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Who Uses Virtual Worlds Anyway?

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ABSTRACT

Virtual worlds have grown tremendously in recent years yet little is known about individuals that are working within these worlds. A study of several virtual worlds reveals that members are hesitant to reveal personal information which complicates investigations of such environments. We investigated the role of sex and computer self efficacy on users' intentions to use Second Life (a popular virtual world environment). We conducted a series of qualitative interviews and developed a survey instrument for a data collection and also conducted an experiment to learn more about the individuals behind the avatars in Second Life. Our interviews suggested that the sex, psychological traits and computer self efficacy of a user will be significant predictors of an individual's intent to use Second Life. Analysis of the data determined that sex and computer self efficacy were statistically insignificant but further analysis suggests that the sex, psychological traits and computer self efficacy of the respondent may influence intentions to use virtual worlds after all.

Keywords

Virtual worlds, Second Life, Computer Self Efficacy, Gender.

INTRODUCTION

Virtual Worlds

Virtual worlds are computer-based environments within which users interact through the use of avatars. At their core virtual worlds are a complex computer-mediated communication system with an immersive interface that appears to have the ability to enhance engagement and interactivity among users. While early virtual worlds were largely text oriented 2-dimensional environments primarily dedicated to gaming and social networking, more recent environments add 3-dimensional avatars as well as audio exchange capabilities creating a more engaging experience and ushering in many new users. A study in 2007 by Virtual Worlds News found nearly twelve million adults, and more than sixty million children and teens had created accounts in a virtual world (2007). Additional virtual worlds, including Google Lively, have recently emerged and are drawing even more new users.

The enhanced features within virtual environments, and the growing user base in these environments, have begun to lure attention from businesses. Second Life, for instance, has attracted an approximate ten million dollar investment from IBM (Reuters 2006), and additional companies such as Scion, Cisco, and Starwood Hotels are venturing into the environment (Tiffany 2007). In a recent address within Second Life Cisco CEO John Chambers predicted that virtual technologies are in very early stages of use in business but that they will eventually explode in terms of their business impact (Framingham 2008). Advances in computers and related technologies (such as touch sensations) are opening virtual worlds to an even larger audience. Companies like Millions of Us are helping foster this growth by specializing in consulting and marketing services that assist firms with their virtual world ventures.

The notion of a virtual world began to take root in the early 1990's through virtual reality technologies, fictional books such as *Snow Crash*, and the emergence of role playing games that began to move toward a 3-D sensory-rich environment. By 2000 researchers were calling for the utilitarian use of virtual worlds for a wide array of applications including mental health (Rizzo et al. 2001) and pain management (Muhlberger et al. 2007; Wiederhold et al. 2007). Recent literature has also begun to explore business implications of virtual worlds (Bell et al. 2007; Holsapple et al. 2007; Holzwarth et al. 2006; Wang et al. 2007).

Virtual worlds are somewhat unique in relation to other information systems as they were developed around a series of hedonic applications such as gaming, role playing, and social interaction. Hedonic features of information systems have been shown to drive adoption of such systems (Van der Heijden 2004; Venkatesh et al. 2001) which is likely part of the explanation for the rapid growth of virtual worlds. The hedonic attributes of virtual worlds in many ways serve to define these environments. Utilitarian functions such as running a business which typically drive the development of new CMC

systems are newcomers that are serving to expand and alter current norms within a virtual world and will likely benefit from the experiential environment.

Social Virtual Worlds

Virtual world environments can be divided into two broad categories namely gaming and social. Gaming environments are developed with tasks and objectives and often include a competitive environment which limits the extent to which users construct their environment in world. Social environments typically do not include tasks and objectives and do not necessarily have any competitive elements. A social virtual world environment simply provides a space in which the participants construct the relationships and opportunities they desire. Communication then is the cornerstone of a social virtual world. Social interaction, running a business, and seeking support are all reasons for using a socially based virtual world. We chose to work with a social virtual world due to the broad and largely undefined set of reasons individuals may choose to interact in such an environment. Specifically, we chose to work with Second Life which is the largest of the social virtual worlds. We selected Second Life due to both its size, (number of subscribers) as well as the fact that it has an in-world monetary system and has attracted investment from mainstream corporations such as Cisco, IBM, and Starwood. This study seeks to gain insight into the users behind the avatars in Second Life and specifically to determine why some individuals choose to use Second Life while many others do not.

Virtual Worlds as a New Media

Virtual worlds can be viewed as a feature-rich Computer-Mediated Communication (CMC) environment. Communication is the goal within virtual worlds and the effectiveness of the communication is an important measure of the environment. Virtual worlds are also having a notable effect on more mainstream CMC systems. The Avatars and other elements from within virtual worlds have been making their way into communications systems outside of virtual worlds for years. T-Mobile phones for instance allow for the creation of avatars to represent favorite contacts. One contributor to this research has a heart that represents his spouse within his T-Mobile phone. A recent contact with an insurance company left me face to face with an avatar who talked me through the process of creating a claim. In the cases of T-Mobile and the insurance company it appears there is a second communication stream that is perhaps more phenomenological augmenting the traditional communication exchange.

We believe the acceptance of these virtual worlds artifacts in mainstream communication systems will serve to quicken the adoption of virtual worlds. We also believe that as virtual world features make their way into mainstream communications, common interfaces such as web browsers will start to adopt 3-dimensional properties and take on the look, feel, and functionality of a virtual world. Indeed, as interfaces provide an increasingly engaging three dimensional functionality we may look back at web browsers of today as archaic as such interfaces forced users to work with three dimensional objects through a series of two dimensional views.

METHOD

We chose to begin this investigation with a qualitative study. A set of interviews were used to gain an initial understanding of the individuals who use virtual worlds. Four conferences were attended with two of them being held virtually in Second Life and two being live conferences with one being held in North America and one in Europe. The two real-world conferences were not dedicated to Second Life but each conference had a sub-conference that was focused solely on Second Life. In each of the four conference environments users were sought who considered themselves regular users (in world at least once per week) and had spent more than one year in world. A total of fifteen interviews were conducted at each of these conferences for a total of 60 interviews to gain insight into why individuals begin using virtual worlds as well as why they continue the use. Participants ranged in age from 26 to 74 with an average of 35 years old. Level of education ranged from middle school to PhD with the average number of years of formal education being 17. It is important to note that the two real world conferences were education related which likely resulted in a set of participants with a higher education level than the average. There were 34 female and 26 male participants.

All interviews in Second Life were conducted using in world audio allowing researchers to be confident in the accuracy of the participant's sex even in cases where the sex of the avatar differed from the sex of the participant operating the avatar. An initial larger survey was used in a previous conference but individuals responded negatively to the intrusiveness of the questions. As a result, a short set of open-ended questions were asked that allowed participants freedom to answer how they wished. Users were asked to identify the issue they felt were most important in choosing to use Second Life and a second survey instrument was developed from the users responses. Each user was asked to take the new survey once it was completed.

A second experimental investigation was conducted to investigate the intention of individuals to use Second Life. The study was conducted at a major university in the northwest region of the United States with participants who ranged in age from 18 to 25. The experimental study included two data collections with the first collection serving as a pilot for the refinement of the instrument and procedures. The pilot study included 168 respondents ranging in age from 18 to 29 with 58% being male and 42% female. Participants interacted with a scripted narrative on a computer that presented an initial survey, and then presented them with four sales scenarios that were presented in random order, and finally a post study survey. The four scenarios were the result of a 2x2 manipulation that included behavior/appearance (HI/LOW) and the storefront characteristics (HI/LOW). The high appearance and behavior manipulations included improved realism of hair, clothing, and skin color, as well as the use of an animation override to ensure lifelike movement. The high storefront condition included enhanced lighting, floor covering, and signage.

The second study was a 2x2x2 manipulation yielding eight scenarios in which the effects of behavior and appearance were pulled apart. The procedures were otherwise the same. In the second study 61% of the participants were male and those who had used virtual world technologies in the past (4%) were eliminated from the study yielding useable results from 210 participants. All of the participants were undergraduate students who earned course credit for their participation and nearly all of the participants were in their second year of study at the university. Participants were business students in both the pilot and final study which spurred the use of a retail environment as a setting for the study.

STUDIES

Qualitative Study

Participants in the qualitative study included the sixty individuals who had previously been interviewed and contributed to the development of the survey. This survey revealed that users within Second Life are well educated. Of the thirty respondents in Second Life more than half reported having a college education, and all had at least a high school diploma. 42 of the 60 participants reported a desire for, or interest in, social interaction to be the primary reason they started using Second Life and 55 of the 60 participants report that social interaction is the primary reason they continue to use Second Life. 44 of the 60 participants reported that they believed there were more women than men actively using Second Life and the remainder had no opinion. 50 of the 60 participants reported that individual differences are an important determinant in whether people use Second Life and 45 of 60 participants reported that users who are more comfortable using technology are more likely to use Second Life. Only 3 of the 60 respondents report they have purchased goods or items in Second Life that could be used outside of the virtual environment though 51 of the 60 participants said they are interested in more options to purchase real world items within Second Life. Only 7 of the 60 participants believe that current retail environments in Second Life are of high quality and the 60 participants were unanimous in wanting increased controls in their purchasing including clear and consistent policies for returning items, consistent mechanisms for providing payment for items, and a consistent way to provide and attain customer satisfaction information for particular merchants.

Experimental Study

The experimental study sought to answer questions that were raised from the qualitative interviews and the resultant survey. Interview participants suggested that there were more women than men using Second Life. One potential reason for the perception provided by respondents was a greater appreciation among women of the opportunity to establish relationships with individuals from unique locations and backgrounds that would otherwise not be possible. Four women also noted that they like to be able to create an avatar with an appearance that is consistent with their personality. While we cannot get data to confirm or deny whether there are more women than men in Second Life we decided to determine if there was a difference in the number of women who intend to use Second Life relative to men which is the basis for our first hypothesis. Intention to use Second Life was a binary item which came near the end of the survey.

H1: Intention to use Second Life will be higher among women than men.

Our experimental study did not support the notion that a higher percentage of women intended to use Second Life. A small number of men (17.1%) reported intending to use Second Life which was slightly higher (though statistically insignificant) when compared with the percentage of women (16.7%) who intended to use Second Life which appears to contradict findings from the interviews.

A second question we addressed was whether an individual's comfort level with technology affects the intention to use Second Life. The fact that 45 of the 60 respondents in the qualitative study indicated that comfort with technology was important in the decision to use Second Life caused us to investigate this phenomena. Specifically, users reported that the complexity and poor documentation of the software, coupled with the high demands on computer hardware and subsequent need to adjust program parameters to demand fewer system resources caused difficulties for users and "scared away" users

who were afraid of technology. Comfort level with technology was measured using Computer Self Efficacy (CSE) (Bandura 1977; Compeau et al. 1995) items (Table 1) at the beginning of the survey before exposure to the Second Life videos and led to our second hypothesis.

H2: Intention to use Second Life will be higher among individuals who have a high level of computer self efficacy.

Our experimental study did not support the notion that a higher level of computer self efficacy would lead to an increased intention to use Second Life which once again appears to contradict findings from the interviews.

To investigate the role of personal differences we decided to administer the Big Five Psychological Inventory to investigate the potential role of psychological differences in forming intentions to use Second Life. Specifically, we used the short form version (John et al. 1999) of the Big Five inventory to determine personality or psychological traits which may be related to intentions to use Second Life which led to our third hypothesis.

H3: Psychological traits are important to the formation of intentions to use Second Life

Our experimental study found that three of the traits in the Big Five inventory were statistically insignificant and not important (Agreeableness, Conscientiousness, and Openness) to the formation of intentions to use Second Life. Extraversion and neuroticism were statistically significant yet still unimportant given the small effect size in the relationship.

POST HOC ANALYSIS

Our qualitative investigation was clear on the perception that sex and computer self efficacy would be important in the formation of intentions to use Second Life. However, no significant relationships were found as we investigated these relationships. As a result, we decided to investigate potential interactions between sex, psychological traits, and computer self efficacy. The qualitative data and interesting findings within the data generated the following research question which was developed post hoc.

R1: There will be an interaction between sex, psychological traits, and computer self efficacy in predicting intention to use Second Life.

Our experimental study found this relationship to be statistically significant $F(1,208) = 25.35, p = .000$. Therefore research question 1 is supported. The effect size for this relationship (Eta squared = .11) calls the importance of this finding into question, however, we believe this relationship is in fact important due to the relationship it reveals, and other relationships it potentially masks.

To explore the data further we chose to combine the pre scenario data from both the pilot study and the final study. The instrumentation and procedures were identical in each study causing us to be confident that this would be acceptable. Three items had stood out in all of the original analyses which were computer self efficacy, neuroticism, and extraversion. Each by themselves was either statistically insignificant, or had effect sizes that were too small to be considered relevant. Tables 2, 3, and 4 report pairwise comparisons that were performed to investigate each of these variables. Table 2 reveals that men scored higher on computer self efficacy in the study. CSE had been determined in the qualitative stage to be important in deciding to use Second Life. Tables 3 and 4 reveal that women scored higher on both extraversion and neuroticism which were each statistically linked to an increased intention to use Second Life. Therefore, there is support for the notion that while men and women have nearly identical intentions to use Second Life, the underlying reasons are different.

IMPLICATIONS

The final outcome being that men and women were essentially identical in terms of the percentage of each that intended to use Second Life was not expected. The qualitative study clearly predicted that women would be more inclined to use the technology. The fact that the men appear less inhibited to begin using Second Life through a higher CSE score, and women seem to be more motivated to use Second Life through higher scores on neuroticism and extraversion, seems to provide at least some insight into the discrepancy between the qualitative and quantitative study findings. Participants in the qualitative study also commented that they expected a higher percentage of women in Second Life because of a desire for increased social interaction. As a result we asked respondents in the quantitative study who indicated a desire to use Second Life why they were interested. Ten of the women who were interested in Second Life indicated social interaction was the reason while two indicated they were interested in the business implications and one reported that it seemed like fun. Six of the men reported being interested in business implications, four reported being interested in social interaction and five reported other reasons.

The more important issue here, however, is the implications for computer-mediated communication. Decades of research in the CMC area have focused on the differences between face-to-face and mediated environments. Social information

processing (SIP) theory (Walther 1992) contends that individuals overcome limitations in CMC environments to communicate their message and even highly affective messages can be conveyed through participants hyper-personalizing their written message cues. However, is this generally true? Can individuals who are poor writers hyper-personalize their thoughts in a traditional text-based CMC environment? Will environments that reintroduce visual cues in CMC environments reduce barriers for poor writers?

This study suggests that the perceived cost and rewards of using Second Life may be different for men and women. If mainstream CMC systems continue to adopt virtual world artifacts then communications in environments such as Second Life may have predictive value for the future. Also, if mainstream communication systems continue to adopt virtual world technologies, will the cues available in CMC environments surpass those available in face-to-face communications? Will the ability to create an avatar with nearly infinite freedom to instill any desired set of cues, coupled with voice communication and animation overrides that can provide a wide range of gestures and other animated presentation options, make face-to-face communication the poorer lesser cue-rich environment?

CONCLUSION

This study was exploratory in nature seeking relationships that will help to better understand intentions to use virtual worlds. While we focused strictly on Second Life in this study we believe that results may well be important to other virtual worlds as well. Second Life has a monetary system, voice communication, interaction tools such as people and location finders and other features which we believe are important to building a long-term social environment. Second Life has grown steadily in membership with more than 16 million total subscribers with tens of thousands of subscribers being online at any given time. As a result we believe Second Life is a uniquely valuable environment to study and understand.

We believe that a more detailed investigation into the effect of gender on intention to use Second Life is needed. IT adoption literature perhaps yields important keys to investigating the relationship of gender on intention to use Second Life. We also believe that continuance of use may be a key issue. In a recent class with 48 students Second Life was used as a medium for the students in the class and their counterparts at another major university. At the end of the class session when Second Life was introduced students in the class before students actually started working with the technology women in the class gave SL a 3.8/10 while men gave it a 5.9/10. These scores are consistent with the computer self efficacy argument as men would be expected to have less apprehension in starting use. However, during the semester the rating by women continually climbed and ended at a 5.6/10 as opposed to a 5.2/10 for men. This outcome also appears to be consistent with expectations as the effect of CSE would fade with increased use and other factors would drive satisfaction with the environment. Continuance of use in virtual worlds may be an even more compelling story than adoption.

The current study failed to find significant outcomes on a number of expected variables which is instructive in itself. The differences in gender were an interesting and unexpected finding which has led to a number of new questions and research questions. Some of these research questions are:

R1: Are mainstream CMC technologies moving closer to virtual world technologies?

R2: Is the ability to overcome cue related limitations in traditional CMC environments (as predicted in SIP) only accessible to good writers who are able to express themselves well in writing? And, are 3-D communications features therefore important to communicate affective messages in a CMC environment for individuals who are not good writers?

R3: Are virtual worlds a utopia to which CMC environments should aspire?

R4: Do virtual worlds provide a more cue-rich environment than face-to-face communication?

R5: Do virtual worlds provide benefits in developing a sense of community among participants in virtual worlds relative to traditional CMC environments?

R6: Are virtual worlds a worthy area of study within the CMC literature?

R7: Do individuals who participate in a longitudinal group in Second Life have less concern regarding CSE as learning to use the system has sufficient long-term benefits to offset the short-term cost of learning to use the software?

LIMITATIONS

There are a number of key limitations with the two studies that we are reporting on in this paper. The qualitative study has the benefit of participants from many countries along with a wide range of ages and sets of experiences. However, 30 of the 60 subjects were recruited within two academic conferences (one in North America and one in Europe) and as a result the

majority of this set of participants work within academia. Also, the 30 subjects interviewed within Second Life were represented by avatars. All interviews were conducted using voice communication which gives us confidence that we were able to accurately determine the sex of the participants, and that we were interviewing 30 unique individuals; however, we could confirm little else about the participants. A number of the participants had vocal accents that would indicate they are from foreign countries but we cannot be confident of where any of these participants reside. This is a somewhat beguiling limitation within virtual worlds as there is a high degree of anonymity which adds complications to the data collection and analysis process.

There is an even greater set of limitations with the experimental study. While the experimental controls (randomizing the order in which participants experienced materials, clear identification of participants, etc...) provided advantages, this environment also provided challenges. Perhaps the most important limitation was the age range of the participants and other similarities. All of the participants were between the ages of 18 and 25 which is an important and interesting group, yet any inferences to other ages must be tempered. Also, these participants were all undergraduate business students who have taken classes together and therefore inferences must again be tempered. Finally, the participants in the experimental condition are predominantly from North America again limiting the inferences that can be made.

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Appendices

Table 1

Construct	Items
Computer Self Efficacy	I believe I have the ability to understand terms/words relating to computer software
Computer Self Efficacy	I believe I have the ability to troubleshoot computer problems
Computer Self Efficacy	I believe I have the ability to determine the best program software for a particular task
Computer Self Efficacy	I believe I have the ability to explain why a program (software) will or will not run on a given computer

Table 2

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	CSE_M	3.4966	146	.85500	.07076
	CSE_F	3.0445	146	.79691	.06595

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Upper	Lower			
Pair 1	CSE_M CSE_F	.45205	1.12354	.09298	.26827	.63584	4.862	145	.000

Table 3

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Extra_M	3.0247	146	.26430	.02187
	Extra_F	3.1127	146	.28235	.02337

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Upper	Lower			
Pair 1	Extra_M Extra_F	-.08808	.33772	.02795	-.14332	-.03284	-3.151	145	.002

Table 4

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Neurot_M	2.6598	146	.30161	.02496
	Neurot_F	2.7614	146	.29458	.02438

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Upper	Lower			
Pair 1	Neurot_M Neurot_F	-.10164	.41103	.03402	-.16888	-.03441	-2.988	145	.003