In Search of SecondLife Nirvana

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Abstract

Pedagogically-driven support for groups is a continuing challenge as we move forward in embracing technology in an ever changing educational environment. SecondLife (www.SecondLife.com) is a virtual environment that is receiving global attention and recognition. In this paper, we compare SecondLife to other group support technologies through an extended Technology Acceptance Model (TAM) lens. The environment chosen is a virtual team space in which an online book is produced through interactions between graduate students in Hong Kong and the Netherlands. A portfolio of technologies including email, forums, videoconferencing, SecondLife, and MSN was provided for team support and subsequently evaluated. Results indicate that SecondLife (at least in its current incarnation) is likely to need some reincarnation prior to ascent to Nirvana. In that sense, it is a goal hoped for but yet to be attained in supporting teams. Suggestions for development and directions for future research are provided. Conclusions are drawn.

Keywords: virtual worlds, technology acceptance, TAM, group support, pedagogy, Second Life

Introduction

Teaching and learning are undergoing a paradigm shift not only with respect to constructive alignment with student needs, but also to the creation of an extended learning environment outside traditional classroom walls. Teams are a mainstay and bedrock element of a broad range of teaching and learning activities. Comprehensively supporting teams technologically, especially in global contexts, is not easy but can be exceptionally rewarding for all involved.

SecondLife (www.SecondLife.com) is a virtual environment (within which real-life experiences can be attained) that has a range of support opportunities for teams including aspects of visualization and sense of presence, as well as text

and audio interaction. However, little is known about the reception of SecondLife in support of virtual team activities, especially in conjunction with use of a portfolio of other technologies.

The Technology Acceptance Model (TAM) (Davis, 1989) and its successor, TAM2 (Venkatesh & Morris, 2000), have been widely utilized in understanding the reaction of individuals to different technologies. TAM (and TAM2) look particularly at aspects of perceived ease of use and usefulness. Extensions of TAM and TAM2 go beyond considerations of gender and experience to include aspects of enjoyment and interaction capacity on the road to understanding user attitude and intention, thus leading to user behaviour in team contexts.

The Hong Kong / Netherlands (HKNet) project has, over the past ten years, provided a structured environment in which virtual teams experience a variety of synchronous and asynchronous technologies. Teams go through a set of pedagogically-driven activities over an eight week period, resulting in delivery of an online electronic book. HKNet has been recognized for innovation in education (e.g., Genuchten & Vogel, 2007; Genuchten, Vogel, Rutkowski, & Saunders, 2005). The project provides a platform within which aspects of the impact and implications of group support technologies can be examined.

In this paper, we compare SecondLife to other group support technologies through an extended TAM lens in the most recent HKNet project (http://bohknet.tm.tue.nl/index.html). A portfolio of technologies including email, forums, videoconferencing, SecondLife, and MSN was provided for team support and subsequently evaluated. Results are presented and discussed. Suggestions for development and directions for future research are provided. Conclusions are drawn.

Background

Teaching and learning is undergoing a paradigm shift not only with respect to constructive alignment with student needs, but also to the extended learning environment outside traditional classroom walls becoming salient. E-learning is key to this transition and sustaining educational presence in life-long learning. Currently, there are many hurdles where a consistent problem is that much of what we have in terms of technological support is not well-understood, nor is it integrated in a fashion that can synergize extended use by a large number of educators and students.

Teams are a mainstay and bedrock element of a broad range of teaching and learning activities. Comprehensively supporting teams technologically, especially in global contexts, is not easy but can be exceptionally rewarding for all involved. A common problem in virtual teams is lack of presence and difficulty in sustaining interaction and developing trust, especially in multi-cultural circumstances. This is further complicated by the often fragmented nature of team support, both in terms of pedagogically-driven protocols and technological support. Seamless integration with a focus on scalability and sustained effort is paramount.

Technological support for teams has been conducted under a collection of names, such as Group Decision Support Systems, Electronic Meeting Systems, Group Negotiation Support Systems, Computer Mediated Communication Systems, and Computer Supported Collaborative Work (e.g., Grudin, 1991). We collectively recognize this area of study as Group Support Systems (GSS). A variety of feature categorizations and frameworks has been proposed (e.g., DeSanctis & Gallupe, 1987). There has been extensive research examining GSS application in both laboratory and field settings (e.g., Dennis, George, Jessup, Nunamaker, & Vogel, 1988; Kwok, Ma, & Vogel, 2002; Nunamaker, Briggs, Mittleman, Vogel, & Balthazard, 1997; Qureshi, Liu & Vogel, 2006; Vogel, Nunamaker, Martz, Grohowski, & McGoff, 1990). GSS has also been evaluated in distributed contexts (e.g., Valacich, George, Nunamaker, & Vogel, 1994) with special attention to processes (e.g., Dean, Lee, Orwig, & Vogel, 1995; Dean, Orwig, & Vogel, 2000). Stahl (2006) has focused particularly on computer support for building collaborative knowledge.

GSS application has recently focused on virtual groups (e.g., Lu, Watson-Manheim, Chudoba, & Wynn,, 2006; Maznevski & Chudoba, 2000; Saunders, Van Slyke, & Vogel, 2004). Piccoli and Ives (2003) examine aspects of trust and the unintended effects of behavior control in virtual teams with US participants, and note the sensitive nature of degree of control in affecting team interactions. Griffith, Sawyer, and Neale (2003) point to difficulties inherent in balancing distribution and transfer of individual and organizational knowledge in virtual teams. Robey, Khoo, and Powers (2000) particularly deal with varied use of technology in international virtual team contexts. Kanawattanachai and Yoo (2007) examine aspects of knowledge coordination. GSS has also long been used in supporting university groups and researchers with technology, in both local and distributed contexts (e.g., Alavi, Yoo, & Vogel, 1997).

HKNet

The HKNet (Hong Kong and the Netherlands) project began in 1998 with the universities of Eindhoven and Hong Kong. The number of students has ranged from 65 to 180, depending on class sizes at the various sites. Each HKNet team typically consists of eight to ten students in two to four locations. The team is assigned an IT-related topic such as software in the car industry and household robotics which students approach from different geographical and cultural perspectives. The structured process consists of several divergent and convergent activities that take place over eight weeks. The different groups produce a Web site for discussing their topics from European and Asian perspectives. The web sites are integrated into an electronic book.

This process involves a multi-year effort in which participants use the results of previous years as input for the current year. In week 1, the participants are formed into teams who first evaluate the previous years' websites. Subsequent weeks focus on identification of research questions in association with their selected topic and creation of a development and delivery plan. In week 6, students need to deliver a Web site that discusses their topic. Then, in week 7, they must integrate a chapter into the project's electronic book (http://bohknet.tm.tue.nl/index.html).

The technologies used in the most recent HKNet project include e-mail, forums (Blackboard), videoconferencing, SecondLife and a common online chat tool (MSN). The students are free to choose which tools to use (and how) to create the Web site. HKNet classroom instructors address group dynamics and management issues to accelerate the experiential learning, including planning, work breakdown, information overload, and knowledge management. Experiences over the years have been systematically recorded (e.g., Rutkowski, Vogel, Bemelmans, & Genuchten, 2002; Rutkowski, Saunders, Vogel, & Genuchten, 2007; Vogel et al. 2001).

There is often confusion on when the word "which" should be used to introduce a clause and when "that" should be used and when they should be separated from the rest of the sentence by commas. In this journal we will follow these guidelines.

SecondLife

Virtual worlds have appeared in educational research since the early 1990s (e.g., Hughes & Moshell, 1997) and are now becoming popular in universities and companies as a tool to create virtual learning environments. For example, Chinese virtual worlds in various stages of development and implementation include HiPiHi, Shanda, uWorld from UOneNet, Entropia, Frenzoo, and Novoking. On a global level, SecondLife, is attracting special interest from educational and business fields. SecondLife (from Linden Research) is an online virtual world where the content is built and owned by its users, providing tools and guidance for manipulating the environment and allowing action scripting, object construction and an economy that supports the creation of virtual environments (Hobbs, Gordon, & Brown, 2006). SecondLife has characteristics both as a

distributed communication tool and as an entertainment environment, and has relevance in both online collaborative learning and online business fields.

SecondLife (www.SecondLife.com) is a virtual environment within which real-life organizational experiences can be attained. It is an opportunity space (not a deterministic space) limited only by imagination. Admission is free and learning opportunities abound. SecondLife has representations of a wide variety of existing global organizations (e.g., car dealerships, computer industry, insurance companies and financial institutions), in addition to newly created entrepreneurships whose only limitation is the imagination of the creators. Governments also have a presence on SecondLife (e.g., the Swedish embassy). SecondLife has a currency (i.e., Linden dollars) that enables participants to engage in business transactions. There are currently over 30 universities with a SecondLife presence and communities of practice.

The Alpine Executive Center, located on the MeetingSupport sim in Second Life, was used in 2007 to support HKNet. Within an alpine ski village, surrounded by snow-covered mountains and tucked away deep inside the mountain, lies an advanced meeting facility where real-world activities take place in a virtual environment. A main amphitheater is accessed via a train that goes deep inside the mountain complex or by a walk along the frozen ice skating pond, or by teleport from the visitor landing area. An auditorium supports large groups in plenum for presentations and moderated discussions. A host of additional facilities exist to support teams. For example, teams can meet at one of the ten gathering spots around the Alpine village, including mountain huts with interactive screens and scenic lookouts. Participants also have opportunities to explore, shop, play, go ice skating or just have fun together riding the chair lift and using the timed downhill and slalom ski runs.

Research Approach

In this study, we focus on respondents' acceptance and use of SecondLife (SL) as a communication tool. We incorporate core constructs of the Technology Acceptance Model (TAM) championed by Davis (1989) based on the Theory of Reasoned Action (TRA), as illustrated in Figure 1. According to Davis (1989), **Perceive usefulness (PU)** is "the extent to which a person believes that using a particular technology will enhance her/his job performance"; **Perceived ease of use (PEOU)** is the "degree to which a person believes that using the system will be free from effort." TAM has been used extensively for understanding and predicting user acceptance of information technology (e.g., Bhattacherjee, 2001; Gefen, Karahanna, & Straub, 2003; Ha, Yoon, & Choi, 2007; Hsu & Lu, 2004; Hwang, 2005; Koufaris, 2002; Lou, Luo, & Strong, 2000; Mellarkod, Appan, Jones, & Sherif,, 2007; Wu & Liu 2007), and has been empirically demonstrated successful in prediction system use (Hu & Chau,1999; Legris, Ingham, & Collerette, 2003).
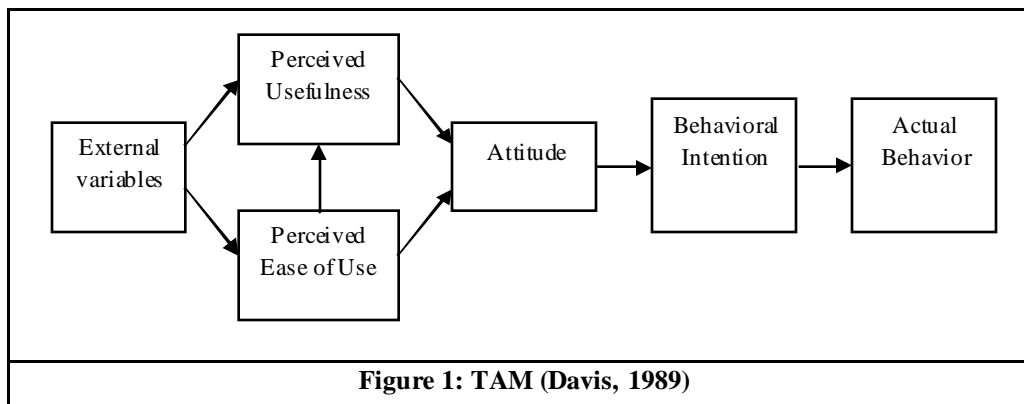

Figure 1: TAM (Davis, 1989)

However, researchers suggest that the two dimensions in TAM, perceived usefulness (PU) and perceived ease of use (PEOU), are too narrow and shine light on only a part of technology acceptance and use. Further, they believe that more factors from other aspects (such as emotional reactions and social factors) should be included to explain acceptance more consistently and comprehensively (Agarwal & Prasad, 1997; Legris et al., 2003; Lucas & Spitler, 1999; Szajna, 1996). Thus, TAM2 (by Venkatesh & Morris, 2000, see Figure 2) has been proposed to better explain the acceptance and use of IT applications. Factors including subjective Norms (SN) and moderators or control variables, including gender and experience, are identified. Empirical studies (e.g., Hsu & Lu, 2004) have been carried out to demonstrate the relevance of TAM2 in predicting IT acceptance.

Figure 2: TAM2 (Venkatesh & Morris, 2000)
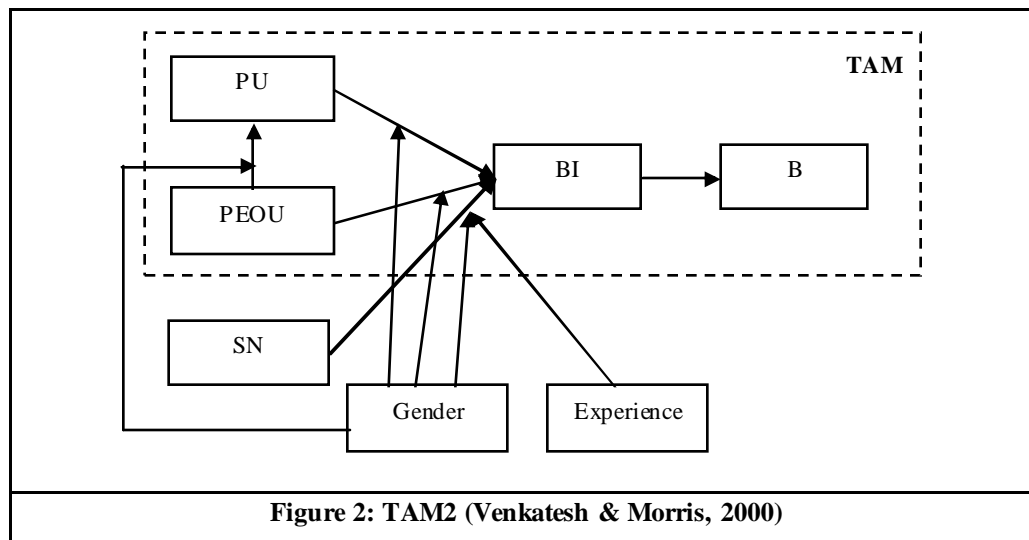
Subjective norm (SN) is the degree to which an individual believes that people who are important to her/him think that she/he should perform the behavior in question (Fishbein & Ajzen, 1975; Venkatesh & Morris, 2000). In the technology domain, social influences (from both peer and superior sides) have been shown to be strong determinants of subjective norms (Mathieson, 1991; Taylor & Todd, 1995). Such circumstances are particularly important in the context of virtual teams. **Interaction Capacity (IC)** as a particular issue was included to tap differences in media richness relevant to team interactions. In this sense, capacity to transmit multiple cues (e.g., body language and voice tone) and emotions (e.g., anger, happiness and excitement) as well as functionality relevant for interaction and an appropriate style of design (e.g., an attractive interface) were added as measures. **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) and was added to take into consideration aspects extending beyond work. PEN has been shown to have positive effects on intention (Ha et al., 2007; Hsu & Lu, 2004).

Results

A voluntary online survey was given in week 3 after students had experienced each of the technologies under examination, i.e., email, forums, videoconferencing (VC), SecondLife (SL) and MSN. The developed questionnaire (see the Appendix) reflects measures for the previously noted constructs using a 7-point Likert scale from "strongly disagree" to "strongly agree." A total of 48 participants (55%) responded. The following Figures illustrate survey results.

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 less (p=.00) compared to any other technology examined. As one participant noted, *"No one is there when I login SL."*
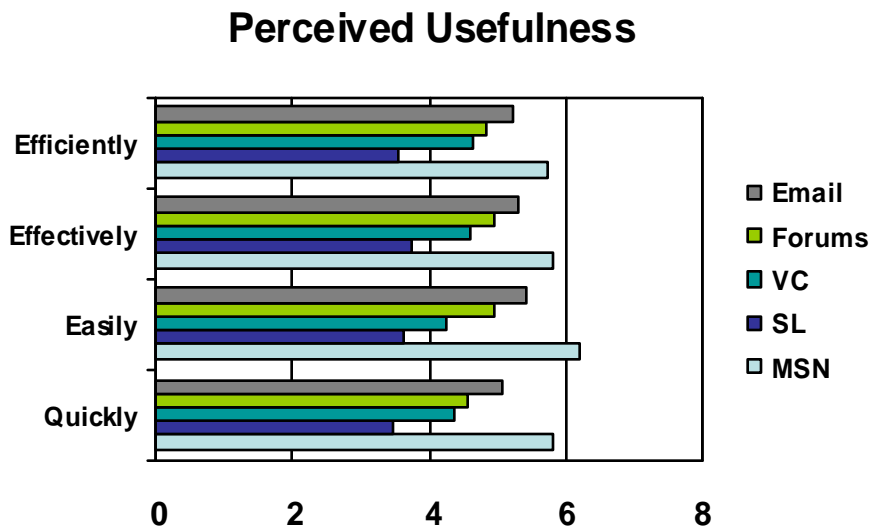
Perceived Usefulness

Figure 3: Perceived Usefulness

Perceived ease of use, as illustrated in Figure 4, followed patterns similar to perceived usefulness for essentially the same reasons. Email and MSN are even more dominant as one might expect given participant familiarity and broad-based use. Here again, ANOVA with Tukey followup revealed that the mean response to SecondLife was significantly less (p=.00) compared to any other technology examined.
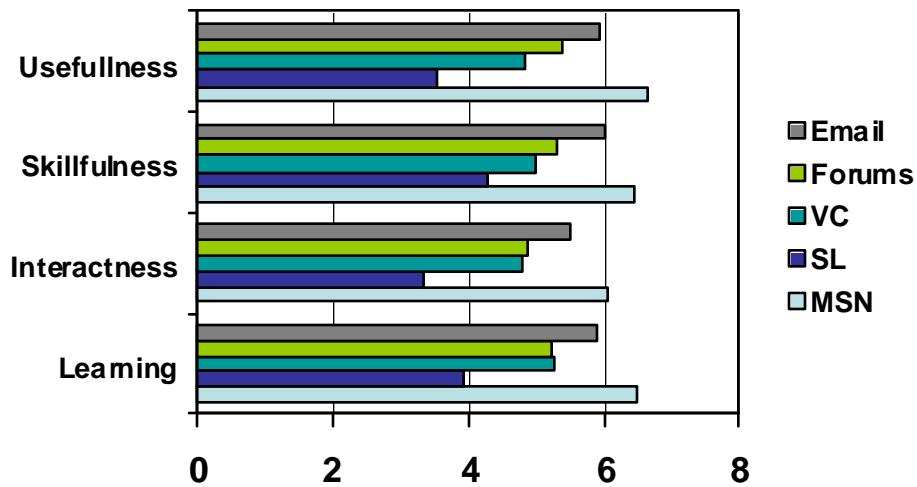
Perceived Ease of Use

Figure 4: Perceived Ease of Use

Not surprisingly, as illustrated in Figure 5, attitude generally follows perceived usefulness and ease of use given their TAM precedence noted in Figure 1. The exception is the enhanced desirability of videoconferencing attributable to its high degree of sense of presence and degree of interaction realism, courtesy of being a rich media. ANOVA with Tukey followup revealed that the mean response to SecondLife was significantly (p=.00) less compared to any other technology examined other than forums (p=.08).
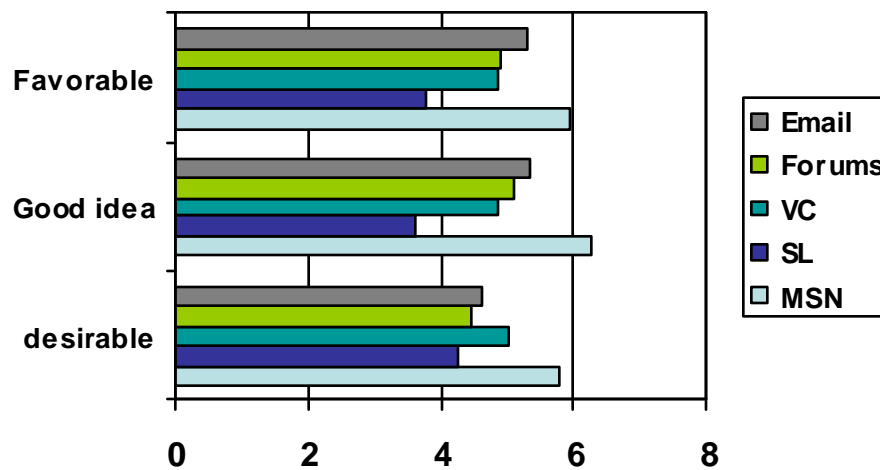
Perceived Team Attitude

Figure 5: Perceived Team Attitude

Perceived team enjoyment as illustrated in Figure 6, begins to recognize some of the distinctive characteristics of other less lean media. Here we can see a relative increase of SecondLife as well as videoconferencing, especially in terms of fun. ANOVA with Tukey followup revealed that the mean response to SecondLife was significantly less (p=.01) compared only to MSN and not sig-

nificantly different to the other technologies (i.e., videoconferencing, email and forums). However, MSN still rules supreme on all measures, perhaps as a reflection of its ease of use and perceived usefulness.

Interaction capacity, Figure 7, illustrates special interest in videoconferencing, and SecondLife to a lesser extent, especially in terms of having an appropriate style of design (e.g., an attractive interface) for interaction. Here, ANOVA with Tukey followup revealed that the mean response to SecondLife was significantly less (p=.00) compared to forums and email and MSN (p=.03) but not significantly different to videoconferencing. Videoconferencing is dominant in terms of ability to transmit emotions (such as anger, happiness and excitement) and capacity to transmit multiple cues (such as body language and voice tone). This is not surprising given its multi-media nature. SecondLife exhibited similar characteristics but was not able to overcome the overall dominance of MSN.

Overall, intention to use as illustrated in Figure 8 speaks well for simplicity and the general dominance of ease of use and usefulness of MSN and email. SecondLife rates poorly by comparison while forums and videoconferencing assume a middle-level existence. ANOVA with Tukey followup revealed that the mean response to SecondLife was significantly less (p=.00) compared to MSN and email as well as videoconferencing (p=.01) and even forums (p=.05) completing the sweep of negative reaction.
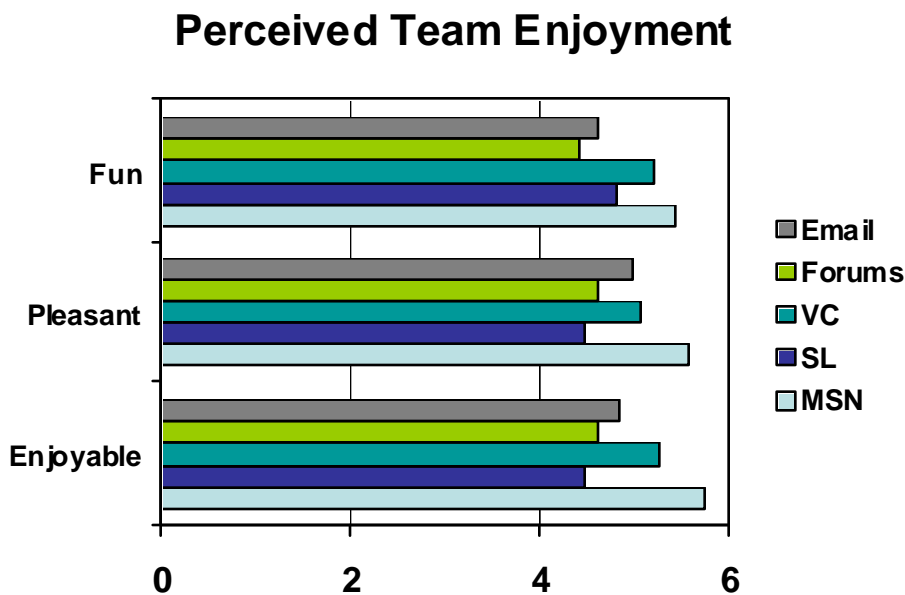

Figure 6: Perceived Team Enjoyment

Interaction Capacity
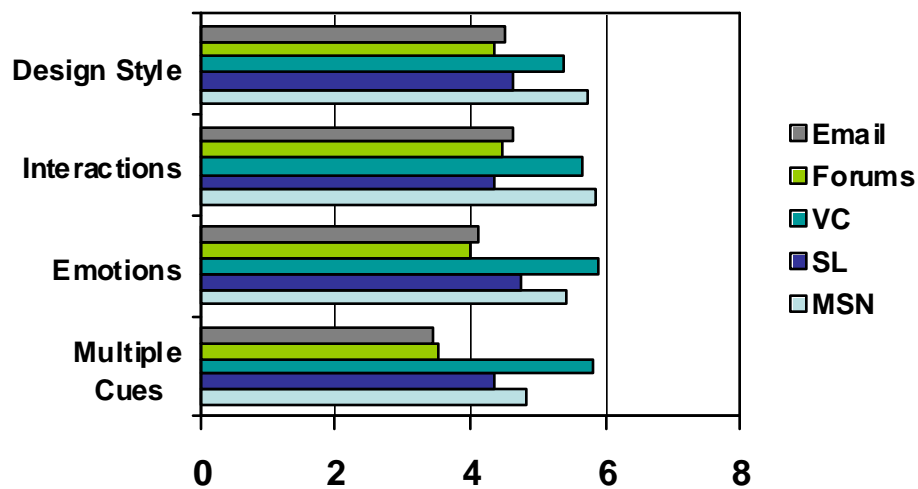
Figure 7: Interaction Capacity

Intention to Use
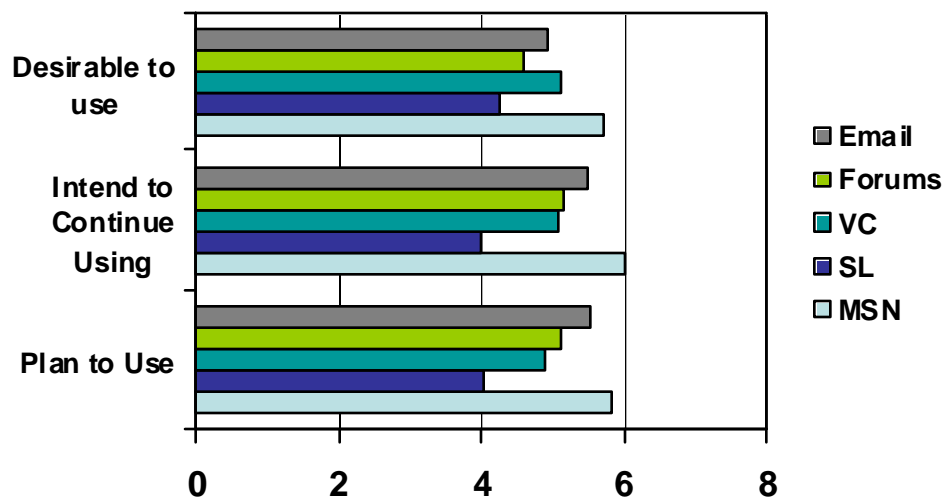
Figure 8: Intention to Use

Discussion

Clearly, SecondLife has not fared well under the lens of TAM and TAM2. Part of the reason lays in the general difficulty of loading and using the software. SecondLife is updated weekly, places high demands on bandwidth and is prone to frequent crashes and general poor performance, relative to more established technologies. 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.*"

Further, it may be that TAM is a poor lens with which to examine SecondLife 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 SecondLife in its combined work and play motif. Indeed, our results provide some support in that regard, noting the relatively higher ratings for SecondLife in terms of perceived team enjoyment and interaction capacity. However, all was not that favorable for SecondLife in this regard. As one participant noted, "*I do not view SL as a game. It is funny, has lots of features, but we do not need these features, MSN is enough.*"

Measures of SecondLife typically had twice the amount of variance relative to other technologies examined, pointing to differences within the population surveyed. Women significantly rated SecondLife higher than men, and older participants were significantly more pleased which we attribute to novelty and lack of interest in more advanced gaming environments (tending towards more violence with less business focus). As one participant noted, "*SL is interesting, has lots of features, but I have no time to explore them, although I like them. But we will try these features in the future.*"

SecondLife, under the best of circumstances, still has much room (and need) to grow beyond issues of technical stability. The lack of avatar realism, compared to popular online games, is a drawback that is relatively easily overcome. The recent introduction of audio helps offset some of the inconvenience of text only data entry. Lacking, however, is the type of seamless integration and support for learning and administration that will propel broad-based use with consistently demonstrated success. SecondLife is currently a very closed system with little inherent support for group support in terms of knowledge discovery, storage and dissemination.

Beyond SecondLife itself are the issues of institutional receptivity and readiness. Institutions struggle to realize that a single product can have both gaming and educational use and that "edutainment" is a viable alternative to more traditional approaches. The end result is that SecondLife is often classified as a game and subsequently is blocked for general student access. This decision is made easier in that SecondLife is resource intensive in terms of bandwidth and only certifies a small range of graphics cards. Institutions are currently unprepared (and under-funded) to deal with these issues that quickly extend to pedagogical and strategic implications.

There are numerous limitations to our current study. Our participants were predominantly Chinese; SecondLife is predominantly Western-oriented, even though a China-town exists and participants can take on an "Asian look" if they wish to do so. Although no significant differences existed in our data relative to participant nationality, the lingering suspicion is that cultural differences do enter into aspects of use. For example, some Chinese have been taught that work and play do not mix which can be expected to affect their reaction to SecondLife. An additional serious limitation is the focus on TAM taken in this study. TAM (and TAM2) are oriented to explore acceptance of more traditional information systems that generally do not have the rich set of characteristics and emotional reaction present in SecondLife. In that sense, there are likely aspects of SecondLife that remain to be illuminated.

Directions for future research include recommendations for further comparison and contrast of products other than SecondLife. Broadening the search space to include sense of presence and other relevant constructs is a high priority, as is also giving more focused attention to the impact of audio on team interactions. Further, we have embarked on adding embedded tools into SecondLife that better support the needs of interacting teams e.g., Brainstorming and voting. SecondLife provides an opportunity to give graphical life to traditional GSS, e.g., two-dimensional voting where participants can "stand" on the cell of their choice.

Conclusion

SecondLife ushers in a new range of opportunities and considerations with respect to supporting teaching and learning. The mix of work and play in education is only beginning to be explored, especially in conjunction with team-based projects as reported in this paper. Examining the impact of SecondLife through the lens of TAM (and TAM2) and extended to consideration of aspects such as interaction and perceived enjoyment is but a first step in understanding acceptance. Results indicate that SecondLife (at least in its current incarnation) is likely to need some reincarnation prior to ascent to Nirvana. In that sense, it is a goal hoped for but yet to be attained in supporting teams. This should be seen more as the first step in a long road of development and research that, over time, can be expected to provide heightened insight and impact technology application in teaching and learning. The future is challenging in this regard.

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Appendix: Online Survey

The aim of this survey is to study the technologies you (as well as your virtual team) use to support virtual team interaction during the HKNet project.

Please mark your response for all propositions for 5 technologies: **Instant Messaging (MSN), Second Life (SL), Video Conferencing (VC), Forums and Email.** The following definitions apply:

- **Virtual Team**: A group composed of both Hong Kong and Netherlands members working together.
- **Forums**: the discussions associated with your virtual team area in Blackboard.

The results of this survey will help us assess learning environment support and development for extended student use and may be used in academic papers. All your responses will be kept confidential. Thank you for your participation!

	Strongly Disagree		Neutral		Strongly Agree
	1.1 MSN				
	1.2 SL				
1. Our virtual team could interact *quickly* using (…).	1.3 VC				
	1.4 Forums				
	1.5 Email				

2. Our virtual team could interact *easily* using (…).	MSN SL VC Forums Email				
3. (…) enhances/enhance our virtual team *effectiveness* in interacting.	MSN SL VC Forums Email				
4. Our virtual team could interact *efficiently* using (…).	MSN SL VC Forums Email				
5. Learning to use (…) was easy for our virtual team.	MSN SL VC Forums Email				
6. Our virtual team found it easy to use (…) to interact.	MSN SL VC Forums Email				
7. It was easy for our virtual team to become skilful at using (…).	MSN SL VC Forums Email				
8. Overall, our virtual team believes (…) was/were easy to use.	MSN SL VC Forums Email				

9. Our virtual team found using (…) to be enjoyable.	MSN SL VC Forums Email				
10. The actual process of using (…) was pleasant.	MSN SL VC Forums Email				
11. Our virtual team had fun using (…).	MSN SL VC Forums Email				
12. In our virtual team opinion, it was desirable (cool) to use (…).	MSN SL VC Forums Email				
13. In our virtual team opinion, it was a good idea to use (…).	MSN SL VC Forums Email				
14. Overall, our virtual team attitude towards (…) was favourable.	MSN SL VC Forums Email				
15. (…) has/have the capacity to transmit multiple cues (such as body language and voice tone).	MSN SL VC Forums Email				

16. (…) has/have the capacity to transmit emotions (such as anger, happiness, and excitement).	MSN SL VC Forums Email				
17. (…) has/have good functionality relevant to interaction.	MSN SL VC Forums Email				
18. (…) has/have (an) appropriate style of design (e.g. an attractive interface) for interaction.	MSN SL VC Forums Email				
19. Our virtual team did NOT schedule the use of (…).	MSN SL VC Forums Email				
20. Our virtual team paid much attention to schedule the use of (…).	MSN SL VC Forums Email				
21. Our virtual team tightly scheduled the use of (…)	MSN SL VC Forums Email				
22. Our virtual team used (…) only when planned.	MSN SL VC Forums Email				

23. I plan to use (…) during the remainder of the project.	23.1 MSN 23.2 SL 23.3 VC 23.4 Forums 23.5 Email				
24. I intend to continue using (…) during the remainder of the project.	MSN SL VC Forums Email				
25. In my opinion, it is desirable (cool) to use (…).	MSN SL VC Forums Email				

Personal Information

Student ID: _____

Your Gender:	A. Male	B. Female		
Your Age:	A. 18-21	B. 22-25	C. 26-29	D. >29
Your Work Experience (years):	A. 0	B. 1-2	C. 3-4	D. >4
Your Location:	A. Hong Kong	B. The Netherlands		
Your Nationality:	A. Mainland China	B. Hong Kong, China		
	C. The Netherlands	D. Other		

Biographies

Doug Vogel is Professor (Chair) of Information Systems and an AIS Fellow. He has published widely and directed extensive research on group support systems, knowledge management and technology support for education. His research interests bridge the business and academic communities in addressing questions of the impact of information systems on aspects of interpersonal communication, group problem solving, cooperative learning, and multi-cultural team productivity and knowledge sharing. Additional detail can be found at http://www.is.cityu.edu.hk/staff/isdoug/cv/

Xitong (Maxwell) Guo is a Ph.D. student in the joint program between CityU (City University of Hong Kong) and USTC (University of Science and Technology, China). He is part of the Knowledge Management and Innovation Research Group in the CityU/USTC Research Center, SIP (Suzhou Industry Park). His research interests include information sharing issues in supply chain management and social computing.

Zhongyun (Phil) Zhou received his B.A. in Management Science from USTC and is currently a PhD student in the USTC-CityU Joint Advanced Research Center, a collaborative scheme for PhD student supervision sponsored by the University of Science and Technology of China (USTC) and the City University of Hong Kong (CityU). His current research interests include the adoption and utilization of new information technology (IT) applications and the roles and strategic value of IT for managing knowledge in distributed work groups.

Wen (Stella) Tian earned her undergraduate degree in Management Science from the University of Science and Technology of China (USTC). She is currently studying at the USTC-CityU Joint Advanced Research Center towards a PhD in Information Systems. She has taken part in research and consultant projects such as Chinese Virtual World Adoption and Diffusion, Short Term Behavior in Chinese Scientific Community and Strategies on Compensation & Culture of Huishang Metal Co., Ltd. and published accordingly.

Xi (Jacky) Zhang received a Bachelor degree from the University of Science and Technology of China (USTC). He is enrolled in the joint PhD program between USTC and City University of Hong Kong (CityU). At present he is a PhD candidate in the department of Information Systems at CityU. His research focuses on software development management, distributed work, and knowledge management in Chinese enterprises.