0.294	0.367	0.302	0.412	0.313	0.286	0.16	0.885	
PSOC: Needs Fulfillment	1	1	0.137	0.054	0.11	-0.142	0.184	0.093	0.103	0.121	0.112	0.122	0.023	-0.038	0.003	0.043	0.112	0.057	0.052	0.161	0.23	0.157	0.046	0.177	0.124	0.143	0.003	0.111	-0.106	-0.024	-0.139	1.000