CHINESE VIRTUAL WORLD ADOPTION: ATTITUDES, EXPERIENCES AND ISSUES

Vogel, Doug, City University of Hong Kong, 83 Tat Chee Ave., Department of Information Systems, Kowloon, Hong Kong, P. R. China, isdoug@cityu.edu.hk

Zhou, Zhongyun (Phil), USTC-CityU Joint Advanced Research Center, Ren'ai Road, Dushu Lake Higher Education Town, SIP, Suzhou, P.R. China, zzyun@mail.ustc.edu.cn

Guo, Xitong (Maxwell), USTC-CityU Joint Advanced Research Center, Ren'ai Road, Dushu Lake Higher Education Town, SIP, Suzhou, P.R. China, maxwell@mail.ustc.edu.cn

Tian, Wen (Stella), USTC-CityU Joint Advanced Research Center, Ren'ai Road, Dushu Lake Higher Education Town, SIP, Suzhou, P.R. China, stellat@mail.ustc.edu.cn

Zhang, Xi (Jacky), USTC-CityU Joint Advanced Research Center, Ren'ai Road, Dushu Lake Higher Education Town, SIP, Suzhou, P.R. China, xizhang@mail.ustc.edu.cn

Abstract

Virtual Worlds are receiving increased global attention in a wide range of applications in education, business, government and social contexts. Kock (2008) defines virtual worlds as "technology-created virtual environments that incorporate representations of real world elements such as human beings, landscapes and other objects." A key element is interaction via avatars. For example, SecondLife (www.SecondLife.com) is a virtual environment (within which real-life experiences can be attained) that has a wide range of artificial domains with user avatars encompassing aspects of visualization and sense of presence, as well as text and audio interaction. Other virtual worlds are emerging that have similar features and aspirations. HiPiHi (http://www.hipihi.com) is one such Chinese environment that has striking similarities with (as well as differences to) SecondLife. In this paper, we compare SecondLife to other virtual worlds (with special attention to HiPiHi) using an extended Technology Acceptance Model (TAM) lens. Results indicate that virtual worlds (at least in their current form) need considerable attention to numerous issues before mainstream impact is achieved. In this sense, it is a goal desired but yet to be attained. Barriers to adoption and diffusion are identified and directions for future research beyond TAM are provided. Conclusions are drawn.

Keywords: Virtual Worlds, Adoption, Diffusion, TAM.

1   INTRODUCTION

Virtual Worlds are receiving increased global attention in a wide range of applications in education, business, government and social contexts. Kock (2008) defines virtual worlds as "technology-created virtual environments that incorporate representations of real world elements such as human beings, landscapes and other objects." A key element is interaction via avatars. For example, SecondLife (www.SecondLife.com) is a virtual environment (within which real-life experiences can be attained) that has a wide range of artificial domains with user avatars encompassing aspects of visualization and sense of presence, as well as text and audio interaction. HiPiHi (http://www.hipihi.com) is a Chinese environment (with a distinctive Chinese look-and-feel) that has striking similarities with (and differences to) SecondLife.   Other Chinese virtual worlds are in various stages of development and implementation. e.g., Shanda, uWorld from UOneNet, Entropia, Frenzoo, and Novoking. Globally, venture capital, technology and media firms have reportedly invested more than $1 billion dollars in 35 virtual world companies from October 2006 to October 2007 (www.VirtualWorldsNews.com).

These virtual world environments are reporting dramatic increases in number of active users. For example, SecondLife peak concurrent users grew to more than 58,000 in Dec 2007. Approximately 893,000 residents logged more than 25.6 million user hours or more than 30 hours a month per user (http://blog.secondlife.com/2008/01/17/second-life-economy-posts-solid-growth-in-q4/). Geographically, the vast majority of these users are from North America with only 13% from Asia.   However, the China Internet Network Information Center (CNNIC.CN) has reported that Chinese Internet users now number 210 million, up dramatically from the 620,000 users recorded in 1997. Posts on the Internet in Chinese are now equivalent in number to those in English as, in China, "the Internet fills gaps and provides what is unavailable elsewhere, particularly for young people" (Economist, 2/2/2008, p. 69). HiPiHi reports growing to more than 40,000 residents in China as at the end of February 2008 (http://forums.hipihi.com/read-topic-86-ff808081168a715701168c652f4524c2-0-1-index-1.html).   But these numbers pale compared to those associated with World of Warcraft (WOW), a particularly popular virtual world game.   WOW has reportedly achieved 800,000 simultaneous players in China (http://www.tgdaily.com/content/view/34205/102/). Clearly, the use of virtual worlds such as SecondLife and HiPiHi is in its infancy. Further, there is a major concern regarding repeat users and extended usage.

However, these concerns have not dissuaded interest on a number of levels.   Individuals have embraced SecondLife as an income opportunity, as well as a place to play. The first millionaire in SecondLife is reported to be Anshe Chung (born and raised in Hubei, China) who has become the first online personality to achieve a net worth exceeding one million US dollars from profits entirely earned inside a virtual world.   (http://www.anshechung.com/include/press/press_release251106.html). According to research by K Zero (http://www.kzero.co.uk/blog/?p=702), there were 85 companies in Second Life as of the end of May 2007, including IBM, Sun Microsystems, Microsoft and Dell. Governments have additionally indicated interest, e.g., the Swedish Embassy has a presence. The Chinese government has also become engaged. For example, Entropia has the backing of the Beijing municipal government with a vision of "bringing 10,000 work-at-home, pollution-free job opportunities to China" (Allen 2007).

This paper presents quantitative and qualitative results associated with virtual world adoption in Chinese contexts using an extended Technology Acceptance Model (TAM) lens. Acceptance attitudes and barriers to adoption and diffusion based on relevant experience are identified.   The appropriateness of TAM and extension in these contexts are discussed. Directions for future research are provided. Conclusions are drawn.

2   LITERATURE

Taylor and Todd (1995) identify two streams of research on IT adoption. One stream examines the adoption and usage of IT from a Diffusion of Innovation (DOI) perspective, considering numerous factors that facilitate or hinder IT technology adoption and implementation from a broad scope, including characteristics of the technology, characteristics of adopters, and the means by which adopters learn about and are persuaded to adopt the technology (Rogers 1983, Fichman 2003). From this perspective, Moore and Benbasat (1991) develop a set of eight Perceived Characteristics of Innovating (PCI), belief constructs that are key antecedents to technology adoption decisions. Cooper and Zmud (1990) apply a stage model of IT implementation activities founded on a stage-model from literature, and identify five major contextual factors impacting processes and products associated with each of six stages. Chau and Tam (1997) apply and develop the three-dimensional Technology-Organization-Environment (TOE) framework proposed by Tornatzky and Fleischer (1990) in the context of using open systems. Chang et al., (2006, 2007) adopt the same framework, which is consistent with Rogers' (1983) theory of innovation adoption on some aspects, to indicate critical factors affecting IT adoption decisions in the healthcare industry in Taiwan.

Another stream of IT adoption research is intention-based, including models using behavioral intention to predict usage and, in turn, focusing on the identification of the determinants of intention (Taylor and Todd 1995). Grounded in models from social psychology, such as the theory of reasoned action (TRA) proposed by Fishbein and Ajzen (1975) to illustrate the roles of beliefs in predicting behavior through attitudes and subjective norms, and the theory of planned behavior (TPB) designed by Ajzen (1985) to predict behavior, scholars have developed their own models with special attention to IS usage behaviors, such as the technology acceptance model (TAM) proposed by Davis (1989) to examine the mediating role of perceived ease of use and perceived usefulness in their relation between systems characteristics (external variables) and system use.

TAM (Davis et al. 1989, see Figure 1) has been accepted and applied extensively as a robust, effective and parsimonious model to understand individual-level adoption of technologies in the IS discipline (e.g., Hu et al. 1999, Bhattacherjee 2001, Plouffe et al. 2001, Koufaris 2002, Gefen et al. 2003, Legris et al. 2003). Core TAM constructs include: **Perceive usefulness (PU)** and **Perceived ease of use (PEOU)** defined by Davis (1989) as "the extent to which a person believes that using a particular technology will enhance her/his job performance," and the "degree to which a person believes that using the system will be free from effort." TAM is generally praised for its generalizability and parsimony in predicting system use.
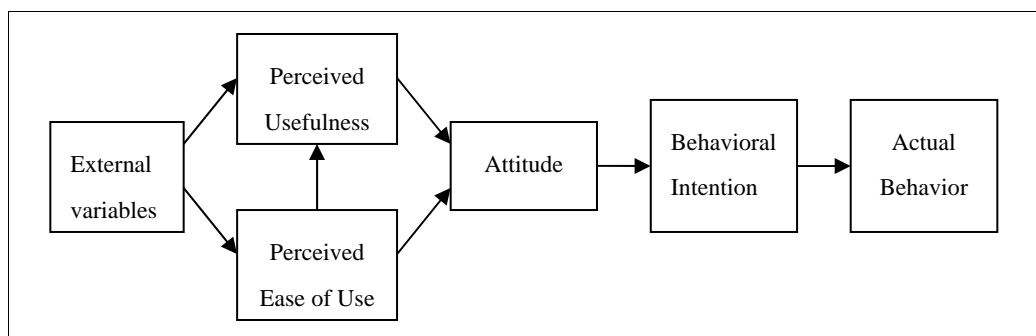

Figure 1. TAM (Davis et al. 1989)

However, "every coin has two faces" and TAM is also criticized for its relatively low predicting power when applying it in a specific technology. Thus, scholars have recently concentrated their efforts on extending the existing model with more factors from other disciplines, and extending the

model to improve its effectiveness (e.g., Szajna 1996, Agarwal & Prasad 1997, Lucas & Spitler 1999, Venkatesh and Davis 2000, Legris et al. 2003). Among them, TAM2 (see Figure 2), encompassing both social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use) as determinants of perceived usefulness and usage intentions, provides a detailed account of the key forces underlying judgments of perceived usefulness, explaining up to 60% of the variance in this important driver of usage intentions (Venkatesh & Davis 2000). Empirical studies (e.g., Venkatesh and Davis 2000, Hsu & Lu 2004) have been carried out to demonstrate the effectiveness of TAM2 in predicting IT acceptance.
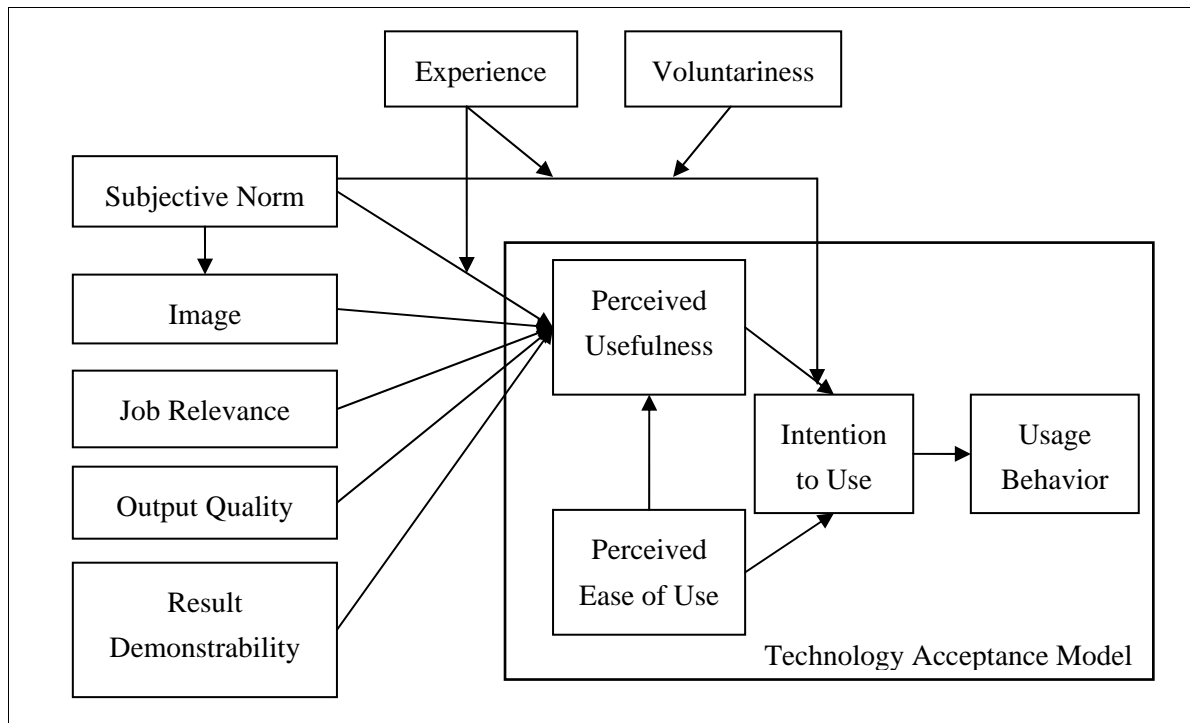

Figure 2. TAM2 (Venkatesh and Davis 2000)

Subjective norm (SN), defined as a "person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein and Ajzen 1975, p. 302) is shown in Venkatesh and Davis' (2000) TAM2 to have impacts on usage intention through three patterns of social influence processes: a direct effect on usage intention (*compliance*) moderated by **Voluntariness**, an indirect effect on intention through PU (*internalization*), and an indirect effect on intention through an effect to PU mediated by **Image** (*identification*). **Job relevance, Output quality, and Result demonstrability**, together with PEOU, are four cognitive instrumental antecedents of PU.

3   RESEARCH APPROACH

The approach taken in this research is a quantitative and qualitative mix including a survey, interviews and search of web forums to examine various aspects of virtual world adoption based on constructs associated with TAM and TAM2 extended to include perceived enjoyment. **Perceived enjoyment (PEN)** is the extent to which the activity in question is perceived to be enjoyable, apart from any performance consequences or utilitarian considerations (Koufaris 2002). **PEN** was added to take into consideration aspects extending beyond work and has been shown to have positive effects on intention

(Hsu & Lu 2004, Ha et al. 2007). The research is embedded within a project embracing virtual teams and then extended to address aspects of generalization and attention to peripheral issues.

Over the past ten years, the Hong Kong / Netherlands (HKNet) project has provided a structured environment in which virtual teams experience a variety of synchronous and asynchronous technologies. Team members engage in a variety of online activities over an eight week period, resulting in delivery of an online electronic book. HKNet has been recognized for innovation (e.g., Genuchten et al. 2005, Genuchten and Vogel 2007). The project provides a platform within which aspects of the impact and implications of different technologies can be examined. A voluntary online survey was given in week 3 after subjects had experienced five technologies under examination, i.e., email, forums, videoconferencing (VC), SecondLife (SL) and MSN. The developed questionnaire reflected measures for the previously noted TAM/TAM2 constructs using a 7-point Likert scale from "strongly disagree" to "strongly agree." A total of 48 participants (55%) responded.

Interviews with participants were conducted throughout their HKNet project to better understand their engagement and reaction to SecondLife. Discussion was directed towards issues of adoption and diffusion within, as well as extending beyond, the project. A search of web forums was used to gauge broad-based reaction to SecondLife and HiPiHi from an adoption and diffusion perspective. Special attention was given to Chinese-centric concerns.

4 RESULTS

Analysis of the survey data revealed widespread dissatisfaction to SecondLife on all dimensions measured under the extended TAM/TAM2 lens. For example, Figure 3 illustrates results for perceived usefulness. All measures loaded strongly on the concept and relevant treatments had a Cronbach's Alpha in excess of .85.
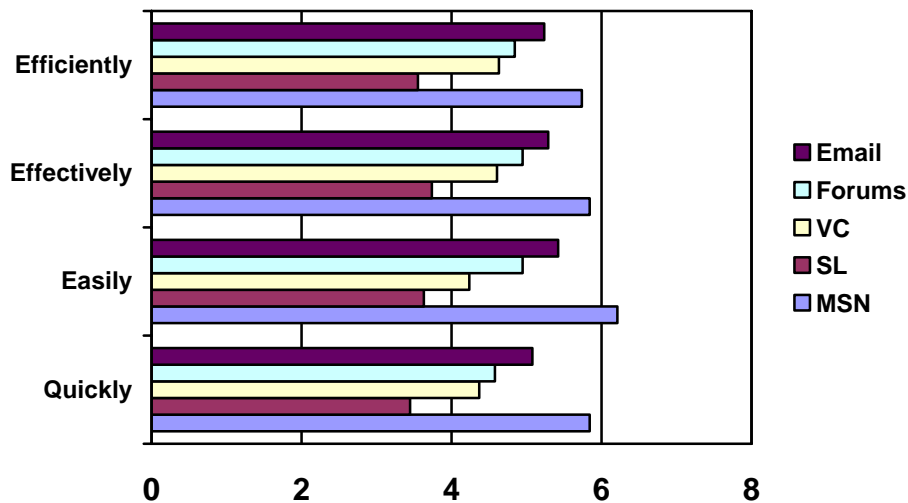

Figure 3. Perceived Usefulness

As quickly recognized in Figure 3, MSN was dominant in terms of perceived usefulness. The MSN-supported quickness, ease and efficiency were to be expected. Somewhat surprisingly, effectiveness ratings were also high in spite of MSN leanness. Videoconferencing was seen as considerably less

useful on all measures but was also scheduled and time-limited, relatively speaking. The high ratings for email are attributable to familiarity and support for asynchronous interaction which was especially important given the seven hour time difference between Hong Kong and the Netherlands. Forums were perceived useful for the same reason. SecondLife fared particularly poorly on all measures. ANOVA with Tukey followup revealed that the mean response to SecondLife was significantly (p=.00) less compared to any other technology examined. As one participant noted, *"No one is there when I login SL."* Perceived ease of use followed patterns similar to perceived usefulness for essentially the same reasons. Email and MSN were even more dominant than one might expect, given participant familiarity and broad-based use. Not surprisingly, attitude and intention to use generally follows perceived usefulness and ease of use, given their TAM precedence noted in Figure 1.

SecondLife fared somewhat better in comparison with respect to perceived team enjoyment, as illustrated in Figure 4. All measures loaded strongly on the concept and relevant treatments had a Cronbach's Alpha in excess of .84. ANOVA with Tukey follow-up revealed that the mean response to SecondLife was significantly (p=.01) less compared only to MSN, and not significantly different to the other technologies (i.e., videoconferencing, email and forums). Perceived team enjoyment begins to recognize some of the distinctive characteristics of other less lean media. Here, for example, we can see a relative increase of SecondLife, as well as for videoconferencing, especially in terms of fun. However, MSN still ruled supreme on all measures, perhaps as a reflection of its ease of use and perceived usefulness.
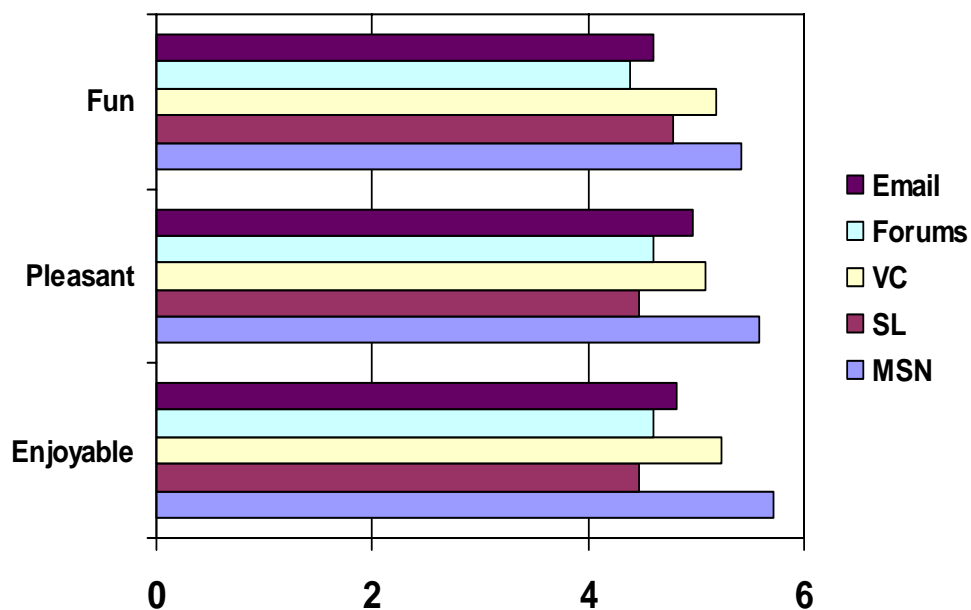

Figure 4. Perceived Team Enjoyment

Interview data began to shed light on the universally negative reaction to SecondLife under the lens of TAM and TAM2. Part of the reason lies in the general difficulty of loading and use of the software, e.g., *"It took us a whole night just to login."* SecondLife is updated weekly, places high demands on bandwidth and is prone to frequent crashes and general poor performance, that is, relative to more established technologies, e.g., *"It has too many graphs, which get the pc running too slowly."* Further, the interface is not particularly intuitive. As one participant noted, *"We could only change dressings, walking around and always get lost in it, I can not control it."* Another summarized the feelings of many in that *"SL firstly seems interesting, has much functions, but gradually, after being familiar with*

some clubs, rules and functions, realized that to achieve higher quality of life in SL needs much work and time, then give up."

A tension between work and play was also especially present in that some Chinese participants had been specifically encouraged in their personal development not to mix work and play. Confusion reigned as to whether SecondLife was a game or a serious work tool, and there was a reluctance of many to appreciate that the work and play could be mixed, e.g., *"It feels strange to work in a game environment."* Another expressed *"I do not view SL as a game. It is funny, has lots of features, but we do not need these features."* Participants also expressed gender differentiations, e.g., *"just an ordinary game"* by a male, and *"it is too complex, not interested in game"* by a female.

A review of web forums was used to ascertain whether conclusions about SecondLife were generalizable to other virtual worlds, specifically HiPiHi which has similar functionality, albeit with a Chinese façade. An active user of HiPiHi noted that he liked its Chinese environment, the Asian look, Chinese characters, and traditional architecture; he also liked the pure communication and the opportunity to live, although virtually, in an ideal way. Another noted that he appreciated HiPiHi as a platform to make oneself known and meet new friends. Yet another, who had spend ￥5000 (about US$ 633) on HiPiHi, saw it as a place where he could share dreams and find spiritual support (http://forums.hipihi.com/main.jhtml) [translated from Chinese].

HiPiHi tends to generally fare better than SecondLife in terms of lowered technological demands and ease of use. HiPiHi supports only two languages: Chinese and English. The HiPiHi support team provides a Chinese version of guidelines to new users with which people can learn to use the functions more easily. Also, HiPiHi reduces the number of categories on the interface to help beginners to become skillful more quickly. Based on observation, the more simple style of interface may save users' time and enhance the perception of ease of use. SecondLife suffers in this regard but, as acknowledged, is also striving to support a broader set of functionality and usage characteristics.

However, HiPiHi is also not without its detractors. One participant noted that limitation of hardware, lack of creativity and software skills slowed HiPiHi acceptance. Although he made an effort to find a computer that could run HiPiHi, the game still crashed several times. Regulations restricting virtual money exchange are seen as very critical as well (http://www.ourlook.net/it/57/155.html) [translated from Chinese]. As another noted, *"There's nothing I can do in HiPiHi."* An early engager noted, *"Chatting? Not as convenient as QQ, which has a small and friendly interface with many good friends; Home Building? Even if you build one, nobody would drop by, which makes you in no mood for decorating; Making clothes? Seems to be the only thing I can do, but the time cost is much higher than the joy return, so I'm out of passion."*

5 DISCUSSION

There are a number of virtual world benefits that continue to promote interest and evolution. As noted by Xu Hui, CEO of HiPiHi (http://www.hipihi.org/node/78), virtual worlds enable perfect repeatability of events and processes while promoting creativity in an infinite space. Degrees of freedom exist that would be practically impossible in the physical world that is part of our daily existence. There is also a blurring between real and virtual elements and integration of applications supporting commercial, social, and governmental activities that bode well for the future of virtual worlds. For example, in HiPiHi (http://www.hipihi.com/dynamic/community/activities.html), residents can: watch a new real movie in a movie theatre; make real money by selling virtual products through accounts on Taobao or Dangdang, and so on; hold sports meetings while asking for judges from the real world; participate in communities, parties, and festival celebrations; and attend conferences, as well as participate in activities related to the forthcoming Olympic Games. There are, however, a number of issues that merit serious attention including adoption and diffusion barriers and

a general question as to the appropriateness of TAM/TAM2 in evaluating individual receptiveness of these emerging technological domains.

5.1   Adoption and Diffusion Barriers

There are numerous hurdles to adoption and diffusion of virtual worlds. Some of these are specific to a particular product or cultural context while others are generic. We summarize barriers based mainly on interviewer responses and evidence from online forums.

Language is a perennial issue in virtual worlds. English in SL was translated into Chinese for players' convenience. Unfortunately, confusion is rampart. For example, *"I play the game with the help of English dictionary. What is the meaning of rate … to people?" "It will be very good to have a Chinese version."*

Technical (Hardware and Software) Problems abound. Participant frustrations quickly get in the way of appreciation of potential benefits. For example, *"Could not download SL and PC do not support SL."* and *"It said my graphic card does not support the game, what should I do?"* As the number of users increase, these problems are quickly amplified and will demand serious attention beyond provision of higher Internet speeds.

Local Production results in unmet expectations. For traditional games (e.g., World of Warcraft), complex methods are applied in order to realize fancy scenes. In order to achieve high performance with minimal hardware, many resources are expended and embedded before finalizing scenes. These resources are dedicated beforehand by professionals. However, in virtual world, scenes are produced by end users through the Internet in real time. Thus, virtual worlds dictate higher hardware demands and, often, do not live up to user performance expectations.

Time Consumption leads users to give up on virtual world engagement. It takes time for an average user to feel comfortable to operate, e.g., flying, teleporting or further exploring. For example, one SecondLife user noted that *"I barely have time for my first life"* and *"Realizing that it takes much work and time to achieve higher quality of life, I give up."*

Chinese Government Policy results in special considerations. In China, virtual money cannot be exchanged directly to RMB (local currency). On 15th, February 2007, the PRC culture ministry in association with other government agencies strictly limited virtual money published by internet game companies and the amount of individual purchases (http://law.lawtime.cn/d662745667839.html, in Chinese).

Copyright Issues are a burgeoning issue. For example, a Japanese shop owner noticed that the mushrooms sold by a Chinese shopper were similar to her original mushrooms. After communications and arguments based on U.S. copyright law, the reseller tried his best to stop the mushrooms from being sold, apologized to the original author, and negotiated a peaceful resolution (based on a case from http://www.cnsecondlife.com/bbs/forumdisplay.php?fid=2). For a more comprehensive review, see   http://www.cnsecondlife.com/bbs/viewthread.php?tid=1929&extra=page%3D5   and http://www.cnsecondlife.com/bbs/viewthread.php?tid=1925&extra=page%3D5 (in Chinese). Also see http://coffycoffy.blog89.fc2.com/blog-entry-162.html#more   for   the   Japanese   shop   owner's announcement, in Japanese and English, as well as the blog of the Chinese shopper owner at http://web.exiang.org/blog/user1/3/1010.html, in Chinese.

Legal Ownership and Privacy Management issues remain unresolved. For example, who owns any art and software created and openly shared by users from an intellectual property management perspective? What privacy tools and policies exist for protecting personal data? Are there rules on collecting information about behavior in the site? See http://vworld.fas.org/bin/view/Main/HiPihi for related issues.

Cultural Diversity is, not surprisingly, strikingly present albeit differentiated in virtual worlds. As note by Davidson (2008), "In some ways it reflects the real world cultures of the residents, and in other ways is quite unique." There is, indeed, a hazy line between real life and virtual worlds and social issues based on cultural differences (e.g., avatar dress and behavior) are raised that are not present in more traditional technology applications.

Management of Abusive Behavior is an open issue. Entry and the ability to control access to specific sites are thorny issues. Should there be age restrictions and rules for blocking access to disruptive participants? See http://vworld.fas.org/bin/view/Main/HiPihi for related issues.

Organization Attitudes are paramount to sustained existence. As previously noted, 85 organizations have a SecondLife presence. So far, HiPiHi has signed partnerships with IBM, Intel, P&G, and has obtained funding from the NGI Group. HiPiHi has also built up a 3-way marketing partnership with Centric, an interactive agency focusing on social media and virtual worlds, and 3Di, the Japan-based virtual world services provider (http://www.hipihi.com/news/trends_placard007e.html).

Advertiser Involvement is an open issue. Reporters from the 3D Virtual club community randomly selected several pioneer advertisers in China asking their opinions about HiPiHi and found that most of them knew no more than ordinary users. Only Lenovo, Haier, Tongfang, and Metersbonwe had made it clear that they were interested in its business model. HiPiHi CEO Xu Hui said that it might be too early to seek extensive organizational support (http://www.3dvc.cn/3dvc_article/ea/677$3.html).

Venture Capitalists remain very cautious at this stage. Because it will take at least 3 to 5 years to build up a model as mature as Second Life (http://www.3dvc.cn/3dvc_article/ea/677$3.html), such an endeavour requires a large input of capital. Although HiPiHi (amidst others) is striving to contact VCs, they are still early on the way to finding out how the wind blows.

5.2   TAM Appropriateness

It may be that TAM is a poor lens with which to examine virtual worlds in that it only deals with a relatively small number of traditional areas, e.g., perceived usefulness and ease of use that are not distinctions of virtual worlds, especially in a combined work and play motif. Indeed, our results provide some support in that regard, e.g., noting the relatively higher ratings for SecondLife in terms of perceived team enjoyment. The number of broader social and collective issues associated with virtual worlds creates a huge space. Under these circumstances, using TAM is akin to shining a fixed beam of light into a dark room. TAM is useful for that on which it shines but cannot be expected to explain all that is going on in the rest of the space, much of which interacts and potentially confounds that under examination using TAM. This is a serious limitation to our current research. There are likely many aspects associated with the rich set of characteristics and emotional reactions present in virtual worlds that remain to be illuminated.

5.3   Implications for Research

Future virtual world research can (and should) proceed in a number of directions. Broadening the search space to include sense of presence and other relevant constructs is a high priority. Comparison and contrast of products other than SecondLife and HiPiHi is certainly warranted as additional functionally and applications emerge. To some extent, current use of virtual worlds is modeled after parallels in the real world. We can anticipate an evolution of behaviors at individual, corporate and societal levels as virtual worlds take on more distinctive characteristics. Consideration of context and previous experience warrants attention as does habit (Limayem et al. 2007). It will also be interesting to witness the implications of government involvement, e.g., control versus pro-activeness.

5.4   Implications for Practice

Individuals, organization and countries should all think carefully about the implications of virtual worlds. This is not easy. Like the early innovators or television whose first inclination was to film stage plays, those engaging in virtual worlds are likely to have difficulty envisioning extended applications and implications. Virtual worlds bring forth a wide range of considerations as noted above in adoption and diffusion barriers. However, this should not stifle creativity and exploration of opportunities.   In that sense, we are likely to see individuals, organization and countries try different things and come and go with respect to virtual world adoption and diffusion.

6   CONCLUSION

In this paper, we have presented quantitative and qualitative results associated with virtual world adoption in Chinese contexts using an extended Technology Acceptance Model (TAM) lens. Acceptance attitudes and barriers to adoption and diffusion based on relevant experience have been identified. However, we have only begun to explore virtual world adoption and diffusion. Studying early adopters' usage provides only part of the answer and will likely be very different from that of mainstream use. Much remains to be accomplished technologically before that occurs. Further, TAM provides only a limited view into the broad range of behavioral issues associated with virtual world use.   To further complicate matters, virtual worlds are in a continual state of change as new applications are envisioned. How people and organizations manage their online and offline presence and ways of conduct will continue to evolve as will integration between different virtual and real world domains. Research opportunities abound.

References

Agarwal, R., and Prasad, J. (1997). The role of innovation characteristics and perceived voluntariness in the acceptance of information technologies. Decision Sciences, 28(3), 557–582.

Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior in Action Control: From Cognition to Behavior (Kuhl, J. and Bechmann, J. Ed.), Springer Verlag, New York, 11-39.

Allen, D. (2007). New Virtual Worlds to Conquer in China. Asia Times, June 28.

Bhattacherjee, A. (2001). Understanding Information Systems continuance: An Expectation-confirmation Model. MIS Quarterly, 25(3), 351-370.

Chang, I.C., Hwang, H.G., Yen, D.C., and Lian, J.W. (2006). Critical Factors for Adopting PACS in Taiwan: Views of Radiology Department Directors. Decision Support Systems, 42(2), 1042-1053.

Chang, I.C., Hwang, H.G., Hung, M.C., Lin, M.H., and Yen, D.C. (2007). Factors Affecting the Adoption of Electronic Signature: Executives' Perspective of Hospital Information Department. Decision Support Systems, 44(1), 350-359.

Chau, P., and Tam, K.Y. (1997). Factors Affecting the Adoption of Open Systems: An Exploratory Study. MIS Quarterly, 21(1), 1-24.

Cooper, R.B., and Zmud, R.W. (1990). Information Technology Implementation Research: A Technological Diffusion Approach. Management Science, 36(2), 123-139.

Davidson, S. (2008). An Immersive Perspective on the SecondLife Virtual World. The Computer and Internet Lawyer, 25(3), 1-16.

Davis, F.D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly, 13(3), 319-340.

Davis, F.D., Bagozzi, R.P., and Warshaw, P.R. (1989). User Acceptance of computer Technology: A Comparison of Two Theoretical Models. Management Science, 35(8), 982-1003.

Fichman, R.G. (1992). Information Technology Diffusion: A Review of Empirical Research. Proceedings of the International Conference on Information Systems (June)

Fishbein, M., and Ajzen, I. (1975). Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research. Addison-Wesley, Reading, MA.

Gefen, D., Karahanna, E., and Straub, D. (2003). Trust and TAM in Online Shopping: An Integrated Model. MIS Quarterly, 27(1), 51-90.

Genuchten, M., Vogel, D., Rutkowski, A., and Saunders, C. (2005). HKNET: Instilling Realism into the Study of Emerging Trends. Communications of the AIS, (15), 357-370. (http://cais.isworld.org/contents.asp).

Genuchten, M., and Vogel, D. (2007). Getting Real in the Classroom. IEEE Computer, 40(10), 106-108.

Hsu, C.L., and Lu, H.P. (2004). Why do people play on-line games? An extended TAM with social influences and flow experience. Information & Management, 41(7), 853-868.

Hu, P., Chau, P., Sheng, L., and Tam, K. (1999). Examining the technology acceptance model using physician acceptance of telemedicine technology. Journal of Management Information Systems, 16(2), 91–112.

Kock, N. (2008). E-Collaboration and E-Commerce In Virtual Worlds: The Potential of Second Life and World of Warcraft. International Journal of e-Collaboration, 4(3), 1-13.

Koufaris, M. (2002). Applying the Technology Acceptance Model and Flow Theory to Online Consumer Behavior. Information Systems Research, 13(2), 205-223.

Legris, P., Ingham, J., and Collerette, P. (2003). Why do People Use Information Technology? A Critical Review of the Technology Acceptance Model. Information & Management, 40(3),191-204.

Limayem, M., Hirt, S., and Cheung, C. (2007). How Habit Limits the Predictive Power of Intention: the Case of Information Systems Continuance. MIS Quarterly, 31(4), 705-737.

Lucas, H.C., and Spitler, V.K. (1999). Technology use and performance: a field study of broker workstations. Decisions Sciences, 30(2), 291–311.

Moore, G.C., and Benbasat, I. (1991). Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation. Information Systems Research, 2(3), 192-222.

Plouffe, C.R., Hullan, J.S., and Vandenbosch, M. (2001). Research Report: Richness Versus Parsimony in Modeling Technology Adoption Decisions – Understanding Merchant Adoption of a Smart Card-Based Payment System. Information Systems Research, 12(2), 208-222.

Rogers, E.M. (1983). Diffusion of Innovations, 3rd edition. The Free Press, New York.

Szajna, B. (1996). Empirical evaluation of the revised technology acceptance model. Management Science, 42(1), 85–92.

Taylor, S., and Todd, P. (1995). Understanding Information Technology Usage: A Test of Competing Models. Information Systems Research, 6(2), 144-176.

Tornatzky, L.G. and Fleischer, M. (1990). The Process of Technology Innovation. Lexington Books. Lexington, MA.

Venkatesh, V., and Davis, F.D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. Management Science, 46(2), 186-204.