Perceptions of Educators Regarding the Acceptance of Multi-User Virtual Environments as an Educational Tool

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Abstract

The concept of Multi-User Virtual Environments (MUVEs) has opened new avenues in the educational spectrum. Despite its popularity as an educational environment tool, the successful implementation of a virtual classroom is heavily reliant on the educator. This research focuses on the perceptions of educators regarding the acceptance of the MUVE as an educational tool. The Technology Acceptance Model (TAM) was used to identify and evaluate the potential benefits of the MUVE in the domain of education. The qualitative approach was considered to be the suitable approach for this study. Semi-structured interviews were conducted with 22 educators; these interviews included the demonstration of a virtual class located in the Second Life Island known as Jokaydia. The collected data was transcribed using NVivo software, and analysed using constant comparison analysis. The transcribed interviews were provided to another researcher in order to obtain an independent analysis; this created the basis for triangulation of participants' perceptions. A summary of this analysis was then sent to all participants to confirm its credibility. The conclusions of the study suggest that the combination of MUVEs' features and strengths will eventually influence the educators to accept the MUVE as an educational tool, although several areas of concern are identified. Future growth in the educational uses of MUVEs is examined, the implications and limitations of the study are discussed, and ideas for future research are elaborated on.

Keywords: MUVE, Second Life, education, TAM, ease of use, subjective norm, enjoyment, facilities, compatibility, security and trust, collaboration, awareness, media richness, discovery learning, situated learning, role playing, controlled environment, immersiveness.

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CHAPTER ONE

Introduction

The emergence of web-based learning has the potential to provide an intuitive work environment in the practice of teaching and learning, thus opening new avenues to researchers in the educational spectrum and in information systems. Volery and Deborah (2000) reported that since the emergence of the Internet, the literature on web-based applications has been steadily increasing. This literature has focused on a variety of opportunities that web-based learning has opened in areas such as distributed learning, computer-based learning, distance learning, and lifelong learning.

Educational institutions are widely implementing Internet-based Learning Management Systems (LMSs) to facilitate learning. A typical LMS offers a variety of features, namely: discussion forums, online chat rooms, grade books, assignment file drop-boxes, self-scoring quizzes, and online tests such as multiple-choice questionnaires. These features are intended to provide flexible access to course materials and to facilitate communication and collaboration between educators and students. Livingstone and Kemp (2006) noted that although traditional LMSs often contain a diverse range of alternatives for communication between educators and students, in actual practice they are primarily used as document storage facilities which can be accessed from outside the classroom by educators and students.

A new paradigm of web-based learning which would open the way to much more natural and rich communication and interaction within a highly configurable contextual form is offered by Multi-User Virtual Environments (MUVEs). In a MUVE, users such as educators and students are represented by avatars in a 3D, computer-game-like environment which can be configured to represent aspects of the real world,

made relevant to the topic of study, or, even, to represent abstract concepts. The potential of the MUVE, (viz. to provide opportunities for students to construct their own learning through interaction, and to offer a rich environment for role-playing simulation, together with providing opportunities for students to practice skills such as job interviews and interpersonal skills and to be a medium for creative arts) in the educational field is widely recognised (see Salt, Atkins, & Blackall, 2008).

Although early prototypes have been available since the nineteen-nineties, the MUVE as a viable technology is relatively recent. Second Life, which became available in 2003, was the first, and until now, the only MUVE system to enjoy a massive following. It attracts educators from all over the world by offering a variety of opportunities for interaction, a sense of community, and role-play capabilities with over 100 educational institutes establishing their virtual campuses in Second Life and actively working in the virtual world (Zhang, 2007). New technologies are not always readily accepted; therefore, before general acceptance, the MUVE technology requires investigation.

Salt, Atkins, and Blackall (2008), released a literature review on virtual worlds to explore the value of a MUVE such as Second Life as it relates to education. In this review, Salt et al. found that Second Life is already being used in educational activities such as experiential learning, role-play activities, direct exploration of environments relevant to science, technology, history, architecture and interior design subjects, art activities, training activities, and activities simulating social situations such as interviews. Salt et al. also identified barriers such as technical issues and the steep learning curve that may prevent educators from using MUVEs such as Second Life as an educational tool.

The work by Salt, Atkins, and Blackall (2008) exemplifies the current literature on MUVE applications in education viz. while the researchers are interested in the use of MUVEs in general, currently Second Life dominates the market as it is the focus of attention for research related to the actual use of MUVEs.

While the full impact of MUVEs in teaching and learning practice is currently being recognised, it is solely driven by enthusiasts, who receive a certain degree of institutional support. In New Zealand, this is exemplified by the Second Life Education New Zealand (SLENZ) project funded by the New Zealand Tertiary Education Commission (Salt, Atkins, & Blackall, 2008). This project aims to increase the awareness of MUVEs (using the Second Life environment) in New Zealand, and to encourage educators to teach within a MUVE. It is led by the Nelson Marlborough Institute of Technology, and involves a number of other New Zealand tertiary institutes including Otago Polytechnic, Wellington Institute of Technology, The Open Polytechnic of New Zealand, and Manukau Institute of Technology.

In this thesis, the researcher focused on the acceptance of MUVEs as a web-based learning tool. In particular, the researcher was interested in the perceptions of educators regarding various aspects of MUVEs and its adoption, with a particular emphasis on the perceptions of the usefulness of MUVEs in an educational setting.

Purpose

The main purpose of this thesis is to study the perceptions of educators regarding the acceptance of Multi-User Virtual Environments (MUVEs) as an educational tool.

The research questions addressed by this thesis are:

1) How do the known determinants of technology acceptance influence the intentions of educators to use the MUVE as an educational tool?

2) How do educators perceive the potential benefits of educational use of the MUVE?

Research Overview

There is a substantial body of literature devoted to various factors relating to technology acceptance. An important factor this researcher looked for is the perceived usefulness; also, many research publications suggest various ways in which MUVEs could be useful in educational settings. (For a detailed account of literature on technology acceptance and on the MUVE's usefulness in educational settings, refer to Chapter Two of this thesis.)

Educators' decisions relating to acceptance of the MUVE will be based on their perceptions which, so far, have not been researched in a systematic way. In this thesis, what the researcher aims to present is a rich description of educator perceptions regarding acceptance of the MUVE; to achieve this, a qualitative research design was employed.

Significance

Although MUVEs have a great potential to be utilised in educational environments, the successful implementation of a MUVE is heavily reliant on the educator. Their perceptions of MUVEs will influence their acceptance decisions, as well as their teaching practice when using a MUVE. Furthermore, as the methods for educational uses of MUVEs are increasingly

supported and promoted by educational and software tools providers, the outcomes of this research are relevant to current and future practice.

The outcome of this study could also be used as a basis for a broader examination of educator perceptions around the use of MUVEs in teaching; for example, a quantitative study that would involve a large numbers of respondents.

Thesis structure

The layout of this research is as follows. First, the researcher conducted a comprehensive review of literature with a focus on factors relating to both the technology acceptance, and the claimed benefits of the MUVE in educational settings. Based on the literature, the researcher formulated an open-ended questionnaire (see Appendix A) and selected 22 educators from a wide variety of backgrounds. Of the selected participants, 11 had experience in using Second Life for teaching; 11 had no experience in using MUVEs. To ensure that the participants with no experience grasped the general concept of MUVE capabilities, the researcher created a teaching environment in Second Life and demonstrated it to each of those participants before the interview.

The data collected was fully transcribed and analysed using the constant comparative method (Corbin & Strauss, 2008). Analyst triangulation (Patton, 1999) was applied for validation purposes. As an additional step to ensure trustworthiness, the interview participants were informed of the summary of data analysis by e-mail and invited to respond with any amendments. Their responses were treated as an additional source of data.

This thesis has six chapters. The introductory chapter is followed by a literature review, which starts by introducing MUVE functionality relevant to educational applications, and using Second Life as an example. Then the literature review introduces the Technology Acceptance Model (TAM) that frames this study, and describes various factors found to influence technology acceptance decisions. This is followed by a review of publications

devoted to educational uses of the MUVE, with an emphasis on claims made by researchers regarding the usefulness of the MUVE in educational settings.

In Chapter Three, the researcher introduces the qualitative research design, and discusses the use of semi-structured interviews in collecting qualitative data. This is followed by the construction of a semi-structured questionnaire to be used in this study. Questions used in the questionnaire are related to the literature. Then the researcher discusses the approach used to select the participants, and presents background information on those who agreed to take part in the study. This is followed by a discussion of the data collection process and of the approach to be taken in data analysis (including steps taken to increase its credibility). The research design chapter concludes with a discussion of how this study addresses the ethical issues.

Chapter Four describes the process of creating the virtual class the researcher used for demonstration purposes in this study, and presents the rationale for selecting the features and tools that were included in the environment.

In Chapter Five, the outcomes of data analysis are discussed by presenting a rich description of the participating educators' perceptions. The steps taken to improve the validity, including triangulation and checking by participants, are also described.

In the final chapter, the conclusions of the study, based on the findings in the previous chapter, are presented by addressing the two questions of the study. A discussion on the implications and limitations of the study is then presented, followed by indications for future research.

CHAPTER TWO

Literature Review

This literature review commences by introducing Second Life as a representative of a MUVE. Next, the Technology Acceptance Model (TAM) factors which are utilised to impact the technology acceptance decisions are discussed. Finally, the claimed benefits of using the MUVE for the educational world are reviewed with a view to expanding the TAM concept of usefulness in the context of educational uses of MUVEs. In Chapter Three, factors impacting on technology acceptance decisions and claimed benefits of MUVEs are used as topics to focus on data collection.

Second Life as a Representative of MUVE

In this chapter, features provided by MUVEs are discussed. The focus is on Second Life, as it is the only currently available MUVE with a massive following (Salt et al., 2008), and any future alternative environments are likely to be strongly influenced by it.

Users in a virtual environment are able to create 3D objects that can be seen and used by the person who created the object as well as by other people. Zhang (2007) pointed out that many researchers and educators are experimenting with the use of MUVEs for teaching and learning. The main environment they have used is Second Life. Furthermore, many pioneers in higher educational institutes are developing interactive learning materials by taking advantage of the MUVE features provided by Second Life.

Currently, a number of MUVEs are available, with virtual environments that could be used as an educational tool. Salt et al., (2008) noted that almost all the

reported educational activities in MUVEs occur in Second Life. This virtual world, introduced by Linden Lab (Linden Lab, 2009), enables its residents to collaborate with each other through avatars, in such a way as to accommodate an advanced stage in a social networking service combined with other visible features of a virtual world. The terms that are commonly used in Second Life are defined in Appendix B (Glossary of Terms). The avatar populated virtual world is highly interactive, and thereby offers a more effective and enjoyable experience. The avatars which are controlled by the visitors, can walk, talk, and face each other as well as carry out a range of other activities performed by real persons (Second Life, 2009a).

This thesis presents a study of the perceptions of educators regarding the acceptance of Multi-User Virtual Environments (MUVEs) as an educational tool. The study is framed by the Technology Acceptance Model (TAM) and this is discussed next.

Technology Acceptance Model

The Technology Acceptance Model (TAM) has provided extensive support for understanding the factors for acceptance of information technology applications. As Chau (1996) pointed out, TAM is one of the leading research models which can be utilised to determine the acceptance of information technologies. As this research investigates educators' perceptions and their likelihood (or otherwise) of adopting the MUVE, it is considered that TAM is an appropriate framework.

The TAM, originally proposed by Davis (1986), is based on the theory of reasoned action (Fishbein & Ajzen, 1975) in psychology research, and addresses how users approach, and decide to accept and use, a particular technology. In the TAM,

there are two major factors which influence its acceptance: ease of use and usefulness. However, this has been extended by other researchers (Venkatesh & Davis, 2000; Venkatesh & Morris, 2000) who have added in factors such as enjoyment, subjective norm, facilitating conditions, compatibility, trust, and security.

The TAM has been broadly used to forecast the acceptance of new technologies. A number of studies have successfully adopted TAM to examine the acceptance of new technologies such as personal computers (Igbaria, Zinatelli, Cragg, & Cavaye, 1997), acceptance of technology for teaching (Hofmann, 2002; Sumner & Hostetler, 1999; Williams, 2002), and adoption of WebCT (Ngai, Poon, & Chan, 2007).

By exploring previous studies, six of the TAM factors were selected in order to analyse the perceptions of educators concerning acceptance of a MUVE as an educational tool. They are viz. ease of use, subjective norm, enjoyment, facilitating conditions, compatibility, and security and trust. The reasons for adopting each of these factors and exploring them with the MUVE selected for the study are explained below.

Ease of Use

Ease of use is an important factor in acceptance of applications; this refers to the degree to which an individual deems working with a particular technology to be free of effort. Davis, Bagozzi, and Warshaw (1989) identified that perceived ease of use, from the user's point of view, equates to the extent of effort required to utilise an application.

The ease of use in MUVEs is defined mainly by the ease of navigation in the virtual environment. To increase navigational ease, Liu (2006) and Hollins and Robbins (2008) suggested that educators should familiarise themselves with the MUVE before

accepting it as an educational tool. This familiarity, gained through their usage of MUVEs, would enhance their perception of navigational ease.

Another factor that could be an issue related to ease of use in a MUVE is the learning curve. Seng and Edirisinghe (2007) created a pilot project exploring the use of Second Life as a learning environment for computer science subjects. The intention of the project was to allow students to use the learning activity with minimal intervention from the tutor. In one of their conclusions, the researchers revealed that a significant learning curve is required for the teaching team to master Second Life. Emphasis needs to be given to devising tools to reduce the learning curve and increase the ease of use. Binder, Davis, Francis, Hoover, and Kilpatrick (2008) created an interactive environment in Second Life by attaching a Heads Up Display (HUD) to enable participants to measure interactivity and engagement. Content analyses of the data retrieved from HUD were performed to determine strengths, weaknesses, and potential interest in future events. The results of the analyses were used to improve the environment and also the ease of use. As a result, these researchers revealed that the user interfaces needed further improvements to enable them to become more intuitive and thus reduce the learning curve in Second Life.

Many researchers who have conducted studies in MUVEs have raised their concerns about the steep learning curve required for educators. Salt et al., (2008) indicated that the learning curve required to become proficient at using a MUVE is a major concern for educators, especially for those who have used only traditional teaching methods for many years. Seng and Edirisinghe (2007) pointed out that the steepness of the learning curve is increased because educators may be required to learn advanced design features (such as a scripting language) when creating or configuring

MUVE tools to conduct virtual classes. However, many researchers have developed virtual tools that educators will be able to utilise without any knowledge of scripting language. A development carried out by Livingstone and Kemp (2006) was the creation of an integration tool between Second Life and traditional Learner Management Systems (LMSs). They outlined the advantages and weaknesses of MUVEs for teaching, and explored the possible benefits of integrating them closely into a traditional LMS. Thereafter, the researchers built a tool to integrate the subject content of a traditional LMS into a MUVE. This tool could be used by educators who have no knowledge of a scripting language. This would be a great advantage to educators as they are able to access the tools in a MUVE by simply downloading them from a traditional LMS. Further studies have been carried out on this integration tool – as described in the work of Livingstone, Kemp, and Edmund (2008), and in Kemp, Livingstone, and Bloomfield (2009) – to introduce teaching tools that educators are able to use with ease in a MUVE.

Subjective Norm

The effect of the subjective norm is that people may choose to engage in a certain behaviour, even if they are not themselves favourably inclined towards its performance. Srite and Karahanna (2006) explained that subjective norm is measured by examining normative beliefs of referent groups such as family, friends, professors, and classmates. Davis (1989), Taylor and Todd (1995), and Venkatesh, Davis, Morris, and Davis (2003), collectively, suggest that users' IT acceptance, intentions, and behaviours are shaped by social norms related to acceptance. This is evident in Second Life where increasing numbers of educators are creating their educational tools and using Second Life for their students.

Calongne and Hiles (2007) noted that educators from around the world are identifying new ways to leverage virtual environment capabilities. Table 1 in Appendix C depicts the educational professionals who have shared their research over the past years, the course subjects they have taught in Second Life, and the details of their educational institutes. Educators who are new to MUVEs can meet these avatars listed in Appendix C by logging in to Second Life and reviewing how other educational institutes and educators use the MUVE as an educational tool.

Enjoyment

Davis, Bagozzi, and Warshaw (1992) examined different influences on information technology, and identified one of the factors as perceived enjoyment. Further, the studies carried out by Agarwal and Karahanna (2006) identified enjoyment as a factor in usage intentions. According to these researchers, when users enjoy themselves by engaging in the activities provided by the technology/application, this could result in increased usage and thereby acceptance of the technology/application.

Researchers are aiming to provide subject content for learners through game-based learning environments (Venkatesh, 1999). As pointed out by Venkatesh (1999), game-based training environments would emulate fun and joy in comparison to the real world classroom atmosphere. Possibly the outcome would enhance cognitive absorption.

To enable educator users to have a flexible application that will allow them to define the context for interaction (such as settings for teaching sessions), a MUVE needs to provide facilities for object creation. Second Life provides tools and facilities for its users to engage in 3D object creation (Second Life, 2009b). This could be very

enjoyable and would motivate participants to engage in the environment. Sanchez (2009) noted that the enjoyment and creative experiences that users encounter in a MUVE prevails over the frustration they feel from the complexity of the user interface.

A major function of a MUVE (such as in Second Life) is to offer users such as students and educators facilities in which to freely immerse themselves and explore the environment (Avatar Languages, 2009). As pointed out by Salt et al. (2008), immersion in Second Life is in itself a rich source of learning activities. This gives the user much self-determination, which is likely to increase the motivation to engage, especially if it is seen as fun and significant to their goals.

As shown above, many researchers have identified the experience of enjoyment when educators engage in learning activities using MUVEs. However, there is the possibility that external parties could disturb this enjoyable experience. MUVEs are open to the public. Unless precautions are taken, uninvited users may cause obstructions for genuine users. Ball and Pearce (2008) noted that griefers – troublemakers – in a MUVE might be an obstacle to the enjoyment of some of its features. The griefers may disturb the avatars by intruding into groups and activities in a MUVE; therefore, educators need to be aware of the potential for such negative activities. Furthermore, educators need to consider other factors of facilitating conditions; e.g. ease of use, compatibility, trust and security issues, and other benefits that MUVEs could offer to the educational world. These factors are discussed under their respective headings in this chapter.

Facilitating Conditions

MUVEs offer many tools and support facilities to their users. Mathieson, Peacock, and Chin (2001) stated that the resources available for an application would influence its usage. Availability of technical support is one of the most important

resources in the acceptance of technology for teaching. This has been noted by researchers such as Hofmann (2002), Mirani and King (1994), Sumner and Hostetler (1999), and Williams (2002).

A major function of the MUVE is to provide facilities that enable communication. The Second Life environment provides useful tools such as audio and video facilities for communication and social networking (Second Life, 2009c). Bakioğlu (2006) stated that various external platforms such as Web 2.0, YouTube, Flickr, and Twitter could be integrated with Second Life. The added advantage of these facilities is that residents are able to communicate with each other and continue to build social networking even when Second Life is in off mode. McCann (1998) observed that digital technologies have played a major role in higher education, and that these innovations offer educators a range of online services and tools that could be used effectively in a virtual class.

Seng and Edirisinghe (2007) pointed out that educators are required to learn the scripting language to build and use tools to conduct virtual classes in Second Life*;* however, Livingstone and Kemp (2006) believed that educators would be able to access MUVE tools even without scripting language. In addition, adequate facilities are available in MUVEs to build the tools required by educators, although the creation of tools would be a challenge for those educators who are new to MUVEs. If educators are unable to build these tools, they may have to spend money to buy the required tools or employ a builder to create them.

Although tools such as SLOODLE defined by Livingstone and Kemp (2006), are available for educators to use free of charge, a number of virtual tools and facilities such as video presenter and facilities to upload images in Second Life require a

financial investment. As noted by Salt et al. (2008), educators may have to spend money to obtain the required tools. The facilities and tools utilised by educators could depend on the availability of finance. This could inhibit acceptance of the MUVE as an educational tool. One's financial involvement in a MUVE varies depending on the environment. Some virtual worlds are free, but some require a monthly subscription. The users who engage in Second Life are required to either own or rent an island to use the environment effectively (Second Life, 2009d and Second Life, 2009e).

The ability to provide online support to its users is another important factor in the acceptance of a MUVE as an educational tool. Second Life offers all the residents around-the-clock support when students and educators are creating 3D objects using Second Life creativity features. Richter, Anderson-Inman, and Frisbee (2007) noted that Second Life provides community support to both students and educators. The communities and educational resources identified by them are:

1) Learning Material Repositories such as those found at the ICT Library on InfoIsland.

2) Seeking out Second Life teachers for technical advice. The Table 1 in Appendix C shows the other educational professionals who have shared their research over the past years and their educational activities in Second Life.

3) Collaborating with organisations such as the ISTE (International Society for Technology in Education) or the NMC (New Media Consortium) that give educators the experiences they need to develop themselves when they are in the SLED (Second Life Educator) community.

4) External Internet support resources such as the Second Life Educator forum (SLED) .The SLED forum has a list of topics and threads that relate to many aspects of education in Second Life. The educators in Second Life have on-going discussions in this forum and discuss topics such as use of intelligent bots for teaching, accessibility issues, quitting Second Life, and issues in recording voice in Second Life. If the educators wish to post topics in this forum they have to register, which is free. This forum is also used to invite educators and researchers to participate in educational activities and events in Second Life.

These communities are available for educators and students to share the knowledge among themselves, and for networking within Second Life. Further, these communities provide assistance in running seminars and conferences on learning activities in virtual worlds.

Another level of support that should be addressed in MUVEs is navigational support, which assists educators in reducing the learning curve required for proficiency in the MUVE. Salt et al. (2008) noted that educators are not yet confident that the environment would benefit from navigational support rather than technical support. Richter et al. (2007) noted that navigational support could be obtained from Second Life; however, users are required to know which communities to approach for assistance.

Compatibility

Compatibility is another TAM factor in the acceptance of information technology applications (Moore & Benbasat, 1996; Tornatzky & Klein, 1982).

Compatibility in an educational application can be considered in two areas: compatibility with existing technology and practices, and compatibility with the perceptions of the users. Tornatzky and Klein (1982, p. 33) elaborated on the definition of compatibility and argued for the existence of two types of compatibility: normative or cognitive compatibility, referring to referring to "compatibility with what people feel or think about an innovation, and practical or operational compatibility, referring to compatibility with what people do." Operational compatibility is further defined to give three dimensions: compatibility with prior experience, compatibility with existing work practices, and compatibility with preferred work style.

There is potential for a MUVE to be utilised as an educational environment; however, if compatibility issues adversely affect the environment, educators will not be able to derive the full potential benefits. Antonacci and Modaress (2005) have identified several drawbacks to the use of Second Life as an educational tool. One of these is the required infrastructure. Second Life has certain hardware connectivity requirements. It also relies heavily on the user having both a high-specification computer, particularly in terms of its graphics capability, and access to a reliable, high-speed bandwidth connection. Many users would not be able to access Second Life due to lack of these requirements.

Compatibility is also linked with existing work practices. Moore and Benbasat (1991) pointed out that compatibility is linked to one's preferred work style, and to a limited extent, to the existing situation. Although the MUVE offers much potential to the educational world, as Conklin (2007) noted, it is not possible to convey all subjects through a MUVE. He suggests that the subjects that could be best conveyed through Second Life are Economics, Business Simulation, Real Estate, Intellectual Property, Language and Culture, Religion, Race, Crime and Punishment, Law, Geography,

Biology, Mathematics, Programming, Physics, and Astronomy. According to Conklin the programming language used in Second Life (Linden Scripting Language – LSL) could be used to create models that could be utilised to convey those subjects through Second Life.

In spite of potential drawbacks such as dependency on high-speed bandwidth connection for graphic usage and not being able to convey all subjects through a MUVE, Antonacci and Modaress (2005) encouraged researchers to extensively explore multiplayer virtual worlds like Second Life so that educators could prepare to teach with this technology as it continues to evolve. The benefits of the MUVE in the educational world are reviewed in the educational benefits in this chapter.

Security and Trust

The latest addition to TAM is security and trust. Gefen, Karahanna, and Straub (2003) showed that consumer trust is as important to online commerce as other widely accepted TAM factors. Security and trust are also necessary for the use of the MUVE in education. There are many security levels in Second Life. Second Life software involves the client sever executing on the user's computer and on several thousand servers operated by Linden Labs (Wikipedia, 2009b). A new version of both servers is deployed every few weeks to rectify problems and make improvements to usability, performance, and security (Wikipedia, 2009b). Further, Second Life facilitates flexible access to course materials both on and off campus, with the security of password-controlled access. However, with any Internet based, these techniques do not provide guaranteed authorised security (Singh, Yu & Venkatraman 2001).

As a MUVE may be open to a broad range of users (Second Life is open to public in general), there could be safety issues when younger learners login. The content in Second Life is more suitable for mature users over 18 years of age. Antonacci and Modaress (2005) noted that a MUVE such as Second Life has some areas with mature content and activities which might be inappropriate for young students.

In Second Life a separate island is allocated to teenagers known as Teen Island. Czarnecki (2008) pointed out that all users in Teen Island must pass a credential checks for criminal and sexual offences, for the safety of the community before they are allowed access to the island. Once they pass the security check, they are given access to Teen Island and are not authorised to leave the island and visit other islands on the teen grid. Although these measures are in place, users need to be aware of the security issues and take precautions (such as young learners not allowed to login to Second Life without proper supervision) in order to avoid deception (Castelfranchi & Yao-Hua, 2002).

Ethical standards in virtual worlds are also seen as concerns in relation to MUVEs. Kerbs (2005) noted that illegal information sharing, spamming, multiple identities, and identity deception are ethical concerns in Second Life. Educational institutes are governed by their own privacy and confidentiality acts. When information is available in a public, open location, educational institutes have to consider these issues.

Rovai (2001) expressed the view that trust in the virtual classroom is the feeling that the community can be trusted. According to Rovai, the trust leads to a feeling of safety, and also fosters willingness and a sense of freedom to speak out.

The participants in a MUVE are represented on-screen by avatars and they are identified by their name. Each avatar has a first name and a last name. The first name can be chosen by the owner of the avatar, while the last name is selected from the list of names provided in Second Life. As pointed out by Hollins and Robbins (2008), MUVE learners are relatively protected by their pseudonyms. The introduction of audio in Second Life has many advantages; however, it has resulted in the unintentional consequence of loss of anonymity. Even if we are unable to identify the name of the avatar, we might be able to identify the voice. However, as noted by Hollins and Robbins, avatars develop levels of trust toward their peer residents in the virtual world, and also value sets (peer residents understand the same terminology asthey had to face the same connection and navigational issues to enter, and they are interested in the MUVE) that are pertinent to virtual worlds. These value sets allow avatars in the MUVE to share knowledge and provide support to each other.

Educational Benefits

In this section various claims made in the literature regarding the expected educational benefits of MUVE are discussed. Most reports of this type are devoted explicitly to Second Life, although the claims are applicable to the MUVE in general.

As pointed out by Davis et al. (1989), people have a tendency to utilise or not to utilise an application only to the level that they believe it would help them perform their job better. Adams, Nelson, and Todd (1992); Davis (1989, 1993; and Szajna (1996) reported that user acceptance of computer systems is driven largely by perceived usefulness.

Attributes of the MUVE include the ability to facilitate collaboration and awareness within a context, its media-rich facilities, discovery and situated learning

opportunities, role projection abilities, immersive environment, and the ability to have a controlled environment. These are discussed next.

Collaboration

Through collaboration, learners are able to build and improve their knowledge. Seaton (1993) noted that among learners, collaboration occurs throughout the learning process; this assists in developing and evaluating different beliefs within learning contexts.

Prasolova-Forland and Divitini (2002) pointed out that MUVEs provide a collaborative virtual environment for social awareness support. Distance learners often find it difficult to collaborate with their educators or peers due to geographical issues and times selected for lessons, and MUVEs have the potential to provide a solution for these difficulties. Geographically separated learners could benefit from the advantage of the collaborative features offered by a MUVE and use it to replicate the social, interactive aspects of a classroom. They would be able to meet peers and educators more often by utilising collaborative features offered by a MUVE. Kalay (2003) noted that the involvement of an educator or peer transforms a simple learning situation into education. Further, Kalay indicated that skill is based on the ability to conceptualise factual knowledge and identify facts and activities that are important. Development of that ability requires the presence of a teacher who can point out the appropriateness and value of the content.

When adopting a MUVE as an educational tool to provide a collaborative space, students and educators must acquire the necessary technical infrastructure to access the MUVE. Cooper (2006) noted accessibility of technology should be considered, as all users cannot afford the technology, and many do not have access to broadband (Neal, 2000). Furthermore, Cooper emphasised that MUVEs are designed to use extensive levels of graphics

to provide a wide range of options. Users will not be able to get the desired effect from a MUVE without having the infrastructure requirements.

The space provided by the MUVE is not in itself sufficient to create an effective environment for learners. As Neal (2000) noted, an extensive list of tools must be provided in the collaborative learning environment to enable effective face-to-face communication and, thus, more effective learning.

Awareness

Users who engage in MUVEs feel their own presence and that of others due to the facilities provided. MUVEs contain various types of information that simulate both physical presence and awareness of audio. Sheridan (1992) noted that there will be a stronger sense of presence when a greater extent of sensory information is transmitted.

MUVE users interact with each other using audio facilities and gestures that simulate emotional feelings. Fabri, Moore, and Hobbs (1999) argued that the feelings provided by a MUVE have a great relevance for improving communication in learners. Therefore emotional awareness is likely to be an acceptance factor.

Many researchers have utilised the environmental awareness introduced by MUVEs to make an intellectual impact on students. Chodos, Naeimi, and Stroulia (2009) implemented a simulator training environment in Second Life to train students in Canadian border procedures. This simulator allowed students to access a real-life environment and develop essential interview skills required in customs-related fields. The results of this research were very successful as the simulator implemented in the MUVE was able to increase the confidence level and the grade level of the students

who participated. The researchers identified that the high level of success was due to the awareness that was offered by the MUVE.

Although audio facilities in a MUVE provide awareness and improved communication, many researchers have identified certain issues related to them. Wadley, Martin, and Peter (2008) noted many users are initially unable to get the voice feature to work; however, with time, most users become more comfortable and familiar with the voice facilities. Another issue mentioned by Wadley et al. was lag, especially during group discussions. Wadley et al. noted the voice channel is more sensitive to network lag than a text channel is, and that the longer lag could cause people to lose track of a conversation. In addition, Wadley et al. specified that group discussions with a large number of users in the MUVE, have longer lags. If the environment is unable to cope with the lags, users may have to cancel the session and logout. Educators need to be aware of these issues when adopting the MUVE as an educational tool, as user frustration may influence acceptance of MUVEs for educational purposes.

Media Richness

MUVEs contain various types of information that simulate both physical presence and awareness. The awareness provided by the MUVE is due to the rich media facilities available. Saeed, Yang, and Sinnappan (2008) carried out a study to identify the media richness in Second Life and its impact on user acceptance. They introduced a framework using a media richness theory by Daft, Lengel, and Trevino (1987) and the technology acceptance model. Daft et al. (1987) indicated that the richness of media is based on the ability to receive immediate feedback, the capability of the medium to have a personal focus, and the expertise to transmit multiple cues and language selection. The framework created by Saeed et al. consisted of five factors: (1)

perceived media richness, (2) perceived usefulness, (3) perceived ease of use, (4) behavioural intention, and (5) actual use. Saeed et al. conducted an online survey to gather responses from the participants; based on data analysis, they concluded that Second Life offers an environment that consists of rich media. In addition, they indicated that this media richness could be used as an effective communication medium for teaching and learning.

Although rich media capabilities can be used as an effective communication medium for teaching and learning, affordability of such technology may limit the number of users of MUVEs. Cooper (2006) noted that accessibility to technology should be considered, as all potential users would not be able to afford it.

Discovery Learning

Discovery learning is a method of inquiry-based instruction which provides an opportunity for learners to generate knowledge and meaning from their experiences (Wikipedia, 2009a). Through discovery learning, students interact with their environment by exploring objects and performing experiments. In MUVEs, the exploration and discovery process assists learners to build knowledge as a group. Bronack, Sanders, Cheney, Riedl, Tashner, and Matzen (2008) explained that notions of exploration and discovery are the key elements of constructivist teaching and learning.

There are resources embedded in Second Life to encourage students to explore and discover (Second Life, 2009f). Visual cues such as storefronts, buildings, furniture, and pathways facilitate learners' experiences. These cues serve as visual metaphors, which provide systems of navigation and structure to the location and organisation of tools and resources. Educators are required to make use of these facilities in MUVEs

and to build educational tools within the MUVEs to provide discovery learning opportunities for learners. Sanders and McKeown (2007) believe that current virtual environments are able to refine the learning process. However, this innovation would likely be a challenge to educators.

Some students may resist using the MUVE as an educational tool. They may prefer to read a book rather than engage in a MUVE. Educators are required to understand this situation as well, and cater for the needs of all students when accepting the MUVE as an educational tool (Vogel, Guo, Tian, & Zhang, 2008).

Role Projection

The avatars in a MUVE are represented by a projection of their selected identities. These avatars could then assume different roles depending on the nature of the situation. Image 1 depicts the avatar that has been exploring Jokaydia Island in Second Life for this study. Luff (2000) noted that achievement of behaviour patterns would encourage students to avoid entanglement with current norms and beliefs. The facilities in a MUVE allow learners to project themselves into the role of a king, or a beggar. The learners are compelled to think outside their own boundaries and imagine the world through different eyes. Bender (2005) noted that the MUVE would be especially suitable for role-playing activities.

Image 1: Avatar in Second Life, Jokaydia Island.

Many studies of role-play projection capabilities have been conducted in Second Life. The framework used by Antonacci and Modaress (2005) was their own Second Life medical clinic. They presented the framework as a role-play scenario where each student takes the part of the doctor, nurse, patient, or patient's spouse. This approach was selected so that students could see patient encounters from different perspectives; this would be difficult or impossible to do in real-life.

Mayrath, Sanchez, Traphagan, Heikes, and Trivedi (2007) used Second Life to illustrate an English course at the University of Texas at Austin. The researchers focused on the process of implementing Second Life in the classroom and conducting a formative evaluation of the students' experiences. Based on the study's findings, several best practices emerged for the use of Second Life in providing instructions and guidance. According to the study, Second Life provides opportunities for role-playing by conducting discussions or debates.

Although the use of avatars provides opportunities for learners to interact with each other, it may also cause issues for learners if they are unable to control the avatar. Schroeder (2007) noted avatars in MUVEs are capable of actions such as manipulating and navigating objects; they allow for a change in appearance; they can walk through, jump around in, and fly through the environment. However, if both learners and educators were unfamiliar with these activities, it would be difficult to use the MUVE as an educational tool. Therefore, for novice users this could impede the acceptance of the MUVE as an educational tool.

The use of avatars, whilst providing the opportunity for learners to interact, may also cause the user to encounter issues such as multiple identities and identity deceptions. Kerbs (2005) noted that such activities and behaviours may cause emotional suffering for learners.

Therefore, educators are required to take precautions to prevent, or be able to stop, such activities before adopting MUVEs as an educational tool.

The role-play activities in MUVEs are enriched by the degree of immersion and complexity this medium offers. There are various role-playing activities in Second Life: some are suitable to young students, but some are not. Bardzell and Odom (2008, p. 239) noted that Gorean fantasy is a "very compelling form of play as well as a source of intimacy and emotion for thousands of Second Life residents." The Gorean culture is a tribal slave society with cultural elements drawn from Greek, Roman, Native American, and early European roots. This is a very male-dominated society, and women are viewed as property. Many residents who visit this island consider this kind of activity to be role-play, although it tends to be quite sexual. While this may be an extreme case, educators need to understand the level of immersion and the complexity of the chosen MUVE before adopting it as an educational tool. Further, this kind of role-play is gender-biased, and mainly male-dominated. In Second Life, groups have been organised especially for the purpose of discussing issues of importance to women and to female avatars. One such group is the Second Life Left Unity Feminist Network (Feminists, 2009). According to the group, they are exploring courses of action that could improve the experiences of women in both real-life and Second Life. Furthermore, this site has listed safety measures that could be important for newcomers. Harassment is another issue addressed by this group. They feel that in Second Life, harassment could take many forms ranging from the apparently relatively harmless but annoying admirer, to explicitly offensive behaviour and language, and even stalking. As pointed out by this site, it is important for educators or authorities to know the possible ways in which learners could be victimised in a MUVE, and the strategies needed to counter these vulnerabilities.

Linden Lab, producer of the Second Life virtual world, has implemented mature ratings for all regions, classifying them as PG, Mature, or Adult. All Second Life users are defaulted to Mature setting. Only verified account holders are authorised to access to Adult regions (Second Life, 2009g). These measures will be helpful for educators when adopting a MUVE as an educational tool. Kerbs (2005) noted a number of preventive measures that could be implemented to safeguard learners. As elaborated by Kerbs, these measures fall into two major categories: enforcement of regulatory bodies, and encouraging learners in the MUVE to minimise exposure of personal information. However, implementation of such polices takes a long time, and the responsibility should be assumed by the educational institute. As pointed out by Second Life Left Unity Feminist Network, although no physical harm could occur in a MUVE, as a basic precaution it is best to keep the real-life identity away from the virtual life.

Situated Learning

Researchers have explored the model of situated learning. McLellan (1994, p.8) noted the situated learning model contains three main components: "(1) the actual work setting, (2) a highly realistic or virtual surrogate of the actual work environment, and (3) an anchoring context such as a video or multimedia program."

Richter, Anderson-Inman, and Frisbee (2007) noted that MUVEs such as Second Life provide community support to both students and educators. These communities are mentioned under the facilitating conditions in this chapter. The learners are able to visit these communities within Second Life and get the assistance required. Stein (1998) stated that situated learning allows students to understand how the knowledge and abilities they have acquired could be utilised in new situations.

According to the information provided by the virtual library in Second Life, another innovative learning situation provided by the MUVE is virtual books. If the text size in these books is too small to read, the readers have the option to touch the book to be directed to a website where they have improved visibility.

Salt et al. (2008) noted that situated learning requires meaningful, realistic activities. As a result, educators are required to spend their time effectively to implement successful solutions. As indicated by Salt et al., the implementation of situated learning capabilities in the MUVE would be a challenge for educators, especially if they are new to MUVEs.

Immersive Environment

Second Life allows students as well as educators to immerse themselves in the environment and freely explore. Rudin (1995) pointed out that virtual environments have introduced a new form of education that allows students to experience situations, instead of simply reading or hearing about them.

Virtual environments reinforce the active participation of students and provide possibilities of discovering new knowledge. As pointed out by Salt et al. (2008), immersion in Second Life itself is a rich source of learning activities. The content and process of engagement provides opportunities to construct knowledge and activities that could be embedded across the curriculum.

Csikszentmihalyi (1990) noted that players with a passion for video games depict psychological behaviour patterns which could be classified as flow experience. MUVEs provide a flow experience to their residents using rich media facilities available in the various environments. The flow experience offered by MUVEs is similar to that offered by video games. However, educators do need to take precautions

to ensure that the learners will not become so deeply immersed in the environment that they are unable to focus on the subject (Quay, 2003).

Controlled Environment

As in any educational environment, control in the MUVE is important for educators; they must be able to conduct classes and convey the subject according to their preferences. As pointed out by Mehrabian and Russel (1974), in a perceived controlled environment a person may feel that she/he is restricted, unable to carry out an activity, or not free to act in different ways.

Kalay (2003) pointed out that when cyberspace is selected as a teaching medium, it is necessary to have controls that allow its manipulation and appropriation through the interface, as it is different from a real classroom environment. These controls include protocols for the users' social interaction; i.e. who may initiate a conversation and/or join an existing one.

The potential for using virtual worlds has already been identified in several studies conducted by researchers such as Kirriemuir (2008a) and Livingstone and Kemp (2006). Furthermore, a growing number of educational institutions have taken up the MUVE and used it in tertiary education. The use of virtual worlds has accelerated exponentially over the years, and during this period, educators have been experiencing virtual worlds. This control element makes it appealing for them to engage in the environment. MUVEs such as Second Life provide many facilities to control the environment; if you wish to have a private area where you can completely control your environment, it is possible to set up access-controlled rooms and buildings.

As Webster and Hackley (1997) suggested, educators should be able to control the environment with the facilities embedded in the MUVE. Further, they should decide how much control should be enforced. It would not be possible to enforce constraints in a virtual environment if the educators are unaware of control mechanisms. Therefore, for educators, the skills, and ability to implement control of the MUVE might influence acceptance of the MUVE as an educational tool.

Summary

This literature review begins by introducing Second Life as a representative of the MUVE. Next, the researcher discussed the Technology Acceptance Model (TAM) along with factors demonstrated in the literature to analyse the impact on technology acceptance decisions. With regard to the factors known to influence technology acceptance decisions, the author has identified ease of use, enjoyment, pressure emanating from others' acceptance of the technology, availability of support, compatibility with existing practice, and perceived security and trust.

Finally, the author reviewed the claimed benefits of MUVEs for the educational world with a view to expanding the TAM concept of usefulness in the context of educational uses of the MUVE. The following potential benefits are identified: mutual awareness leading to collaboration between students, emotional connection between teachers and students which enables more effective feedback, media rich experience, teaching in 3D environments simulating real world situations that are not available to use for teaching in the real world, teaching in 3D environments representing important concepts (environments that do not exist in the real world), role-playing by assuming the identities of different avatars, flow effect resulting in students remaining focused and the ability to control the environment to provide an effective educational setting.

The following negative features related to MUVE were raised in the literature: a steep learning curve, security issues for young learners, requirement for high speed bandwidth connection, and lack of affordability.

In the following chapter, factors that create an impact on technology acceptance decisions and the claimed benefits of MUVEs are used as topics to be focused on in the data collection.

CHAPTER THREE

Research Design

In this chapter, the qualitative approach adopted for this research is discussed. The face-to-face and virtual semi-structured interviews were guided by a schedule of questions based on issues raised in the literature and the TAM factors discussed. The sample selected for the interviews is discussed, followed by an outline of how the interviews to gather data were conducted. The constant comparison method used in the data analysis is then explained. The approaches that were used to improve validity, including analyst triangulation and member checking are discussed. The chapter concludes with a discussion of the ethical issues.

The main goal of this research is to study the perceptions of educators regarding the acceptance of MUVE as an educational tool. As stated in the literature review, TAM (Technology Acceptance Model) was considered as the tool to analyse the perceptions of educators. Factors identified in TAM address the issues as to how users decide to accept a certain technology. The model suggests that when users are presented with a new technology, a number of variables influence their decisions about how and when they will use it (Davis, 1989). As noted in the literature review, the TAM was identified in 1989, and it has been extended by many other researchers (Venkatesh & Davis, 2000; Venkatesh & Morris, 2000). The initial TAM proposed by Davis (1989) emphasised that the influence on technology acceptance is dominated by perceived ease of use and perceived usefulness. With the extensions, factors such as enjoyment, facilitating conditions, subjective norm, compatibility, and security and trust were added to the TAM.

The first research question is based on the TAM factors: How do the known determinants of technology acceptance influence the intention of educators to use the MUVE as an educational tool?

As described in the literature review, the potential benefits of a MUVE could influence educators to use it as an educational tool. Likewise, some factors may discourage educators from using a MUVE. These benefits and potential negative features were identified and added to the analysis to further evaluate educators' perceptions.

The second research question is based on the educational benefits of MUVEs identified in the research: How do educators perceive the potential benefits of educational use of the MUVE?

Qualitative Approach

Corbin and Strauss (2008) stated that qualitative research provides a guide for both choosing the concepts to be investigated and for framing the research findings. Qualitative research, emphasises the importance of looking at scenarios in the natural settings in which they are found. The qualitative approach has been adopted by researchers such as Eichorn (2001) and James and Busher (2006) in examining the acceptance of technologies and perceptions of groups towards technology. This enabled the researchers in those studies to explore the meanings, feelings, and viewpoints of the subject group, and to carry out two-way discussions which allowed the subject group to ask questions, which the researcher answered. Given that the present study focuses on the perceptions of respondents — the feelings and viewpoints of educators regarding their acceptance of the MUVE as an educational tool — and the qualitative approach

which was considered to be the most suitable approach for this study, semi-structured interviews were used to gather data that will be discussed more fully later in this chapter.

Interviews and the Demonstrated Virtual Class

Interviews were selected as the method to gather data in this research. Plummer (2001) stated that when people comprehension, a range of visions, awareness, intercommunication, and most importantly, perceptions, can be explored; the choice to interview is a humanistic approach to the research. As pointed out by Talja (1999), a humanistic approach is a subject-centred approach which allows the researcher to capture the participants' experience. For the current study, the use of interviews allowed for the gathering of as much feedback as possible from the participants, and allowed them to set the pace and direction for the discussions, which were overtly biased towards the researcher.

The process for gathering qualitative data involved establishing contact with the potential interviewees and meeting with them at an agreed time and location. At each interview, there was an introduction, which included a statement of the objectives of the research, and a demonstration of the virtual class the researcher had developed. During the interview, the participants were given an opportunity to critique the environment by comparing their own ideal vision of an educational environment with that of the demonstrated virtual class. This virtual class was constructed in Second Life (chosen because most reported educational activities in MUVEs occur in Second Life (Salt et al., 2008)). The development of the virtual class is discussed in the Virtual Class, Chapter Four.

Schedule of Questions

A detailed scheduled of questions was prepared by focusing on identified TAM factors and educational benefits of MUVEs (see Appendix A). It consisted of 25 detailed questions and was created with the aim of gathering descriptive responses from the participants, and guiding the flow of conversation. The questions were divided into four sections.

The first section (questions 1–6) of the questionnaire focuses on building a profile of the participating educator's experience with a computer system and also with MUVEs. However, questions which related to personal details such as the actual names of the participants are not included in the questionnaire.

The second section (questions 7–15) relates to TAM factors identified in the literature review. The questions in this section allow the participants to describe expectations and impressions related to the TAM factors and to critically analyse the environment through comparisons with their own ideal visions of a learning environment. The perceptions of participants were then analysed to identify their level of acceptance of a MUVE as an educational tool. TAM factors that relate to the questions and how it was demonstrated in a virtual class is described below:

1) Ease of use – The navigational facilities in the virtual class were demonstrated to participants to analyse their perceptions concerning acceptance of a MUVE on the basis of ease of use. How easy (or not) it would be to become familiar with the environment, was studied to analyse the participants' perceptions concerning acceptance of a MUVE as an educational tool.

2) Enjoyment – Activities such as teleporting to different locations, avatar appearance changes, and viewing video presentations were demonstrated to the participants; they were then requested to give feedback in order to provide some understanding of the enjoyment level they experienced while engaging in these activities.

3) Compatibility – The limitations and issues related to compatibility were explained to the participants, and their impact on the benefits of a MUVE in the educational field was discussed.

4) Facilitating conditions – The facilities and tools available in the virtual class were demonstrated in order to explain the feasibility of the environment. Details of the support groups available in Second Life were distributed to the participants to give them an understanding of these, and were to be kept for their use when support was needed.

5) Subjective Norm – The participants were then told about educational institutes that are already using Second Life as an educational tool; the facilities and tools used in other educational institutes were demonstrated by teleporting to other islands in Second Life.

6) Security and trust – The security measures available in Second Life were demonstrated to the participants.

The third section (questions 16 –24) relates to benefits of MUVEs as identified in the literature review. In this section, participants were provided with an opportunity to give detailed feedback about the perceived benefits of MUVEs. Each educational benefit and how it was demonstrated in a virtual class is described below:

1) Collaboration - The benefits of collaboration for students were discussed during the demonstration, along with the ways in which compatibility issues such as broadband requirements affect the educational environment.

2) Awareness - How the MUVE users interact with each other using audio facilities and gestures (hand and head movement of the avatar during communication) that simulate emotional feelings was discussed with participants.

3) Media richness - The media facilities such as the ability to create 3D objects, buildings and social spaces where people could interact , external and internal third party applications like streaming media and VOIP technology Salt et al., (2008) available in the virtual class were discussed and demonstrated to participants illustrating benefits of the rich media facilities available.

4) Discovery learning – During the demonstration, discovery learning facilities were illustrated by teleporting to NASA Island located in Second Life. This Island is operated by NASA officials and allows users to participate in NASA projects through exploration in the virtual world. More details are provided in the virtual class, Chapter Four. During the demonstration, the benefits of discovery learning were discussed in order to analyse the perceptions of participants concerning their readiness to accept a MUVE as an educational tool.

5) Role projection – During the demonstration, the role of avatar in MUVEs was discussed in order to analyse the perceptions of participants concerning this aspect of a MUVE and its potential benefits for students.

6) Situated learning – The situated learning possibilities such as virtual books in Second Life Library Island, how to access Second Life support for educators in Second Life, and the limitations of the environment were discussed in order to analyse the perceptions of participants concerning acceptance of a MUVE as an educational tool. Salt et al. (2008) noted that situated learning requires meaningful, realistic activities and that educators would be required to spend their time effectively for successful implementation of solutions.

7) Immersive environment – How the educators and students utilise the immersive environment to meet virtually in Second Life is discussed with participants. Additionally, the precautions that need to be taken by educators so that the learners would focus on the subject without being deeply immersed in the environment were discussed with participants.

8) Controlled environment – The controls available to demonstrate a virtual class were discussed during the demonstration in order to obtain feedback and analyse the perceptions of the participants concerning their attitudes regarding acceptance of a MUVE as an educational tool.

Section four (question 25) focused on gathering educators' perceptions of the future of MUVEs. This did not relate to TAM factors or MUVE benefits to the educational world. As pointed out by Salmon (2009), all learning technologies are a complex marriage of the technological application with the challenging pedagogical drivers which result in appropriate support and learning design. The future of applications is up to each of us to determine. Therefore, it would be appropriate to identify the participants' perceptions regarding future growth of MUVEs.

Sample Selection and Description

The research was conducted by adopting a purposive sampling approach. Researchers such as Lincoln & Guba (1985) and Marshall (1996) noted that the purposive sampling approach allows the researcher to select and derive the most compelling and productive sample in order to answer the research questions. As this research was aimed at studying the perceptions of educators regarding the acceptance of MUVEs, a wide range of experienced educators from a variety of backgrounds was invited to participate.

The participants were invited via a convenient approach. According to Lunsford and Lunford (1995) a convenience sample approach allows the researcher to select the sample of the practicable and accessible aspects required by the researcher. Educators who participated in the research were categorised into two participant cohorts; viz. those who were Familiar with MUVEs and those who were Unfamiliar with the environment. Since the perceptions of educators who are Familiar with MUVEs could reflect a bias towards it, another group of educators who were Unfamiliar with MUVEs was introduced to the research. There were 22 educators who participated in the interviews, made up of 11 in each group; 11 were females and 11 were males.

As Second Life is the wildly adopted MUVE, educators who had been actively engaged in Second Life were selected for the Familiar cohort. Several educational institutions utilised Second Life to conduct seminars related to MUVE which could be beneficial to educators. The organisers of these seminars invited other Second Life users to become participants or presenters through the Second Life Educators forum. By accepting these invitations the researcher conducted four presentations during the research. The details of these presentations are provided in the Virtual Class Chapter

Four. These presentations provided opportunities to build a social network with educators who were already conducting classes in Second Life and with those interested in the MUVE concept. These educators, who represented several countries were looking into effective tools that could be used in a virtual class. The educators who became acquainted with the researcher through this social network were invited to participate in the research.

The educators who belong to the Unfamiliar cohort provided their feedback based on the virtual class demonstrated in Second Life, and their personal experience of other educational environments and tools. Several educators from universities (10 educators) and a secondary school (one educator) were contacted to join this cohort. These participants were selected from publicly available information; 4 in this group were introduced by one of the supervisors.

Before commencing the interviews, each participant was given a form with which to give his or her consent (see Appendix D). This also advised them of their individual and privacy rights, and provided assurance of their anonymity; an information sheet (see Appendix E) was also provided, with a brief introduction to the research.

The participants came from many countries and had different levels of experience as educators. Table 2 shows details of participants in the cohorts in relation to their years of experience and the subjects they teach. The participants are listed according to their years of experience in the educational world. To ensure confidentiality, pseudonyms are used instead of actual names.

Table 2: Details of educators who participated in the research

Name	Experience	Gender	Details in teaching experience
Manik	2.5	Female	Tertiary Educator. Teaching subjects related to nursing.
Tony	3	Male	Tertiary Educator. Teaching Information management and Commerce.
Callum	5	Male	High school educator. Technology coordinator in high school and science subjects for middle school [Primary School].
Victor	6	Male	High school educator. Teaching Greek History, Language and Literature.
Biyanka	8	Female	Secondary and tertiary level teacher. Teaching business computing, teacher training
Sonali	10	Female	Tertiary Educator. Teaching under-graduate and postgraduate at Masters level. Teaching subjects related to midwifery.
Dave	12	Male	Tertiary Educator. Teaching English Literature and arts.
Cameron	20	Male	Tertiary Educator. Teaching programming, query language, databases and software engineering.
Eila	25	Female	Educator from kindergarten to graduate level. Training teachers to integrate technology in to curricula.
Bruce	26	Male	Tertiary Educator. Teaching teachers how to use instructional media.
Alison	30	Female	Tertiary Educator. Teaching IT subjects.
Samantha	4	Female	Tertiary Educator. Teaching engineering subjects.
Jasmine	4	Female	Tertiary Educator. Teaching accounting subjects.
Stuart	9	Male	Tertiary Educator. Teaching media production.
Joe	10	Male	Tertiary Educator. Teaching Accounting Information Systems and Introductory Accounting.
Mabel	13	Female	Tertiary Educator. Specialising in Marine Biology and Aquaculture.
Arnold	14	Male	Tertiary Educator. Teaching programming and systems analysis and design.
Chris	15	Male	Tertiary Educator. Teaching engineering subjects.
Rod	37	Male	Tertiary Educator. Teaching statistics, mathematics, computing and information systems.
Katrina	39	Female	Tertiary Educator. Teaching information systems management.
Sue	11	Female	Tertiary Educator. Project Management, Analysis and Design System Development Methodology.
Sandra	20	Female	Secondary educator. Teaching English language.

Table 3 contains details of the participants' levels of familiarity with computers, Internet, video games, and MUVEs. All the educators who were familiar with MUVEs had conducted classes in virtual environments, or had conducted research and published theses on MUVEs. The educators who were Unfamiliar with MUVEs had used Internet facilities and other educational tools such as MOODLE to assist learners. Most of the participant educators utilised the Internet extensively in order to access WebCT and MOODLE in conducting classes. In Table 3, the educators who navigated the Internet were described as *Extensive users*. The other educators only utilised the facilities of the computer as a repository of documents and to access their e-mail. In Table 3, these educators who accessed the computer and Internet were described as "Moderate users". However, this was the first time they had experience with a MUVE; the exception was Samantha, who had participated in several virtual classes conducted by a colleague; although this was the first time she had been given an opportunity to use the tools herself and navigate within a virtual class.

Table 3: Experiences with Educational Tools, Video Games, and the MUVE

Name	Computer & Internet	Video Games	Experience in the MUVE
Manik	Extensive use	Yes	Teaches technical staff to teach patient history taking for diagnostic purposes, physical examination, and path physiology.
Tony	Extensive use	Yes	Conducted research and produced a thesis on Virtual World Libraries. During the study, Second Life Virtual Library Island was used extensively.
Callum	Extensive use	Yes	A location in Second Life rented in Jokaydia and conducting presentations in Second Life regarding SLOODLE.
Victor	Extensive use	No	Conducting a class through Second Life to teach educators the implementation of Role-Playing instructional technique.
Biyanka	Extensive use	Yes	Lead educator in SLENZ and associated with ISTE and Comm Educators in Second Life.
Sonali	Extensive use	Yes	Active member of SLENZ group in Second Life. Planning to conduct the first class in Second Life very soon.
Dave	Extensive use	Yes	Constructing a Second Life educational installation to teach 17th century English literature, printing technology and culture for undergraduate and graduate level students.
Cameron	Extensive use	Yes	Conducted a computer system architecture course in Second Life.
Eila	Extensive use	Yes	Teaches graduate level course called “Teaching and Learning in Virtual Worlds” in Second Life.
Bruce	Extensive use	Yes	Conducting a class in Second Life for teachers to introduce a variety of media tools.
Alison	Extensive use	Yes	Conducted a class for a third year system development paper in Second Life. The class was used as a discussion session.
Samantha	Moderate use	Yes	Participated in a virtual class conducted by a colleague.
Jasmine	Moderate use	No	Unfamiliar with the MUVE.
Stuart	Extensive use	Yes	Heard about Second Life from colleagues.
Joe	Moderate use	No	Unfamiliar with the MUVE.
Mabel	Extensively	No	Briefly involved with the MUVE.
Arnold	Extensively	Yes	Heard about Second Life from colleagues and other educational institutes.
Chris	Moderate use	No	Unfamiliar with the MUVE.
Rod	Extensive use	No	Unfamiliar with the MUVE.
Katrina	Moderate use	Yes	Heard about Second Life a long time ago.
Sue	Extensive use	Yes	Unfamiliar with the MUVE.
Sandra	Yes	Yes	Unfamiliar with the MUVE.

Data Collection Process

The 22 participants were involved over a period of six weeks in the semi-structured interviews which were conducted either individually, in pairs, or virtually. Table 4 provides a summary of interview details.

Table 4: Summary of interview details

Interview Type	Familiar with MUVE	Unfamiliar with MUVE
Individual	1	8
Pairs	-	1
Virtual	10	1

Ten participants in the Familiar group were interviewed online at a mutually convenient time. These ten participants agreed to conduct the interview virtually in the virtual class. Prior to the virtual interview, each participant was given the schedule of questions via a notecard facility provided in the selected MUVE. As a result, participants had prior knowledge of the interview questions. Further, the schedule of questions also acted as a guideline for these interviews which were conducted individually, and with the permission of each participant, audio-recorded. Of these ten participants 5, answered the questionnaire with details and returned it to the researcher using the notecard facility. The eleventh participant in the Familiar group was interviewed in real-life (not in Second Life). This participant was provided with a demonstration of the virtual class prior to proceeding with the questions from the questionnaire. This interview was recorded using a recording device.

Ten of the Unfamiliar participants were interviewed face-to-face in real-life. Each participant was first given a demonstration of the concept of a virtual class to introduce the practical phenomenon of a MUVE. Eight participants were given individual interviews and two participants were interviewed as a group. These participants were shown a DVD presentation to illustrate how a virtual class is conducted in a MUVE (see Chapter Four, Virtual Class). During the demonstration, the participants were given the schedule of questions. As a result of this, participants had prior knowledge of the interview questions which also served as a guideline for these interviews. Eight individual interviews were audio-recorded. The two participants who were interviewed as a group returned their answers via e-mail. Of the eleven participants who were Unfamiliar with MUVE, one was met in Second Life to conduct the interview. This participant was able to login to Second Life after step-by-step instructions were given to him. A demonstration of the functions and facilities was provided, during which the participant was sent the questionnaire via e-mail. The answers to the questionnaire were e-mailed back to the researcher.

Data Analysis

The framework adopted for data analysis in the study is constant comparison analysis. As pointed out by Corbin and Strauss (2008), constant comparison analysis allows for identification of variations in the patterns in the data collected. Further, these variations are not limited to one category or pattern, but may also include dimensionally varied patterns that allow for comparison of properties under different conditions; thus the dimensionally varied patterns in the educators' perceptions were analysed. The adaptation of constant comparison analysis has been successfully applied

in previous studies examining composition strategies (Seddon & O'Neill, 2003) and musical communication (Seddon, 2005; Seddon & Biasutti, in press).

Corbin and Strauss (2008) stated that constant comparison analysis involves five main stages: (1) Identify units of analysis; (2) Categorise: Focus on seeing the diversity of the dimensions under the categories; (3) Write about the categories that are being explored in an attempt to describe and account for all the incidents in the data while continually searching for new incidents; (4) Work with the data and emerging model to discover basic social processes and relationships; and (5) Engage in sampling, coding, and writing as the analysis focuses on the core categories.

During the analysis, data obtained from participants who were familiar with MUVEs were compared with data gathered from participants who were unfamiliar with the environment. To be more specific, data was broken into manageable chunks. These chunks were based on factors identified from the literature — TAM factors as well as potential benefits of MUVEs in educational fields, negative features such as steep learning curve, novel medium for educators, and the potential future development of MUVEs. Each chunk of data was examined closely. If it was conceptually the same as the previous interview, then it was coded under the same node defined in NVivo software (NVIVO, 2009). The data was extensively analysed to provide understanding of the perceptions of the participants regarding the MUVE. This process was formulated by NVivo software; this allows for illustration of the connection between the coding and transcript data, which leads to further analysis.

Fifteen discernibly different categories were identified after gathering data from the interviews viz. ease of use, enjoyment, compatibility, subjective norm, facilitating conditions, security and trust, usefulness, collaboration, awareness, media richness,

discovery learning, role projection, situated learning, immersive environment, and controlled environment. These 15 categories were entered into NVivo as nodes.

Validation

The next process in qualitative data analysis is validation, which ascertains how credible the research results are. Patton (1999) stated that data triangulation comes in four forms: (1) methods triangulation, which is checking the consistency of findings generated by different data collection methods, (2) triangulation of sources, which examines the consistency of different data sources within the same method, (3) analyst triangulation which uses multiple analysts to review findings, and (4) theory/perspective triangulation which uses multiple perspectives or theories to interpret.

Analyst triangulation was used for this research to improve the accuracy of the judgments of the research. Patton (1999) noted that in analyst triangulation, more than one researcher is involved in the analysis. Further, Patton (1999) noted that when two or more researchers have independently analysed the same set of qualitative data the result provides an important check on the selective perception, and therefore the analysis becomes less biased.

In view of this, each transcribed interview was provided to an independent researcher to perform his own independent analysis. The independent researcher who was familiar with user acceptance variables as well as study, agreed to pseudonyms in the transcripts. The independent researcher conducted a separate analysis and subsequently produced a list of themes that could be utilised to analyse the perceptions of participants. When the two analyses, namely, the independent research and the

author's research, were completed, the two researchers coordinated and reviewed the areas to find paths of convergence and areas of non- convergence (The summary of the analysis by the independent researcher is depicted in Table 5 and Table 6 in Appendix F). Nevertheless, there appeared to be some areas where there was divergence of opinions. These views related to discovery and situated learning benefits in the MUVE.

According to the author, although discovery and situated learning educational benefits can be used effectively to engage in critical thinking about authentic scenarios and actual capabilities, the successful implementation of these facilities would be dependent on the educators or the educational institution. Although the independent researcher did not focus on discovery learning and situated learning benefits of the MUVE, he pointed out the challenges that educators would face when using the MUVE as an educational tool under properties of environment.

The two independent analyses were then reviewed repeatedly to explore new perspectives. The reviews conducted did not lead to a change in initial factors identified in the analysis. Nevertheless, the analyst triangulation initiated a complementary extension of data analysis for this research. Greene, Caracelli, and Graham (1989) noted that there are five major bases when conducting mixed methods research. They are: (1) triangulation – seeking validation; (2) complementarity – seeking elaboration and simplification of the results from one method with the results from the other method; (3) initiation – distinguishing ambiguity; (4) development – perusing an outcome from one method to assist the progress of the other method; and (5) expansion – in broad-basing all aspects of the research by utilising diverse methods to investigate various components. Although these are rationales of mixed method, triangulation,

complementarity, initiation, and expansion noted by Greene et al, they strengthened the data analysis of this research.

A summary of the analysis findings was sent to the participants in the study by e-mail or notecard so they could confirm the veracity of the analysis. Lincoln and Guba (1985) described member checks (as in a member of the study participant group) as an imperative technique for building plausibility in a study. The participants' feedback was then added to strengthen the analysis.

A 40 percent response rate was received in acknowledgement of the summaries. Most of the feedback received was satisfactory and contained compliments.

Sue was a participant who was Unfamiliar with the MUVE. Many participants who belong to the same group as Sue were fascinated with the number of educators who participated in this research. There were two reasons for the high level of participation; the first was that more and more educators are willing to step outside their own academic communities and become members of a MUVE, or they are interested in finding out about the MUVE. The second reason was the collaboration facility offered by a MUVE to learners and educators (Prasolova-Forland & Divitini, 2002). Due to these collaborative features offered by a MUVE, communities grow, evolve, and offer support mechanisms that are sustained over time. As a result, an enormous amount of resources are available to students within a MUVE that would not be available to them in real-life. As Bell, Pope, and Peters (2008, p. 29) pointed out, "content is the king, but collaboration is the key in MUVEs."

Ethical Issues

The ethical approval for this study was obtained from Massey University. It was deemed low risk. Before commencing the interviews, each participant was given a consent form (see Appendix D) to sign, and an information sheet (see Appendix E). To ensure confidentiality during the analysis, pseudonyms were used instead of actual names. As mentioned in the validation section of this chapter, the researcher provided the participants with a summary of the analysis of the study for verification; this also contributed to the ethics of the study. All the data gathered was stored securely under lock and key. Furthermore, the researcher ensured that no one except for the researchers involved in the project could access the data. After the completion of the research, data collected will be disposed of by following standard procedures for treating confidential waste, and all copies of digital audio recordings will be deleted.

Summary

This chapter describes the research design, semi-structured interviews, and analytical approach adopted for this research. The purposive, convenient sample was an appropriate approach to investigate perceptions of the Familiar and Unfamiliar users of MUVEs.

The next chapter describes the development of the virtual class which was demonstrated to interviewees. As mentioned earlier, the class was created in accordance with the TAM factors and the potential educational benefits identified in the literature.

CHAPTER FOUR

Virtual Class

This chapter describes the overall design process of the virtual class developed and used in this research. As noted in Chapter Three, this virtual class was used for demonstration purposes during data collection. While designing the virtual class, the researcher gained an in-depth understanding of MUVE functionality relevant to educational uses, and got immersed in the Second Life community, which proved to be valuable in selecting participants for the study.

Furthermore, this chapter describes how assistance was obtained from the communities within Second Life to identify the facilities available, and how a place to create a virtual class was selected. This is followed by explanations of how the tools were created to build the virtual class, a detailed explanation of the purpose of tools in the virtual class, and how the class created was presented to participants in the Second Life community.

Identifying the facilities

One of the facilities available in Second Life is community support for its residents via the Second Life educators' forum; one of the main resources for researchers who conduct studies in MUVEs. The users of Second Life may register in this forum using Mailing List (2009) and gain access to many Islands from which useful resources for a virtual class can be gathered. An Island in Second Life is an area allocated to a particular community. Jokaydia Island is one such Island with facilities for educators; Jokaydia Island is designed to provide a flexible and dynamic space, and includes both formal and an informal locations and a range of educational tools (Jokaydia, 2009). In addition, public meetings in Second Life are arranged

by the organiser of Jokaydia Island, Jokay Wollongong, to assist new residents to gain experience and assurance in using Second Life. Information regarding one such conference was gathered from the Second Life Educators' Forum in this research.

The conference presented an opportunity to identify how tools and facilities are integrated effectively in a virtual environment by using virtual presentations, notecards, instant messaging, and Twitter.

Creation of the Virtual Class

The main purpose of this exercise was to create educational tools that could be used in the virtual class. The intention was to provide an interactive environment in which the educators could conduct a virtual session so that the students could master project management skills.

It has always been a challenge to construct objects required for the virtual class without having either private land or a rented property in Second Life. However, Second Life Islands such as Edtech and Jokaydia provide sandboxes that can be used for a limited time.

A sandbox in Second Life is a location researchers can visit to improve their creativity; their use is strictly limited to non-commercial purposes. The Edtech sandbox area was used extensively by this researcher to carry out creations without making any financial contribution.

Tools created to be used in the virtual class were scripted using Second Life script language (LSL). The tutorial provided by Second Life made the process easier. Many educators who had participated in the Second Life Education Forum provided guidance and support when a question was asked. The social network provided by Second Life assisted in the creation of effective educational tools.

In the beginning, all the tools were created in a sandbox area. However, as the sandboxes are shared by many users, it was difficult to conduct a virtual class in that

environment. Consequently, a location was rented from Jokaydia Island in which to conduct the virtual class for this research.

The Virtual Class

The virtual class consists of five sections:

(1) Navigation centre — provides information to enable people to navigate easily within the virtual class.
(2) Virtual classroom 1 — provides slide presentation and virtual tools to conduct a session virtually.
(3) Sandbox — an area to socialise with other students or to discuss subject matter.
(4) Integration tool centre — provides virtual tools for the educator by integrating with MOODLE application.
(5) Virtual classroom 2 — a virtual classroom with more MUVE-specific tools.

Navigation Centre

At the start of the virtual lecture, the participants were provided with a link to the virtual class (Virtual Class, 2009) on Jokaydia Island. This link brings the participants into the entrance area. Image 2 depicts the entrance to the virtual class.

Image 2: Entrance to the Virtual Class.

The building where the virtual class was created is visible to the participants from the entrance area. The entrance to the building consists of a navigation centre, depicted in Image 2. Davis (1989) identified ease of use as an important determinant of system acceptance. The navigation centre provides information to enable people to navigate easily within the virtual class. It also provides opportunities for students and educators who visit the virtual class to familiarise themselves with the environment before commencing the class. The billboards at the navigation centre suggest landmarks to visit such as the Virtual Campus, Library, Edu Square, and Newbie Garden on Jokaydia Island.

Edu Square on Jokaydia Island provides access to thirty educational destinations in Second Life. The information provided by Jokaydia Island suggests that these destinations would be good places to visit in order to understand the educational resources available in Second Life, and a place to begin building ones social network. (Jokaydia, 2009)

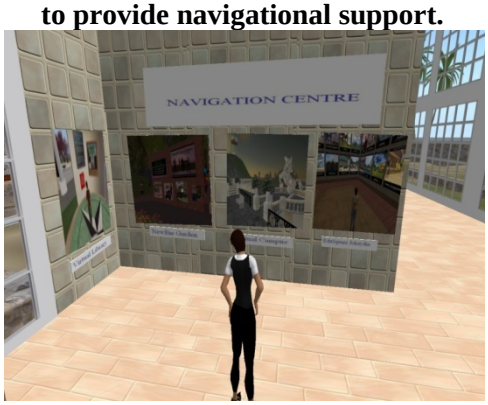
The Newbie Garden of Jokaydia Island provides simple tips for beginners so they can become familiar with the environment. These tips allow students and educators to navigate and interact with virtual objects and study the educational

material easily. After gaining experience on this Island, students and educators are able to immerse themselves in the environment.

The virtual library consists of many Islands that relate to libraries and education. The virtual library provides interactive books and audio books. In addition, it assists participants to locate resources and gives directions or suggestions on other places of interest.

The Virtual Campus is another educational island operated by Linden Lab. This Island assists educators who wish to have a permanent presence in Second Life by providing space for a specific class or for ongoing educational research purposes. Image 3 depicts the billboards in the virtual class.

Image 3: Billboards displayed in the Virtual Class to provide navigational support.



The virtual class provides facilities to view an external web site through a web browser. External web sites can be accessed by utilising virtual laptops in the class; these provide links to enable users to visit Second Life tutorials, Wikipedia, and Time World Clock web sites.

Second Life tutorials provide easy-to-follow instructions for beginners, and the Wikipedia site provides references to the Project management topic discussed in the

class. Second Life maintains its own clock. The students and educators who log into a virtual class from different locations use the Second Life clock which uses the USA-California-San Francisco time zone. The Fixed Time World site helps students and educators to obtain their local time zone.

Another navigational tool presented in a virtual class is a YouTube video presentation. This helps students and educators learn how to use voice facilities in Second Life. Image 4 depicts the laptops and the video facilities in the virtual class.

Image 4: Laptops and YouTube Video presentation.

Navigational ease is a main factor in the acceptance of any application, and the perceived usefulness of an application is an added advantage to encourage its acceptance. As identified by Davis (1989, 1993), user acceptance of computer systems depends on their perceived usefulness – which, in turn, depends on the tools and facilities available in the application. Mathieson et al. (2001) reported that the resources which are available for an application influence its acceptance. The tools that can be used effectively in a virtual class are demonstrated on Jokaydia Island and were incorporated into the virtual class.

Virtual Classroom 1

The next area of the building consists of tools and seating arrangements that are used to conduct the virtual class. The seating for participants was arranged in front of the presentation screen. A slide presentation using this screen was used to conduct our virtual class. The lecture notes utilised in the virtual class were collected from a project management book, System Approach to Planning, Scheduling, and Controlling (Kerzner, 2006). Arrow keys displayed on the screen enabled navigation within this interactive display tool to illustrate the lecture points during the class. The presentation screen is shown in Image 5.

Image 5: Presentation screen.

Many researchers critique slide presentations in MUVE. Kluge and Riley (2008) noted that PowerPoint presentations in MUVE are likely to prevent educators from adopting more MUVE specific tools and opportunities. However, there are many advantages to creating slide presentations in Second Life. Firstly, it's easier for the educators or educational institutes to interact and set up an ideal environment. Secondly, with minimum effort, there can be dialogue with individuals or groups who then interact with each other. In the event of several individuals confined in the same sim, if the is great deal of moving about (moving, running, and animated educators and students), a 'lag' may result; this means the transmission and reception of the session will slow down. When an educator conducts a slide presentation,

student avatars in a seated position in the virtual classroom will minimise the lag (Blog-efl, 2009).

The educator was given the opportunity choose a location from which to conduct the lecture. The participants were advised to activate their voices by pressing the "Talk" button at the bottom right-hand corner of their screen. This voice communication facility was used to communicate during the lecture. Image 6 depicts the educator conducting a virtual class with a group of students.

Image 6: Educator and student avatars in the Virtual Class.

The IM panel is a way of communicating with the educator by sending text messages instead of using the voice feature during the virtual lecture. The messages communicated through IM were recorded during the class and responses were e-mailed back to students after the class was over.

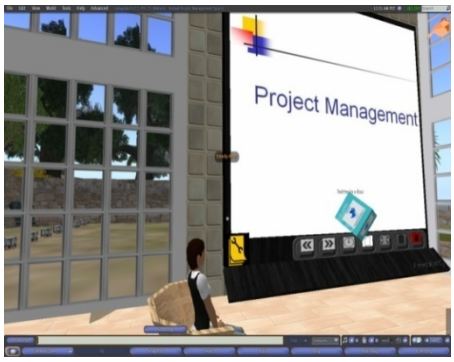
The virtual class consisted of many facilities to provide students with information related to subject contents. Image 7 depicts the educator having a discussion with students in front of a virtual diagram. The diagram presented in the virtual class was another tool to provide information.

Image 7: Diagrams used in the Virtual Class.

Discovery learning is one of the educational benefits that the MUVE offers. Sanders and McKeown (2007) stated that virtual environments promote discovery learning. Facilities are provided in the virtual class to enable the students to visit other islands during the class. The virtual class created for this study allowed participants to teleport to NASA Island in Second Life. The goal of this island is to create a cultural and technical infrastructure for more meaningful public participation in the space programme. This Island allows participation in NASA projects through exploration in the virtual world. Participants were given an opportunity to discover an example of a matrix project on NASA Island by allowing them to teleport to Island.

As pointed out by McCann (1998), digital technologies have played a major role in both social changes and the transformation of education. As a result, educators are now being offered a range of online services and products that are well suited to classroom use. Such an online service is Twitter. Bakioğlu (2006) stated that Twitter could be accessed by Second Life in an on and off mode which enables its use as a communication medium between students and educators. The participants were provided with a Twitter facility to communicate either online or offline with the educator. Image 8 depicts the tool that contains Twitter facilities. Students were able to touch the tool that contains Twitter and copy attachments to their inventories which included instructions on how to use Twitter.

Image 8: Tool that contains Twitter facilities.

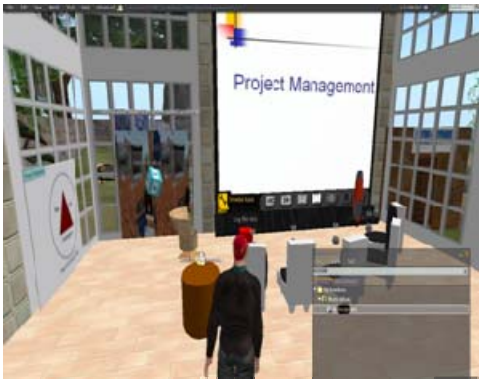


The educator provided information to the students, regarding virtual discussion groups scheduled for the assignment. These virtual discussion groups will provide opportunities to communicate subject matter issues or moot points that students come across in the assignment. The presentation slides and assignment were made available for students to download to their inventories after the lesson. Image 9 depicts the tool that contains the presentation slides and assignment.

Image 9: Presentation slides and assignment details for students.

The students were advised to touch an object and submit their assignments to the class upon completion. When the educator touches this object, e-mail is sent to him/her with the submitted assignments attached. Image 10 depicts the tool that students are advised to use to submit the assignment.

Image 10: Student avatar submitting an assignment using the tool.



A virtual session was conducted in the classroom to deliver a lecture in project management after creating the virtual class and the tools. This virtual lecture was recorded using a facility known as “Fraps professional version”. Fraps is a Windows application that can be used to record videos into other video formats (Fraps, 2009). The recording was copied into a DVD and a copy of this DVD is attached to this thesis (See Appendix J).

Sandbox

Prasolova-Forland and Divitini (2002) explained that the MUVE provides a collaborative virtual environment for social awareness support. The virtual class created is capable of providing a collaborative learning environment for students. This opportunity is available during and after the class session. The students who visit the class outside class hours have an opportunity to visit the sandbox area. The students may visit the sandbox area by walking, flying, or teleporting. The teleporting facilities are provided in the entrance of the virtual class. The sandbox is depicted in Image 11. Students who visit this area are able to socialise with other students or discuss the subject matter. Learners can use this area to collaborate freely, especially to discuss

group assignments. The researcher has provided facilities for students to teleport back to the entrance area of the virtual class after the discussions.

Image 11: Discussion area for student avatars.

Integration tool Centre

As MUVEs are evolving, many researchers have built integration tools to be used in Second Life. Livingstone and Kemp (2006) revealed how an existing Learner Management System known as MOODLE was integrated with Second Life using an integration tool, SLOODLE; this transforms subject contents into three dimensions.

As Livingstone and Kemp (2006) revealed, MOODLE is a Learning Management System, a free web application that educators can use to create effective online learning tools. MOODLE can be used to build collaborative learning environmental tools related to a particular subject matter. In order to integrate MOODLE into Second Life, developers have created an integration tool known as SLOODLE. SLOODLE is an Open Source project, in which useful, usable, desirable tools have been developed to support education in virtual worlds, thus making teaching easier. When using the SLOODLE interface, educators are unable to implement MUVE benefits such as roll-projection, discovery learning, and situated learning. However, the

interface will allow them to integrate subject contents defined in MOODLE into Second Life without requiring knowledge of scripting language. To reuse subject contents defined in MOODLE, it was decided to implement SLOODLE integration tools in the virtual class. These tools are accessed through a server that has a MOODLE Learner Management System and SLOODLE integration tool in Second Life.

The MOODLE Learner Management system in Jokaydia server was utilised to define the project management course prepared for this research. Image 12 depicts the details defined in the Jokaydia server.

Image12: MOODLE in the Jokaydia server.

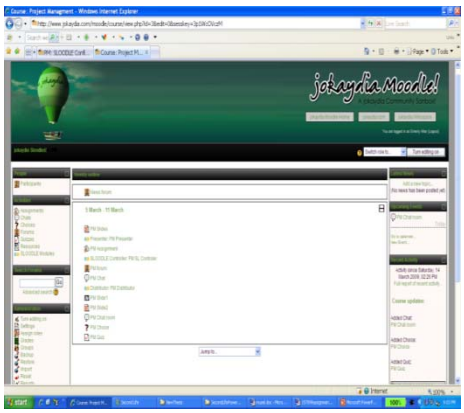


Image 13: SLOODLE integration tools in the Virtual Class.

The SLOODLE integration tool can be downloaded from SLOODLE (2009) or SLOODLE Island in Second Life. There are dedicated educators and groups in Second Life that support SLOODLE integration tools. The main educator is Fire Centaur, and the main group in Second Life is SLOODLE group. All of these supports and tools are provided free of charge. Image 13 depicts the SLOODLE integration tool 0.4 which had been downloaded for this research from SLOODLE Island in Second Life. Options provided in the SLOODLE integration tool allowed the integration of subject content from the MOODLE server to Second Life. This exercise provided a 3D effect to tools defined in the Learner Management System.

Kalay (2003) pointed out that when cyberspace is selected as a teaching medium, it is necessary to have controls that allow its manipulation and appropriation through the interface. The SLOODLE integration provides several facilities to control access to the classroom. Educators are able to salvage the user accounts defined in MOODLE without defining them in Second Life. Combining the enrolment setting with MOODLE's settings is a very interesting idea, and would make life simpler for educators. The first access control tool downloaded from SLOODLE tool set is the access checker. It verifies whether the student is supposed to be in the class. If the student is allowed to enter, this tool will let them through. Image 14 depicts the avatar student accessing the checker.

Image 14: Student avatar accessing checker.

Only a bona fide student avatar would be allowed into the classroom after positive identification. Image 15 shows the avatar entering the classroom after being approved for entry.

Image 15: Student avatar entering into the Virtual Class.

An access control tool is the SLOODLE Login Zone. When an avatar appears in the zone, it will be registered to its MOODLE user account. Image 16 depicts the Login zone in the virtual class.

Image 16: The Login Zone available in the Virtual Class.

Another access control tool that can be downloaded from MOODLE is a registration booth. This tool will allow the student avatars to access their user accounts defined in MOODLE through Second Life. This will also enrol the student into the corresponding MOODLE course, if not already enrolled. Unlike the Login Zone tool, this has to be accessed every time a student avatar enters into the virtual class. Image 17 depicts an avatar student's attempts to register in a virtual course that has been set up in

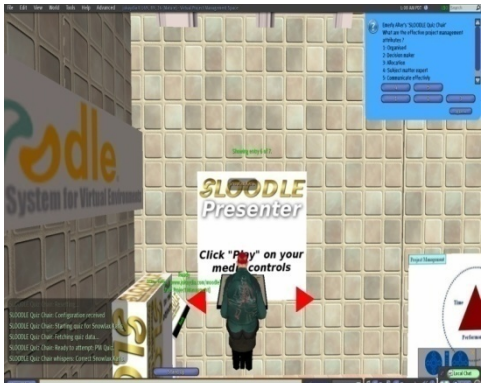
MOODLE. Educators are not required to utilise all these control mechanisms in the classroom. They may select the appropriate tool for their virtual classroom.

The SLOODLE integration tools allow reuse of many other subject contents defined in MOODLE. One product that could be reused in Second Life is the Quiz tool which allows users in Second Life to take a multiple-choice quiz that the teacher had set up in MOODLE. This could be used to turn quizzes into competitions or simply to bring a visual element to assessment. This virtual quiz sends results to student avatar via instant message.

Image 17: Student avatar attempts to enrol in a course using SLOODLE tools.

As Venkatesh (1999) explained, game-based training environments typically emanate fun and joy in comparison to the real world classroom atmosphere. It is possible that the outcome would enhance cognitive absorption. Educators would be able to use the quiz tool in a MUVE to provide a game-based environment for learners. Image 18 depicts an avatar student accessing the quiz from Second Life.

Image 18: Student avatar engaged in a quiz.



Web-intercom is another tool downloaded into Second Life using SLOODLE; it is a chat room that brings the MOODLE chat room and Second Life chats together. Students can participate in chats in Second Life using the approachable MOODLE chat room. Discussions can be archived securely in the MOODLE database.

Another tool available in the SLOODLE interface is a virtual Drop Box. This tool allows learners to return assignments after completion. Image 19 depicts a student avatar submitting an assignment via the Drop Box. Educators are able to access the assignment just by touching the Drop Box. All the submitted assignments will be automatically copied to the educator's inventory.

Image 19: Student avatar sending an assignment to MOODLE.

PowerPoint slides need to be uploaded to Second Life in order to conduct a virtual presentation. Uploading slides to Second Life costs Linden dollars, which is one

of the disadvantages of the presentation tool, but the presenter in the SLOODLE interface provides a solution for this problem. Educators are able to conduct presentations in Second Life using presentations of slide and/or web pages on MOODLE. Thus, a presentation can be conducted in Second Life without having to go through processes to convert or upload images. Image 20 shows the lecturer avatar viewing the presentation set up using the SLOODLE interface.

Image 20: Educator avatar viewing the SLOODLE presenter.

Virtual Classroom 2

The educators have an opportunity to implement more MUVE-specific tools in virtual classes using Second Life facilities. However, to implement these tools, educators require a sound knowledge of Second Life scripting. The Virtual Classroom 2 offers more MUVE specific presentations that can be used to conduct an effective virtual session. The avatars who visit this class could directly teleport into the virtual class. The layout of this classroom is completely different to the virtual classroom, as explained in the section of Virtual Classroom 1 depicted in this chapter.

The educator is at liberty to deposit pre-prepared slides in this classroom. These slides are scripted in a manner which will cause them to only appear in response to the

avatars' activity, for example, walking on the stage. When the educators and students visit the next stage of the slide, the previous one disappears. The slides presentation of the Virtual Class 2 is depicted in Image 21.

Image 21: Virtual Classroom 2 layout.

The avatar in image 22 is only capable of viewing the first presentation slide. To view the next slide the avatar needs to walk or fly to the next stage. This is shown in Image 22.

Image 22: The slide presentation in the Virtual Classroom 2.

When students and educators reach the end of the class they can all teleport and retreat to the beginning of the class. The effective use of Virtual Classroom 2 requires a sound knowledge in scripting language. Further, in view of the nature of this form of classroom, it may cause lag in Second Life, due to its multi-capability concept in the

activities in the classroom. If scripting knowledge is inadequate, the next option would be to purchase the tools created by others.

Presentations

One of the factors which encourages acceptance of information technology is the subjective norm. As pointed out by Srite and Karahanna (2006), users will accept an application if it is already being used by professors and classmates. Therefore, the next step in the research was to identify other educators who were using tools in MUVEs.

The researchers who are actively participating in Second Life utilise Second Life forum to invite other users to their educational activities through e-mails. As a result of these e-mails, the researcher had several opportunities to conduct presentations within Second Life regarding the research topics and virtual tools. These presentations were held in the City University London Island, Ontario Island, and the University of Melbourne Island. All presentations were conducted virtually; participants who attended logged in to Second Life from many countries. During these presentations, the creation of the virtual class and the effective use of tools were explained. The usefulness and issues regarding the MUVE as an educational tool were discussed. The main concerns identified by the participants were learning curve and affordability. Organisers of the presentations in City University London and the University of Melbourne sent e-mail invitations to their presentations to all members of the Second Life educators' forum. Refer to Appendix G for these presentation schedules.

The City University London Island is a property of City University London. Participants in this session were teleported to the virtual class created for this research. At least fifty people attended this presentation which was conducted using audio facilities; participants were also given an opportunity to ask questions or provide

feedback using instant messages. Many avatars who logged in to the virtual class found it difficult to navigate into the class due to lagging issues (Wadley et al., 2008).Digital Ontario Island is a property of the government of Ontario. This island is a part of the Ministry of Government Services that is researching the challenges and opportunities of broadband use, especially for educators. Participants who attended this presentation were unable to teleport to other islands in Second Life due to the strict security measures in place. Therefore, the tools created were transferred from the virtual class to Digital Ontario Island using Second Life facilities that allow the transfer of tools and objects from one island to another. The organisers of this presentation sent a notecard to all presenters after the presentation. Refer to Appendix H for the notecard received by the researcher.

University of Melbourne Island is a property of the University of Melbourne. The participants were teleported to the virtual class created for this research without any hindrance. There were ten participants, and due to the small number, the presentation was conducted with ease.

Another presentation was held with Second Life Education New Zealand (SLENZ) project members. The SLENZ group had set up a research project in the online virtual world of Second Life for New Zealand educators. This presentation was conducted in a real-life location and explained how the navigational support tools were utilised in the virtual class, how the virtual tools were created, and how the tools were utilised to conduct a virtual class. After the presentation, there was a discussion period that elaborated on how the educators with different backgrounds worked collaboratively to build a virtual class (relating to SLENZ group); it also identified issues that arose when introducing virtual classes to the educational field. One of the

major concerns was the steep learning curve for newcomers. To reduce the learning curve, a series of familiarisation courses for newcomers was discussed. The members of the SLENZ group published details of this presentation in their blog (SLENZ, 2009). Refer to Appendix I for details of the SLENZ blog.

These presentations provided an opportunity to meet educators from around the world who are already conducting classes in Second Life as well as educators who are exploring the MUVE concept.

Summary

This chapter describes the overall design development process of the virtual class framed by the TAM factors and the educational benefits/issues identified in the literature. The Second Life community was highly supportive and the rapport the researcher developed at this stage greatly facilitated the selection of participants with Second Life teaching experience.

The next chapter presents the results of the interviews.

CHAPTER FIVE

Analysis and Results

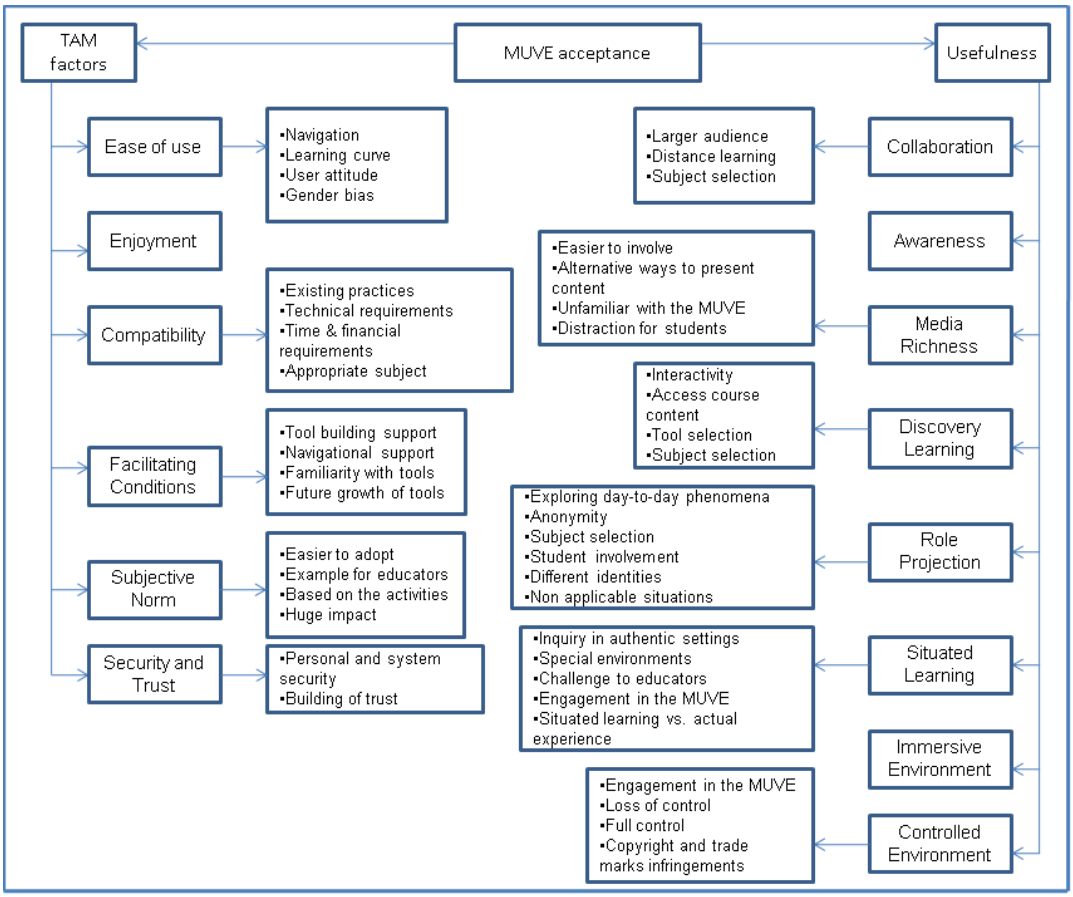
In this chapter, findings from the data analysis are presented against each topic identified from the literature reviewed in Chapter Two. This includes factors known to impact on technology acceptance decisions and claimed educational benefits of MUVEs.

Analysis

The interview transcripts of two participant cohorts were analysed against the TAM factors discussed in Chapter Two, Literature Review. Figure 1 depicts the structure of the analysis outcomes. There are two major functions of MUVE acceptance. They are TAM factors and MUVE usefulness to the educational spectrum. The TAM factors are listed on the left hand side of Figure 1 with the related sub headings. The features of usefulness are listed on the right hand side of Figure 1 with the related sub headings.

As the perceptions of most participants were similar, to point out the facts, only the descriptive answers received are mentioned in the analysis. Full details of the participants are presented in Chapter Three, Tables 2 and 3. In the analysis, participants who are familiar with the MUVE are identified as “F” and the participants who were unfamiliar with the MUVE were identified as “U”.

Figure 1: The structure of the analysis outcomes.



Ease of Use

There are different attributes identified by the participants which contributed to their perceptions of what made a MUVE easy to use. These attributes are: navigation, learning curve, user attitude, and gender bias. These attributes are discussed under those headings.

Ease of use – navigation. Ten out of the 22 Familiar participants interviewed said they either were conducting or planned to conduct Second Life classes in the near future. These participants indicated that virtual classes in Second Life were easy to use and navigate and this influenced them to use a MUVE as an educational tool. Victor is

conducting classes in Second Life and uses the SLOODLE integration facility to interact with MOODLE subject content.

> Ease of use is the number one in my decision to use Second Life as an instructional tool. (Victor, F)

Sonali was planning to conduct her first MUVE class and was preparing the environment. She found the navigation in Second Life a challenge compared to other tools she had used. Although Sonali had to face several navigational issues, she decided to use Second Life as an educational tool because of its potential benefits. These benefits are discussed in sections on the educational benefits of MUVE in Chapter Two.

> I'll be honest with you I find Second Life is a challenge. I found the access to it was a challenge, navigation, talking and teaching all were challenges. I have done Twitter and Skype. I found Second Life a challenge. Having said that, we can use Second Life in specific ways. (Sonali, F)

Familiar participants indicated that the navigational support available in Second Life is spread throughout the environment. As a result, the educators or students who are new to the environment would face navigational issues, as they are unable to find the appropriate navigational support. If we were able to provide a high degree of navigation as demonstrated, usage of MUVEs would be increased.

> The Project Management space in Jokaydia Island has a high degree of navigation ease. I think one of the problems Second Life has is the lack of navigation ease. This is one of the pitfalls of Second Life. Once they re-engineer the navigation controls in Second Life, I think it will allow the increased usage of Second Life as a whole. (Callum, F)

Familiar participants believed that difficulties in it are overstated. For example, participants like Eila said:

> The navigation tools in the demonstrated virtual world were very easy to use. Large navigation buttons with pictorial representations of the locations and text to explain what to do, make it very easy to get to other locations. I think that the difficulty of learning MUVE and Second Life in particular is over-stated. I find with my students that a two hour orientation is all they need to get started and eight more hours of practice is enough to make them quite comfortable. This is no greater than a teacher would need to learn to use new Learner Management System software. (Eila, F)

Arnold, who taught a wide range of tertiary IT-related topics including programming, systems analysis, and design was the only one from the group of participants Unfamiliar with MUVE who participated in the discussion through Second Life. With very little assistance, he was able to find his way through the MUVE. At the start, he had issues locating the created virtual class. However, after a few seconds, he mastered the environment and gained confidence in navigating within it. Arnold said:

> I had problems finding the class but once in I was OK. At one point, I seemed to become stuck not being able to move but this seems to sort itself out after a few seconds. Ease of use is always an important consideration for a busy teacher. However, developing an interactive environment such as the one demonstrated is obviously an acquired skill that has to be learnt and that would take some time. It needs to be remembered that some teachers are reluctant to even learn how to use tools such as Blackboard and WebCT. I think teachers with the time dedication and enthusiasm will adopt tools such as Second Life. (Arnold, U)

Rod was an Information Technology tertiary educator who was unfamiliar with MUVE. He had the same view as many other participants who were Familiar with MUVE in that he thought that navigation in the demonstrated environment was difficult. Nevertheless, as he is an adaptable person, he predicted that he would be able to catch up.

> It seems hard to me. But, I am able to learn and adapt. For the learner, the application must not impede the learning. (Rod, U)

Katrina was unfamiliar with MUVE and following the demonstration of the facilities and tools available in MUVE, did not find navigation a challenge. According to her, every educator has to feel at ease before using the application. She suggested conducting orientation classes such as she had experienced for all the educators who would be using MUVE as an educational tool.

> I just started using Second Life. Seems to be OK. Before using the class in Second Life, educators will need some kind of orientation as displayed in your class. (Katrina, U)

Joe was also unfamiliar with MUVE and had similar perceptions to Katrina.

> The demonstration by the researcher made it seem straightforward. However, staff who would be required to use MUVE have to be given training. (Joe, U)

Ease of use - learning curve. Participants, like Alison, who had experience in conducting classes in a MUVE, were hesitant about teachers who are new to MUVEs working in Second Life with students. According to her, educators must be thoroughly conversant with MUVEs in order to work with students.

> It is not easy to use like any other tool, you need to know how to use it properly before using it effectively. I myself am very hesitant about teachers working in Second Life with students when they themselves are not comfortable and familiar with being in Second Life. There is a learning curve. (Alison, F)

Further, Alison expressed her convictions that if educators identified the benefits of the MUVE, they would accept it as an educational tool, despite the challenges of the learning curve.

> I think the educators who are going to use Second Life effectively are those who actually understand the benefits of this kind of environment. (Alison, F)

Cameron had conducted virtual classes to deliver a system architecture course and emphasised that there would be a learning curve for newcomers. However, he clarified that this is no different from any other educational tool. According to Cameron, a little bit of hard work will go a long way.

> There is a learning curve. But when you get used to the environment, it is very simple to use. This is according to my experience. This will vary with educators' own backgrounds. For the very first time, when we are using the environment, we require a little bit of hard work to get used to the environment. We can enjoy ourselves if we know what we are doing. This is like any other tool. (Cameron, F)

Familiar participants indicated that students who are learning in these environments are required to spend time to understand the environment and subject content. Dave Said:

> The learning curve in Second Life is a very important issue. The students may need to spend several hours learning how to navigate in Second Life. That means it cannot be used casually in a teaching situation. The investment in time required to master it, means that it is really only practicable for student use if the payoff will be sufficiently valuable. (Dave, F)

Ease of use - user attitude. Chris taught engineering subjects. He was open to innovations in the area of teaching, learning, and technology, with the ability to adjust to changes and implement them in the classroom and the school. However, he was unfamiliar with the MUVE. According to Chris, navigation in the MUVE is easy; therefore, it will be accepted as an educational tool.

> As it is easy to navigate it becomes easy to accept (Chris, U)

Mabel specialised in Marine Biology and Aquaculture. She was conducting research into innovative teaching tools. However, she was Unfamiliar with the MUVE. According to her, navigation depends on the personality. If people are prepared to adopt new tools, they will be able to pick them up very quickly.

Educators will pick up if the tool is user friendly. It all depends on the personality.

> Certain people are more adaptive to new tools than others are. People who are already using other educational tools will be keen to use Second Life. (Mabel, U)

Ease of use - gender bias. Jasmine was Unfamiliar with the MUVE and had different perceptions about adopting the MUVE. As an accountancy lecturer she said.

> Easier for students to accept this type of environment, but I think it would appeal more to males (who tend to enjoy gaming more) than females so there could be a gender bias introduced. (Jasmine, U)

Historically there has been a strong male-bias in the design and use of traditional computer games. However, Mubireek (2003) noted that today there is increasing evidence of female gaming; therefore, depth and context in games have changed. If games are well designed, they could be used to challenge players and keep them involved.

The results indicate that participants believe one of the important factors in determining the acceptance of MUVE was ease of use. However, ease of use could be challenged by the learning curve for newcomers, particularly those unfamiliar with technologies such as video games. The participating educators suggested that one of the

ways to shorten the learning curve would be to provide navigational support and information in one location for easy access.

Prior researchers have suggested that usefulness is more important than ease of use (Davis, 1989). The participants in this research acknowledged the significant benefits of the MUVE to the educational world, and indicated that they were prepared to accept the MUVE as an educational tool in spite of drawbacks such as the learning curve for newcomers. The significant benefits of the MUVE to the educational world are discussed in the following sections of this chapter.

The participants who were unfamiliar with the MUVE indicated they should be given training and opportunity to become familiar with the environment before accepting the MUVE as an educational tool. Further, they explained that if they were able to find the necessary time, had the required dedication and enthusiasm, and were adaptive to new technology, they would then adopt the MUVE as an educational tool.

The participants who had been using traditional teaching methods for a long time and who were unfamiliar with the MUVE were reluctant to adopt the MUVE as an educational tool. However, they predicted that if they were hardworking and open to new ideas, it would not be an issue to accept the MUVE as an educational tool.

Both male and female participants who engaged in the MUVE indicated that it was enjoyable to work in this type of environment. However, one of the female participants who were unfamiliar with the MUVE indicated that this type of environment could be gender biased. Mubireek, (2003) noted that current gaming environments are built with the view of accommodating both genders. Therefore, new

game environments should be able to attract both genders, challenge them, and keep all players involved.

Enjoyment

Many of the participants who were familiar with the MUVE stated that the fun element in MUVEs would vary depending on the person. If one was familiar with the environment and understood its benefits, it would be more enjoyable.

> I certainly hope so. I think the educators who are going to use Second Life effectively are those who actually understand the benefits of this kind of environment (Alison, F)
>
> If you are familiar with the environment, yes, it will be easy to enjoy. Otherwise, it will be very difficult to use the tool. (Tony, F)

Eila was an educator who had 25 years' experience in the educational world. She was involved in various Second Life learning activities and conducted classes in Second Life. According to her, MUVE visual objects are not developed up to video game levels. Therefore, initially it could be frustrating for students who are used to enjoying the techniques of video games. However, the playful aspect of the environment has a positive effect on learning.

> Initially, a MUVE such as Second Life can be disappointing to students who play on-line games. It has predetermined objectives and because the maps are stored on the Linden Lab server the action and visual effects are chunkier than most video games. On the other hand, the playful quality of the environment (if preserved) has a positive effect on learning. (Eila, F)

By expressing her own experience, Eila said that enjoyment is one of the factors which caused her to accept the MUVE as a teaching tool, and it would actively

convince their institute to use the MUVE. Further, she indicated that not only educators but also students would enjoy working in this environment.

> I find it extremely enjoyable and this is motivating me to try things that I may not have in the past or did not think were possible. Enjoyment is what made me accept the MUVE as a teaching tool and actively convince my college to use Second Life. (Eila, F)

Victor and Bruce agreed with Eila's sentiments and identified increase student motivation when "there is an element of fun" (Biyanka, F)

Samantha was new to the educational world and the MUVE. However, she had participated in virtual classes conducted by one of her colleagues. According to her, there would initially be issues for educators and students who were new to the environment; however, after becoming familiar with it, they would be able to enjoy themselves.

> Initially, there will be issues for students and educators. However, with development of the environment issues will vanish. In the future, they will be enjoying the process. (Samantha, U)

Joe, who had ten years of experience teaching accountancy subjects, predicted that the building activities and performances related to avatars could provide enjoyment to students as well as to teachers, although he was unfamiliar with the MUVE.

> Building the environment, improving the appearance etc. may prove to be enjoyable challenges. (Joe, U)

Rod was reluctant to comment regarding enjoyment, as he had not experienced the environment fully himself. However, he predicted that a virtual class environment

could be more effective than a real-life classroom, especially considering the capability of simulations.

> I have yet to think this through. Among many possibilities, I imagine the use of simple simulations, addition of live links and streaming can make for a learning environment that is more effective than within the traditional lecture theatre. (Rod, U)

The participants who were familiar with MUVE stated that the fun element depend on the individual. All the participants who had experience in creating 3D tools enjoyed the immersive nature of the environment. Regardless of their gender, participants who created tools in the MUVE to conduct classes enjoyed the process. They also noted that the enjoyment they experienced in the environment resulted in motivating them to continue working with the MUVE. Agarwal and Karahanna (2006) noted that enjoyment is likely to exhibit a positive influence on users' intentions to accept the use of information technology. This has been so for the participants who were familiar with MUVE; they indicated that enjoyment is one of the factors they were looking for when they were using, or planning to use the MUVE as an educational tool. Experienced participants who were familiar with the MUVE indicated that educators who identify the benefits of the MUVE would adopt this as an educational tool, regardless of the enjoyment. However, they believed that students who are experienced with video games would be frustrated with MUVEs initially as the visual objects in the MUVE are not developed to video game standards.

Participants who were unfamiliar with the MUVE, but who had video game experience, indicated that there would be certain issues during the familiarisation period. However, they were confident that with the passage of time the difficulties

would diminish as experience increased, and then they would be able to enjoy the environment. Participants who were unfamiliar with MUVE, and who had no video game experience, were reluctant to comment on the enjoyment factor, as they had no experience in this type of environment.

Compatibility

Participants had different views of compatibility with existing teaching practices, technical requirements of the MUVE, time and financial requirements, and appropriate subject choices. Although many believed that compatibility would not be an issue when selecting the MUVE as an educational tool, some of them thought differently. The factors identified by the participants are discussed under those headings.

Compatibility - existing practices. Eila, who had conducted classes in the MUVE, indicated that the concept is compatible with existing teaching practices.

> Yes, it absolutely does fit and that was very important in my decision to use Second Life in teaching. (Eila, F)

Dave, who had conducted MUVE classes, identified the need for him to change his current teaching approach:

> Using Second Life in teaching will require a pretty major rethinking of the ways I teach parts of my courses. It requires an approach that is, frankly, very unlike what I employ in my real-life classrooms. This will be a challenge, but one that I am looking forward to facing. (Dave, F)

Compatibility - technical requirements of the MUVE. Many participants who had conducted classes in MUVEs indicated that the broad technical requirements and

infrastructure requirements of the MUVE would limit the number of people using these environments. Tony's quotation exemplifies their concerns.

> Most of our students do not have broadband facilities. Drain on bandwidth is another issue. Bandwidth requirement on Second Life is quite significant due to the fact that you are downloading stuff. We need computers with graphic cards. Technical requirements for Second Life are very high. (Tony, F)

Alison, who was experienced in MUVE and real-life teaching, had strong views regarding connection issues. According to her, the connection issues and bandwidth issues would prevent her from providing a better service to students.

> I don't think that the compatibility is an issue. I think the thing that is going to create the biggest problem for us (that is, people wishing to use Second Life on campus as an educational tool) is bandwidth. Second Life uses an enormous amount of bandwidth. If you are trying to have 50 students in a session all accessing Second Life at the same time, you are eating up the university's bandwidth very rapidly. If we reduce the number of students in a class, then we are restricting the students' experience in Second Life just purely to the hour or hour and half whatever you are teaching them. (Alison, F)

Bruce was a participant who had already conducted classes in a MUVE. According to him, although there were limitations due to compatibility issues, they would diminish in the future, and educators and students would be able to use the MUVE as an educational tool.

> Yes, I agree there are issues. But I am confident these problems will diminish in the future. It is like the first time when we tried to use Internet. Everyone said they don't have connection. But they do now. (Bruce, F)

Sonali, who would soon be conducting her first class in Second Life, was convinced that the issues surrounding it would be diminished and the MUVE would be used as an educational tool.

> The MUVE has lots of potential and very exciting opportunities. As a teacher, if I have to spend a lot of time to understand, I'll use something else. I think in the future these issues will be covered and we will be using Second Life as a teaching tool. (Sonali, F)

Cameron was another participant who had conducted classes in Second Life. According to Cameron, he has already adopted MUVE as an educational tool and connection issues did not stop him.

> I don't think we have to wait for the future to resolve connection issues. We have it on campus just like any other tool now. In some of the workstations, it says the workstation does not meet Second Life requirements but it works. I don't think this is an issue. (Cameron, F)

Several participants who were unfamiliar with the MUVE agreed with Bruce. According to them, the issues that we face today will be resolved in the future, and educators will be able to use a better application in the future. Stuart's quotation exemplifies their perceptions.

> I think the compatibility issues will fall away very quickly. The institute I work with keeps up to date with hardware so I don't think we will have issues with hardware. (Stuart, U)

Samantha who was unfamiliar with the MUVE pointed out that the matter of affordability of computers would arise, as everyone required access to a computer to login to the MUVE. Further, she said that computer literacy would also be an issue.

> There will be many compatibility issues. Almost everyone will need to have a computer. Affordability will be an issue here. Another issue is that we have to be computer literate; e.g. students who are studying nursing have to study computer on top of their heavy workload. (Samantha, U)

Sandra was unfamiliar with the MUVE. She had similar perceptions to Samantha. According to her, it would be very frustrating if her students were not able to access Second Life due to poor connection or lack of proper equipment.

> Some girls in my school do not have computers. So that will be an issue. Most importantly, if Second Life becomes inaccessible due to poor connection or lack of proper equipment it will be an issue. It will be frustrating. (Sandra, U)

According to Rod, who was unfamiliar with the MUVE, his institution is committed to e-Learning; therefore, he did not see that technical limitations would be an issue in adopting the MUVE as an educational tool. Rod was more interested in interfaces such as MOODLE and SLOODLE.

> My teaching institute has committed to e-Learning, and the LSM is MOODLE. The MOODLE "add-ons" demonstrated with Second Life will help influence a merging of these two learning environments. (Rod, U)

Compatibility - time and financial requirements. Another issue pointed out by the participants was the time and money invested in the virtual environment. According to Sonali, if the teachers were new to the MUVE, they needed to hire someone to create a classroom. In real-life, the classroom is already prepared and educators do not need to worry about the classroom setting.

> There are opportunities in Second Life for educators. However, it is very time consuming. You need to set up the environment and prepare the classroom. Especially if you are like me; I have very basic knowledge in Second Life. Therefore, I had to pay someone to set up the classroom in Second Life. Therefore, it is not like running a classroom in real-life. But after you have set up the environment Second Life has very interesting things to offer. (Sonali, F)

Although Sonali pointed out that there were issues with time and financial factors, she also said that if one has the time and required funds then the MUVE could be used as an educational tool. After the initial investment, it would be used again and again.

> If you have time to build the class and money to spend then we can use the Second Life for classes. If there is budget then go for it. After you have built it then you can use it time and time again. (Sonali, F)

Compatibility - Appropriate subject choice. Cameron and Alison were very experienced MUVE educators. They had both conducted classes in Second Life to teach Information Technology subjects. According to them, before starting to teach in a MUVE, a considerable amount of time must be spent to identify the subjects to present because the MUVE is not a medium that is suitable to deliver all subjects. Alison's quotation exemplifies their concerns.

> We can't use all the subjects in Second Life. The most important thing is how you are going to use Second Life as an educational tool. Any subject that involves a high level of interactivity between students or between the subjects that they are learning can be selected to teach in Second Life. (Alison, F)

Arnold was unfamiliar with the MUVE, but he agreed with Cameron and Alison, participants who were familiar with the MUVE. He felt that not all subjects could be delivered through a MUVE.

> I think for certain topics such as gathering system requirements from people within a virtual organisation, there is a very good fit. That would encourage me to spend the time to develop an environment. For those areas where I believe there is a poor fit, such as teaching programming, I simply wouldn't use a MUVE. (Arnold, U)

As pointed out by Moore and Benbasat (1996) and Tornatzky and Klein (1982), compatibility is an important factor recurrent in technology acceptance studies. The two participant cohorts understood the technical limitations within MUVEs. These limitations may even limit the number of people accessing the MUVE as an educational tool. However, they felt that existing technical issues would soon be resolved, and the MUVE would be widely accepted as an educational tool. Further, participants indicated that not every subject could be delivered through a MUVE.

Participants who were familiar with the MUVE indicated that they had to take a completely different approach in the MUVE as it is not compatible with existing teaching practices. Further, they believed that there would be the need for a considerable financial commitment, and also available time, in order to prepare and accomplish the task of using a MUVE as an educational tool.

Unfamiliar participants identified the technology requirements as a compatibility issue when adopting the MUVE as an educational tool despite the fact that 10 of the familiar participants have already adopted the MUVE as an educational tool.

Conklin (2007) noted that not all subjects could be delivered through a MUVE. Participants who were unfamiliar agreed with this statement and said that when conveying subjects through a MUVE, educators need to be mindful of the fact that not all subjects could be successfully conveyed through this medium, and that it would be necessary to use traditional teaching methods for certain subjects such as medicine.

Experienced educators who were unfamiliar with the technology indicated that if the educational institutes were committed to e-learning, the technical limitations would not be an issue in adopting the MUVE as an educational tool.

Facilitating conditions

Different attributes were identified by the participants: tool building support, navigational support, familiar tools, and future growth of tools. These factors contributed to their perceptions of what facilitating conditions they expected from the MUVE that would lead to accepting it as an educational tool.

Facilitating conditions - tool building support. Over two-thirds of the participants who were familiar with the MUVE indicated they were building tools for the virtual space with which they were engaged. The participants indicated that they required minimal support in the MUVE to build a virtual classroom or conduct a virtual class.

> Almost all that I have created in Second Life for use in teaching has been built without technical or design support. That said, such support would undoubtedly have been useful, had it come early enough. (Dave, F)

When Eila was questioned regarding the MUVE support available, she replied that the groups that are available for technical support around the clock for MUVE were adequate.

> All I needed was the support of my Second Life colleagues SLED list, ISTE, Real-life Educators, and Educational Roundtable (Eila, F)

Facilitating conditions - navigational support. Participants who were familiar with the MUVE believed that the existing support would be sufficient for new educators to enter into a MUVE. According to Eila, the existence of free or inexpensive tools and rich builds in a MUVE (as experienced in Second Life) is the kind of support that one would not have if one attempted to work in a school server-based MUVE.

> The existence of free or inexpensive tools and equipment, and rich builds in Second Life is a kind of support that one would not have if they attempt to work in a school server based MUVE. (Eila, F)

According to Sonali, she required support from many sources to organise her virtual class. Further, she expressed the view that support is essential — especially for people who are new to the MUVE.

> A person like me will not get into this without the support. The virtual classroom is very much a team effort unless you are expert. If I have a team to back me up, I'll really use it. (Sonali, F)

Bruce, who had attended the interview location (in the virtual class) a few minutes earlier than planned, decided to have a look around the class. While he was observing the available educational tools, he met another visitor (avatar) in the class and started a conversation. During the conversation, Bruce was able to gather

information regarding a new educational tool. According to Bruce, this was always the case. People are willing to give advice freely when you are in a MUVE.

> It is extremely easy to get help around here. I came to this room early in the morning and you were not here then. I ran into someone else and he just didn't seem to be able to resist the temptation to tell me about a new technological tool which I found wonderful and I am probably going to use it in my Second Life class. (Bruce, F)

Cameron, a participant who had experience as an educator in the real world as well as in a virtual world, indicated that support availability is very useful. However, to obtain assistance, the users should know what kind of support they require. This may make it difficult for newcomers to acquire the support they need.

> Availability of the support is very useful. On the other hand, there is so much. You need to be in a position to select one suitable to you. (Cameron, F)

Tony's experience in the education world is minimal compared to that of many who participated in this research. Although he was familiar with the MUVE, he had not conducted a class in a MUVE. According to Tony, educators who are new to the MUVE, or using a MUVE to teach, would not be engaging in building tools. For this group of educators, support comes in a different form: the navigational and instructional support from tools available in the environment. According to Tony, many builders in current MUVEs are not educators. Therefore, the builders are not aware of the educators' actual requirements. In order to ensure that new applications and technologies meet the claims of the developers, builders and educators must be willing to work together. According to Tony, there is a lot of room to improve in MUVEs; the introduction of integration tools such as SLOODLE, developed by a group of educators, has been a worthwhile improvement.

> The technical support is good for people who are building in Second Life. But for educators this will not be useful as they are not into building. At the moment, not all the people who are into Second Life building are educators. If you have a professional group of users who are building educator tools then the educators will accept this. Again, I think SLOODLE - as you have shown here - is a really good example, because there is a group of people building SLOODLE and it is freely available. (Tony, F)

Eila indicated that if the support provided by the MUVE communities could be extended to institution level in the future, educators would more easily accept the MUVE as an educational tool.

> Most instructors I have met in SL are not receiving support from their institutions. Instructors may receive institutional support for developing courses in MOODLE or Blackboard, but few institutions (I think) have Ed. Tech. support for courses in MUVEs. I think when this is available many more teachers will give MUVE teaching a try. (Eila, F)

Samantha, Chris, Arnold, Rod, and Stuart who were unfamiliar with the MUVE referred to availability of support as an important factor in accepting the MUVE as an educational tool. Stuart's remark exemplifies their concerns.

> It is very essential to get off the ground. With education, so much time is taken in preparation. As new technology comes around, we have to start our preparation from scratch. So the more assistance you are able to get, the more it speeds that process up. (Stuart, U)

Jasmine and Mabel, who were unfamiliar with the MUVE, said that it is very important to have support in one location. They referred to the time they had used MOODLE and WebCT, when their educational institute intended to use it as an educational tool. They explained that they had to use the tool without proper support.

According to their experience, they had to wait in a long queue to get support from a single support person. Even then, the solutions were provided on a trial and error basis. As a result, they noted that it is essential to have adequate support available when introducing the MUVE as an educational tool.

> It is positive and efficient to have one location for everything. It is really essential. With MOODLE, there was no design manual and it would have really helped initially. (Jasmine, U)

Mabel suggested a simple solution to what she considered to be a deficiency in any new educational tool. According to Mabel, it is important to have many support personnel available in a physical location. However, this could be more expensive to provide. Eila earlier had noted that there are many education forums and communities available online to provide adequate support. Educators would be able to use these facilities, as the support is available around the clock.

> If the university is going to introduce this as an educational tool, we need several people who specialise in this environment and we should be able to access them any time. (Mabel, U)

Joe, who was unfamiliar with the MUVE, but who had a great deal of experience with distance learning students, felt that sufficient technology support such as how to login to the MUVE, how to navigate, and whom to contact in case of an issue should be provided to educators and students; otherwise, there could be an increase in dropouts due to lack of support.

> This would be good for students who have to present a case study to the rest of the class. However, I would be more concerned with students dropping out because they cannot work the system. Extramural students are working at home alone with little help. They

> may drop out of the course if faced with unfamiliar technology. (Joe, U)

Facilitating conditions - familiar tools. Manik, who had two-and-a-half years of experience as a Nursing lecturer, was in the process of building a class in a MUVE for teaching purposes. According to her, when familiar tools are available in a virtual world it becomes easy to navigate in a MUVE.

> I believe this makes it easier to interact in the area. The virtual world and real world become almost as one. Therefore, students expect the same technology to be available in the MUVE as in the real world. This makes it easier to navigate and gives a familiarity to the learning environment. (Manik, F)

Although Cameron's comments regarding available support indicated that it was not entirely satisfactory, he was very pleased with the tools available in the MUVE. According to Cameron, the availability of familiar facilities such as Twitter and Presentation Board would have a positive impact on students, as most of the students are already familiar with these tools.

> Most of the students are familiar with these tools (Twitter, Facebook, presentation slides). So we can provide an interactive session easily. (Cameron, F)

Dave and Eila were educators who were familiar with the MUVE. Further, both participants had conducted classes in a MUVE. According to them, existing tools in MUVEs are not sufficient to conduct classes, and they need to be improved upon.

> On the whole, I don't personally find the availability of "familiar" communication technology to be a particular advantage in SL, except insofar as it facilitates the ease with which students can learn to

> communicate with each other in-world. In some cases, as with PowerPoint, I find the in-world equivalents markedly inferior to the "real-life" analogue. I think this is actually an area that SL needs to improve upon. (Dave, F)

According to Eila, MUVE tools such as PowerPoint presenters are empowering students to take charge of their learning. However, these tools could deter the educators from using more MUVE-specific tools.

> The ability to use familiar tools and especially "their" tools (IM, profiles) empowers students to take charge of their learning. However the downside of this is that the availability of tools that are familiar to instructors – specifically tools that support a didactic approach to teaching – such as PowerPoint presenters can limit the instructors' use of more MUVE specific tools and opportunities. (Eila, F)

Rod was unfamiliar with the MUVE, but felt that the availability of familiar tools would add richness to MUVEs.

> I think this is a perfect blend of real-life tools and MUVEs. Such tools simply complement, and add richness to the environment. This is a vital part of accepting and using new teaching tools. (Rod, U)

Facilitating conditions - future growth of tools. At the end of the interview, participants were asked for their views on the future of MUVEs. Both, Cameron and Bruce, had conducted classes in a MUVE.

Cameron believed that there would be an emergence of competitors to the existing MUVEs and as a result, educators would be able to utilise more versatile virtual environments.

> Second Life will evolve in the future because that is the only way they are going to survive. Definitely there will be other competitors to

> Second Life. Educators will be able to use more developed tools in the future. (Cameron, F)

Bruce believed in the future, MUVEs would evolve to provide sophisticated tools.

> I am more interested in tools that can be used to control the computer without your hands. It is actually based on things going on electronically in your brain, and muscle movement in the face. I am curious to see someone build an interface in Second Life with that. To feel you are really there, you don't have to use your hands. You can turn your head and use face muscles, and then your avatar turns. (Bruce, F)

Researchers such as Hofmann (2002), Sumner and Hostetler (1999), and Williams, (2002) reported that support is one of the most important factors in the acceptance of technology for teaching. The participants in this research indicated that their acceptance of MUVE as an educational tool would depend on the availability of facilities and support.

The participants who had previously conducted virtual classes in Second Life indicated that the tools available were not adequate and they had to build them from scratch. Further, they expressed concern that tools such as PowerPoint presentations could limit educators from using more MUVE-specific tools. However, these participants expressed positive possibilities of interfaces between MUVEs and LMS. The interface tools were built by educators and could be used without any knowledge of scripting language.

The participants who were unfamiliar with the MUVE were of the opinion that tools could add much value to the environment; they focused on navigational support

rather than technical support, indicating that navigational support is an essential factor in considering whether or not to adopt the MUVE as an educational tool.

Familiar participants predicted that there would be more competitors to existing MUVEs, and in the future, more versatile virtual environments with sophisticated tools would emerge. According to de Freitas, (2008) and Kirriemuir (2008b), alternative platforms to Second Life are emerging which could be used and explored for educational purposes in the near future. Hence, educators would be able to select from a variety of environments/tools.

Subjective Norm

To analyse the acceptance of a MUVE as an educational tool due to subjective norm (normative beliefs of referent groups such as family, friends, professors, and classmates (Srite and Karahanna, 2006)), participants were asked the question: "As elaborated, many educational institutes use the MUVE as a teaching tool. In which ways will your colleagues/other educators' acceptance of a MUVE as a teaching tool be likely to influence your own acceptance of a MUVE?" This section includes an analysis of the influence of other educational institutions on the decision of whether or not to accept the MUVE as an educational tool. Different attributes were identified by the participants: easier to adopt, an example for educators, based on activities, and huge impact.

Subjective to norm – easier to adopt. Most participants who were familiar with the MUVE expressed the view that when there is a pool of teachers already using the environment it would be easier for other educators to adopt the MUVE. Eila compared

the process to e-mails. Ten years ago, many people were reluctant to use e-mail. But now, most everyone has an e-mail account.

> I think that as our colleagues begin to accept MUVEs as teaching tools, their colleagues will come to accept, or at least dip their toes in the MUVE pool. We already see how in the past couple of years the numbers of educators joining Second Life are growing at a steady rate. We are mostly still in the pioneer phase with early adopters leading the way. I believe that we are approaching a critical mass at which point it will become easier and easier for new teachers to accept MUVEs as something they too can do. The process is similar to e-mail. Ten years ago many people felt that e-mail would never be necessary for them. Now grandmothers and kindergarteners have e-mail accounts. (Eila, F)

Subjective to norm – example for educators. Bruce and Victor who were familiar with the MUVE, if other institutions were using MUVE it would be an example for educators, "it would be an example or a proof of effectiveness" (Victor, F).

Alison was one of the principle participants in SLENZ. She had not only conducted classes in a MUVE, but she had also supported other educators in conducting classes in MUVE. According to Alison, when renowned universities like Harvard, Oxford, or MIT are using MUVEs, other educators are curious and therefore inclined to find out what they are doing.

> Yes. Gradually, the MUVE will become mainstream. Some of the educators I know are influenced by big universities like Harvard, Oxford, and MIT. More than the big names, we like to see what exciting things other people are doing. (Alison, F)

Subjective to norm –based on the activities. Tony, who was familiar with the MUVE, said that educators would not accept the MUVE simply because high profile

universities were using it as an educational tool; they would want to know how they are using it.

> If the other high profile universities are using it, yes, then it will be influential. But I would like to know how they are using it. (Tony, F)

Subjective to norm – huge impact. The participants who were unfamiliar with the MUVE indicated that the subjective norm would have a huge impact on accepting the MUVE. Sue had had eleven years of experience as an educator and she was unfamiliar with the MUVE. The interview with Sue was conducted in her educational institute. As she had no existing access to Second Life, she had to install it on her PC. Due to the current infrastructure of her educational institute, Sue had to face many issues during the installation. These were not common issues and took a considerable amount of time to fix. Although she was able to complete the interview after several days, Sue said all the set-up issues were due to the fact that she was the first person in her institute to try out a MUVE. If her colleagues had been using MUVEs before her, she would have been able to compare issues and achieve better results.

> This will make a huge difference. If my colleges are using it, I can ask questions and see what they do to the tool, or compare the notes. If I am the only person using it, it will be difficult. (Sue, U)

Davis (1989) noted that subjective norms in technology acceptance are likely to influence the user acceptance of information technology applications. Participants who were familiar with the MUVE doubted the statement made by Davis (1989). However those who were unfamiliar with the MUVE predicted that subjective norm would play a considerable role in the acceptance of the MUVE as an educational tool.

Participants who were familiar with the MUVE indicated that subjective norm is not a significant factor in adopting the MUVE as an educational tool, but they thought that subjective norm serves as both a model and as a form of justification. Other educators are more likely to adopt it when there is a critical mass of educators already using MUVEs.

Participants who were unfamiliar with the MUVE indicated that in the event the other educators or institutions commit to the use of the MUVE as an education tool, it could be a motivating factor. Those participants who were conversant with traditional teaching methods and unfamiliar with the MUVE were of the opinion that subjective norms introduce peer pressure, and because of this, they would be forced to adopt the MUVE as an educational tool.

Security and Trust

Security and trust were identified by the participants as important factors in accepting a MUVE as an educational tool. In this section, their perceptions regarding security and trust concerns relating to the acceptance of MUVE as an educational tool are explored. Different attributes were identified by the participants: personal and system security, and building of trust.

Security and Trust – personal and system security. According to Victor, who was familiar with the MUVE, the level of security in the MUVE was sufficient for him to accept it as an educational tool.

> I could not use Second Life, if I could not control security issues in my place. Assurance and security are very important issues in my decision. (Victor, F)

Eila, who had previous experience in a MUVE, emphasised that although there are concerns with security in a MUVE, the educators could provide more security to students than in real-life, as no physical harm could be inflicted in a virtual classroom.

> I think it is a good thing to re-examine our needs for security and finding a balance that is more successful in our current very global society. But one advantage to MUVE is that the person in front of you can do you no physical harm. With some guidance, we can help prevent emotional harm too. (Eila, F)

Sue who was unfamiliar with the MUVE agreed with Eila's comment on security.

> Security wise in Second Life you have more security. If someone shoots you with a gun in Second Life you will not die. But in real-life you will die. I am not concerned about security in Second Life. (Sue, U)

According to Dave (Familiar participant), security was a major concern in the MUVE. Educators need to understand the level of immersion and complexity of the MUVE before introducing students to it.

> Linden Lab has introduced new regulations regarding content in Second Life: the distinctions between PG, Mature, and Adult. It's pretty big news, in some ways, and I think it has made educators feel more secure. But I don't think they really understand it. Second Life is a powerful learning environment. However, it also contributes to danger in other ways. It's also its own culture. Before introducing students to this complex environment, the educator is required to understand the immersiveness of the environment. I think that part of the way in which we train educators here is to make them understand that Second Life is huge and complicated, not just a giant sandbox for educators. My point, however, is that we are letting students loose in this environment without adequate preparation. (Dave, F)

Several of the participants who were unfamiliar with the MUVE indicated that the "strict controls need to be place before adopting the MUVE" (Joe, U) as an educational tool.

Sue who was unfamiliar with the MUVE also indicated that the security issues could be resolved just as in any other online application.

> As this is an online classroom I think all the issues related to online applications will be the same here. I don't think this is an issue. (Sue, U)

Sue raised another factor that could be of concern for educators. Although she had been briefed about the recording (voice and images) facilities in the MUVE which are activated according to the preference of the user, she was concerned about the situation where everything could be recorded.

> Interesting thing is that you said you could record everything spoken in Second Life. I think this will be a concern. In a real-life classroom, it is me and the students. Whatever we are saying to each other is not recorded. The issue here is every single thing that you say will be recorded. I have never been in a situation like this before. Therefore, I am concerned about the situation. I need to know who will be accessing them and for what purpose. (Sue, U)

Security and Trust – building of trust. Eila, who was familiar with the MUVE, expressed her concerns with the deception of avatars. When talking to avatars, it would be difficult to identify whether talking to a man or a woman.

> Trust is another issue. The rules have changed. In a MUVE you do not know if you are actually talking to a man or a woman. But you can be pretty sure that the dragon in front of you is not actually a dragon. (Eila, F)

Eila, had opportunities to create tools in Second Life. According to her, she trusted the support provided by Second Life support communities although she is not able to trust the identities of avatars. According to her, all she needed to build the tools required for her virtual classroom was the support of the groups that are available around the clock.

> The rules have changed. In a MUVE you do not know if you are actually talking to a man or a woman. All I needed was the support of my SL colleagues (SLED list, ISTE, Real-life Educators, Educational Roundtable). (Eila, F)

Most of the participants who were familiar with building in Second Life believed positively regarding support provided by Second Life communities and other avatars who visit the Environment.

> I ran into someone else and he just didn't seem to be able to resist the temptation to tell me about a new technological tool which I found wonderful and I am probably going to use it in my Second Life class. (Bruce, F)

Many participants who were unfamiliar with the MUVE indicated that trust in that environment depended on the reliability of the technology. In case of power failure or loss of connection, educators would be required to find an alternative strategy to conduct the class. Arnold's quotation exemplifies their concerns.

> Trust is an important issue. There is nothing worse than not being able to deliver a session that everyone has turned up to because of a failure in the technology. Then we need to find other means to conduct the class. (Arnold, U)

Sue, who was unfamiliar with the MUVE, agreed with the other unfamiliar participants regarding the reliability of the virtual classroom. Nevertheless, Sue indicated that the reliability issues are not specific to the MUVE. This could happen in a real-life classroom too. According to Sue, educators could contact support personnel in a real-life setting. However, they may not always be available. The educators are required to have an alternative teaching method (in conducting classes using traditional teaching methods in the case of a real-life classroom; for distance learners, an alternative time could be arranged or subject content could be distributed via email) as no technology is always reliable. Reliability is an issue for all applications that depend on technology.

> Well, I have to admit that if I logged in to Second Life and found that I couldn't do what I wanted to do, I would be really annoyed. For example, if the Internet is down or Second life is down or some technical issue. If I had a class scheduled then I would not be able to conduct the class. But this can happen in real-life too. If there are any issues in the real-life lecture theatre, I can ring someone and get assistance. But not always. Sometimes you have to be flexible and have your own backup ready. In Second Life, it would be the same. If it is down, we can use chat or something else immediately. You have to be flexible. You have to have the backup procedure in your mind already planned. This is not due to Second Life. This is to do with the technology. It is not one hundred percent reliable all the time. (Sue, U)

Both participant cohorts indicated that trust and security issues in the MUVE are no different from those associated with any other online applications. However, participants who were familiar with the MUVE suggested that educators needed to understand the complexity and immersivness of the MUVE and the need for supervision of younger learners engaged in a MUVE. Another concern raised by participants was identity deception in a MUVE. As noted by Kerbs (2005) such behaviours may cause emotional suffering for learners. In view of this,

educators may be required to take precautions to prevent such behaviours before adopting MUVE as an educational tool.

Rovai (2001) stated that the users in a virtual environment build their trust based on the trust level that they feel with the community or the environment. Those participants who were familiar with the MUVE trusted the environment due to the friendliness of users who were ready to share information, and the communities available for support.

Participants who were unfamiliar with the MUVE focused mainly on the reliability of the environment. According to them, reliability is not limited to virtual classes. Participants believed that technology is widely used and the MUVE is no exception. However, they noted that it is essential to have alternative plans in case of technology failures. Unlike in a real-life classroom- the proceedings in a virtual classroom could be recorded.

Usefulness

During the interviews, each participant was illustrated with the educational benefits such as mutual awareness leading to collaboration, emotional connection between teachers and students enabling more effective feedback, media rich experience, and teaching in 3D environments simulating the real world in the context of educational uses of a MUVE. Then the participants were asked, “What are your views in relation to the benefits that a MUVE can offer?” The participants’ perceptions regarding the acceptance of MUVEs as an educational tool, as reflected by its usefulness, are discussed in this section.

Many familiar participants felt that the MUVE would fundamentally change the manner in which we provide education, and the MUVE would eventually be absorbed into the mainstream. Alison’s quotation exemplifies their perception.

> The future is about MUVEs. The MUVE fundamentally will change the way we teach or the way we provide education. This will be a fundamental change and we will not go back. It will grow enormously. And it will be in the mainstream within a very short period of time. Just imagine living without the Internet. Like that in another ten years' time, it will be difficult to live without virtual environments. (Alison, F)

Stuart, the unfamiliar participant, believed that the usefulness of MUVE would grow and many more applications would be developed.

> MUVE is here to stay. Although, people are complaining about it, we have to adopt it as an educational tool. I don't think it will go anywhere. The usefulness is growing. More and more applications are coming out. (Stuart, U)

Several unfamiliar participants said that they prefer to see their students face-to-face rather than through a virtual world. However, they were prepared to use the MUVE as an educational tool similar to any other tools they were using in the educational world due to MUVEs usefulness. They felt that the MUVE will complement the teacher's role. Samantha's quotation exemplifies their perception.

> Virtual Worlds are becoming useful tools. However, it will not take the teacher's position. In the future, we will still have the real classroom and teachers, but we will use the MUVE to convey the course context to students. (Samantha, U)

Both cohorts agreed that the virtual learning environment could be used as an educational tool due to the MUVE's usefulness, and that there would be sustainable development. The participants' perceptions regarding adaptation of the MUVE as an educational tool, based on its usefulness are further analysed in the ensuing sections.

The sections are: collaboration, awareness, media richness, discovery learning, role projection, situated learning, immersive environment, and controlled environment.

Collaboration

Many of the participants believed that the MUVE could enhance student engagement through a sense of shared experiences, and added opportunities for collaboration. Such areas of collaboration are: larger audience, distance learning, and subject selection; these are discussed below.

Collaboration - larger audience. Dave, who was familiar with the MUVE, indicated that the MUVE allows students to collaborate in ways that may not otherwise be possible, and thought that in a MUVE students could feel they belonged to a community.

> This, I think, is a real benefit of Second Life, in that it allows students to network, experience different perspectives, collaborate in ways that may not otherwise be possible, and so forth. The addition of a more realistic social dynamic is also an important benefit. Students become more engaged if they feel that they are part of a community. This is, in fact, the only convincing rationale I've ever heard to explain the use of Second Life for more conventional modes of learning. (Dave, F)

Eila, who had conducted classes in a MUVE, indicated that MUVEs provide an enduring space for a larger audience where students from different parts of the world could meet and return to meet again.

> Being able to connect students from different courses and universities is a fantastic opportunity to enhance learning. Access to experts is another opportunity that is much easier to arrange in Second Life than in real-life. Because my class is in a virtual world, I have a larger audience and attract students from around the world. To exchange educational philosophy and experience with people from other countries has been a boon for my students. (Eila, F)

Victor thought the collaboration facilities in the MUVE would have an impact on students, as they could meet many other students who are studying the same subject and share knowledge easily with each other. He noted:

> Yes, it can. They have encounters which are more rich, and interdisciplinary interests. They share their experiences easily with each other, they have help in what they do, they get socialised, etc. (Victor, F)

Mabel, who was unfamiliar with the MUVE, pointed out that the collaboration features in a MUVE would provide an advantage to the international students because they would be able to login from their home without commuting.

> I feel the opportunity for social constructs is one of the strengths of MUVEs, especially between international students. (Mabel, U)

Collaboration - distance learning. Callum, who was familiar with the MUVE, indicated that collaboration in a MUVE could be utilised in distance learning and to facilitate rural students.

> For areas such as rural Alaska, the MUVE holds great promise for an increased learning experience through the learning communities that can be developed for both teachers and students. (Callum, F)

Sue, who was unfamiliar with the MUVE, agreed with Callum. She explained the difficulties she had to face when she was following distance learning courses, and identified the lack of opportunities that students had to face when they studied extramurally. Therefore, for distance learning students, she thought the MUVE would be a better location to meet and discuss the subject matter.

> As I know, it is very difficult for students who follow block courses or extramural courses to meet frequently and offer opportunities to each other. Normally we use e-mail, as that is the only facility

> available. So if we have an environment like this, it will be really useful. We will be able to collaborate freely. As you know, when you write e-mail, you have to compose the thing and ask the right question. But when you meet face-to-face, even in the virtual world, you can ask anything. You don't have to wait for an e-mail. It feels alive. That is how I feel. (Sue, U)

Stuart, who was unfamiliar with the MUVE, agreed with the foregoing perceptions. He indicated that extramural students would be able to attend classes scheduled in a MUVE. But it would be ideal for them to meet in one location to discuss their issues or subject matter. This would be less disruptive for students as well as for their employers (if students are working) as they could login to the environment from any location.

> I think it will be ideal for extramural students. The only disadvantage will be that the classes will be held at a certain time. This will tie them to a traditional timetable. They will have to attend a class at a certain time. However, if we can provide a discussion area for extramural students to meet, it will be valuable. A lot of my students will prefer a class like this as they are studying while working. Something like this will allow the students to login to the area from wherever they are. Less disruption to their employer, this will be attractive to them as well. (Stuart, U)

Arnold, who was unfamiliar with the MUVE, felt that a MUVE would provide a location for extramural students to share knowledge and work together. This would not be possible in real-life as extramural students face geographical separation.

> Group work has always been used as an effective teaching tool. The benefits of sharing knowledge and experiencing it together on a problem are just as valid in the MUVE environment as they are in any other environment where students can work together. The real advantage of MUVEs is that geographically isolated students can now participate equally in group activities. (Arnold, U)

Collaboration – subject selection. Tony, who was familiar with the MUVE, indicated that if a MUVE is used as an educational tool for distance learning students, special preparation has to be put into the process to select the appropriate subject, as not all subjects could be conveyed through a MUVE.

> This is really good for architecture students, design students, and people who try out new things and play. But if you are using it for other subjects, you have to be very creative. (Tony, F)

Prasolova-Forland and Divitini (2002) noted that multi-user virtual worlds provide a collaborative virtual environment for social awareness support. All participants in the research agreed with this view.

Both groups agreed that the virtual learning environment could be used to eliminate the difficulties that distance learners face due to geographical issues. According to participants, the virtual environment could be utilised to provide an environment for distance learners to collaborate effectively.

The participants who were familiar with the MUVE expressed the view that a MUVE would provide opportunities to connect outside the class, promote social presence, and support collaborative deep group learning. However, they indicated that the level of success would depend on the effectiveness of the tools selected and the creativity of the educator.

Awareness

In the previous section, perceptions of educators regarding the importance of collaboration in a MUVE were analysed. The collaboration provided via the MUVE would be more effective as users are able to sense the physical presence of others. Users may have different levels of awareness of each other. Higher awareness levels correspond to higher

interaction levels. Participants' perceptions regarding the acceptance of the MUVE as an educational tool relating to awareness in a MUVE are discussed in this section.

Several participants who were familiar with the MUVE indicated that awareness factors in a MUVE would have more impact on students than writing e-mail in real-life. Cameron's quotation exemplifies their perceptions.

> Yes. Definitely, students will feel the sense of availability. This will have more advantages over e-mail or a text-based extramural course. The students can have a real experience. (Cameron, F)

Further, the participants who were familiar with the MUVE indicated that they felt connected as a result of the physical presence in a MUVE due to the availability of audio facilities and the ability to talk to each other in the environment. Further, they noted that the opportunities to have discussions in virtual environments are due to the facilities available in a MUVE which would create an awareness of our presence. Bruce's quotation exemplifies their perceptions.

> That part is really exciting. I know many students have problems with distance education because they do not feel really connected; Second Life has this experience. If you get in, you feel like you are there. You and I are communicating essentially through a telephone connection and a rather awkward telephone connection. But at the same time I do get the sense that I am here in the room with you. (Bruce, F)

Bruce, who was working in a MUVE to conduct a class for teachers to introduce a variety of media tools, described his personal experience with Second Life. He had used a virtual environment to communicate with his sister who was living 300 miles away and found that it was quite overwhelming. He was hoping to achieve this kind of experience with students.

> I realised this first time when I talked to my sister through Second Life, she was 300 miles away. After the meeting I didn't feel that I had a conversation on the phone. I felt like I'd been with her. I felt like two of us spent the afternoon together. That is what we are hoping to work for students. (Bruce, F)

Further, the participants who were familiar with the MUVE felt that the students were highly motivated and contributed more when in a MUVE. Because of the voice content in collaborative tasks, it becomes more real and exciting for both students and educators. Eila's comments exemplify their perceptions.

> People state emotional content more readily because they can't share it with a facial expression, and they are not afraid of negative consequences; their avatar protects them. Student with student and student with teacher interactions are more equitable and forthright. Many reticent students contribute more in Second Life. And teachers can often find out more directly how a student feels about their work or workload. (Eila, F)

Callum, who was conducting a MUVE class in Jokaydia said that the MUVE provides an opportunity for students who are reluctant to speak in the normal classroom area to express themselves.

> MUVE allows teachers to connect in many areas that are not available in a classroom setting. This can be a highly motivating feature for students that are too timid, shy, or intimidated to speak up in the normal classroom. Research has shown that people are more inclined to participate when the peer pressure or other barriers are removed as in a MUVE. (Callum, F)

The participants who were unfamiliar with the MUVE expressed similar views to Callum's. That is, the facilities in a MUVE encourage feedback between students and

teachers. Whether it is negative or positive, feedback is always good in a learning environment. Stuart's comments exemplify their perceptions.

> Real time talking will help to break down lots of age barriers. Older people who are not faster at typing can come here and sit with a headphone on and not do anything other than sit, listen, and talk. As an educator, I am enjoying talking in the classroom. But quite often it can be challenging to get actual conversation happening in a classroom because some people are nervous. Some people are reluctant to put their hand up because they might feel funny and they don't want other people to look at them. Here you've got an avatar between you and everyone else. Nobody knows who is talking. (Stuart, U)

According to the participants, the main factors in education are timeliness of feedback and the ability to follow paths that may open up during the discussion. Even students who are not willing to communicate in a normal class would be encouraged to talk to the lecturer. Gee (2003) calls the type of security that virtual environments offer a psychosocial moratorium. By reducing or eliminating real-life consequences, learners can change behaviour patterns that they might otherwise deem risky. The person who cannot overcome his/her natural reticence, who remains quiet in the classroom, can safely speak out in the virtual world.

Joe who was Unfamiliar with the MUVE raised a concern regarding awareness in a MUVE. According to Joe, many educational institutes practise voice blocking. As a result, educators and students would have issues using voice facilities in a MUVE. Joe felt that this would present issues when controlling a large group of people. He thought there would be more misunderstanding in a MUVE than in a real classroom.

> With large numbers, it is very difficult to interact emotionally in a meaningful way. Probably more room for misinterpretation than in a face-to-face situation. (Joe, U)

Fabri et al. (1999) noted that the feelings provided by a MUVE have great relevance to improving communication in learners. Participants in the research observed the same phenomenon in MUVEs. They indicated that although a MUVE offers limited combinations of emotional indicators, educators often find communication to be much more honest and direct in a MUVE. Those participants who were familiar with the MUVE indicated that awareness is much stronger in a MUVE, and they would be expecting this form of experience with students. All participants pointed out that the MUVE provides an opportunity for students who were reluctant to speak in the normal classroom area to express themselves freely.

Media Richness

Participants identified different attributes that contributed to the acceptance of the MUVE as an educational tool due to the media richness of facilities it offers. These attributes include: easier to become involved, alternative ways to present subject content, unfamiliarity with a MUVE, and distraction for students. These attributes are discussed under those headings.

Media Richness - easier to involve. Several participants who were familiar with the MUVE indicated that the media richness in Second Life is a special facility that could be beneficial in teaching. Dave's comments exemplify their perceptions.

> Media capabilities are the primary reason why I wish to employ Second Life as a teaching tool. I think, frankly, that there are other, better and easier applications that would be preferable for simple distance learning. It is only by exploiting the media-rich potential of Second Life that it becomes truly worthwhile for teaching. (Dave, F)

Media Richness - attract students. Alison, an experienced educator in both the real and virtual worlds, indicated that without media richness in the MUVE it would be a normal web application. Further, she explained that this would attract students to a MUVE.

> These facilities are important. Without this, students will get ordinary 2D web type application. That is why students are more attracted to the environment. (Alison, F)

Sandra who was unfamiliar with the MUVE, but had experience in primary and secondary teaching, explained that media richness would be very helpful in creating visual learning objects, and would encourage them to engage in learning.

> I think it is good for them. Something visual they are going to remember. If they are not so literate, it is going to help them. They are going to be engaged and encouraged (Sandra, U)

Jasmine who was unfamiliar with the MUVE indicated that she was unable to comment on the usefulness of the media richness although she admitted that it is an attractive feature.

> It is sexy, but I am unconvinced it has a significant "value added" usefulness (Jasmine)

Media Richness - alternative ways to present subject content. Victor, who was familiar with MUVE, indicated that the rich media effects available in a MUVE provided alternative ways to present the content of a subject.

> According to Learning Styles theory and Multiple Intelligences theory, this is very important. The alternative texts, video, sound, and images help students to understand deeply the educational content and psychomotor goals. (Victor, F)

Several participants who were either familiar or Unfamiliar with the MUVE indicated that its rich media facilities could be used to replicate special environments and 3D prototypes, especially those related to medical services. The students could practise in such environments without any hesitancy or fear of making mistakes. Sonali's comments exemplify their perceptions.

> This has real potential to our students. Because when we try to teach how to manage a haemorrhage in real-life, we cannot make mistakes. However, if we can implement this kind of environment in Second Life using 3D visuals, it will be very helpful. Then students can make mistakes and go back to it. It is more real than using a simulator. (Sonali, F)

Media Richness - unfamiliar with the MUVE. Sue, who was unfamiliar with the MUVE, indicated that media richness would be able to capture the interest of students in the educational environments. However, she had reservations about how students who were not familiar with video games would adapt to a MUVE.

> According to what I see, I think this environment is rich enough to capture the interest of students using rich media capabilities. But I still have concerns about students who don't use video games or who are not interested in using video games. (Sue, U)

Media Richness - distraction for students. Several participants who were unfamiliar with the MUVE indicated that this would be a distraction to students, as they would be more interested in media richness than the subject content. Mabel's comment exemplifies their concern.

> I think some students can get distracted rather than focusing on the context of the subject matter. I am not sure if this is important or not. (Mabel, U)

Saeed et al. (2008) noted that the media richness in a MUVE could be used as an effective communication medium for teaching and learning. The participants in this research indicated that this media richness is an asset to learners, and the Familiar participant cohort felt that the media richness of the MUVE was more useful than web applications such as WebCT and MOODLE. They remarked that this media richness made it easier for them to become involved. Furthermore, the participants expressed the view that, due to its rich media functionalities, the MUVE could be used to simulate environments. This had the advantage of allowing students to practise in these environments without any hesitancy or fear of making mistakes.

The participants who were unfamiliar with the MUVE indicated that rich media capabilities would help them to create visual objects in the educational world. According to them, visual objects are always helpful in encouraging students to engage in learning. Experienced participants who were unfamiliar with the MUVE were unable to comment on the usefulness of the media richness although they acknowledged its versatility; however, they were concerned about students who were not familiar with video games, and how they would be able to adapt to a MUVE.

Discovery Learning

MUVEs are capable of providing learning resources to support discovery learning in education. The learning resources include audio and video on demand, archives of images and schematics, conventional texts, search tools, objects that can be manipulated and queried, and programming bots.

Participants identified different attributes that contributed to acceptance of the MUVE as an educational tool due to discovery learning features available in a MUVE. These attributes are viz. provide interactivity, not limited to one location, access course content, tool

selection, and subject selection. Further attributes are discussed under respective headings mentioned herein.

Discovery Learning - interactivity. According to Callum, intelligence could be greatly influenced by the interactivity available in MUVEs.

> This is a real advantage of the MUVE. The ability to interact in a sim of a molecule, biome, or human genome is a great tool for interactive, discovery learning. This interaction can greatly influence the multiple intelligences for different students. (Callum, F)

Discovery Learning - not limited to one location. Eila also commented on intelligence development and the benefit of how MUVEs formulate.

> The ability to facilitate project-based learning experiences in a MUVE offers the same promise as any project-based learning: conceptual learning, higher-order thinking, problem solving, or deep understanding; the possibilities are not limited by location. (Eila, F)

Discovery Learning - access course content. Several of the participants who were familiar with the MUVE indicated that it is possible to implement conceptualised themes and course contents in more direct and engaging ways in a MUVE. According to them, the MUVE allows learners to access course content that might otherwise be inaccessible in real-life. Dave's comment exemplifies their perceptions.

> A recreated environment makes it possible to conceptualise themes and course content in more direct and engaging ways, as well as to demonstrate virtual replicas of real-life material culture that might otherwise be inaccessible. (Dave, F)

Stuart, a media production educator, always looks for the practical side of the subject. He was unfamiliar with the MUVE, but according to him, a MUVE is the best

place for his students to work as he can make use of resources belonging to other companies that are present in the MUVE.

> If I am discussing different methods of construction – for example, different piling systems – many specialist organisations exist within this area. As a result, those companies produce marketing materials for themselves and materials that demonstrate what methodologies they use and how they construct certain things. So, it can be quite useful to draw on the resources of the other companies. To visit them through Second Life will be really helpful and easier. As these environments grow, many organisations will be represented in them. I would imagine these sorts of resources will be quite helpful. (Stuart, U)

Discovery Learning - tool selection. Alison, who had a considerable number of years' experience with MUVEs, said that discovery learning is a key feature of the MUVE. However, she explained, the level of success would depend on the effectiveness of the tools selected, and the creativity of the educator or the educational institute.

> Discovery learning is a key feature of the MUVE. Again, I have to say this is going to depend on the teacher's or institution's ability to select or build tools. (Alison, F)

Cameron and Tony were familiar with the MUVE; they believed that people who were capable of writing programmes would be able to provide facilities such as discovery learning through a MUVE. However, for others it would be a challenge to work in this kind of environment. Tony's comment exemplifies their concerns.

> In Second Life, you can create tools if you know programming. This is the real strength of Second Life; however, at the same time, it will be a real challenge for educators and people who are working in Second Life. (Tony, F)

Discovery Learning - subject selection. The participants felt that the MUVE is suitable for conveying subjects related to IT, but there could be matters of concern relating to other subjects.

> This environment is particularly suited to IT teaching, but the world of tertiary education is a big place. For example, I wouldn't like to have an injection from a nurse who had only learned how to do it in a virtual environment. It is an additional tool, but nothing replaces the real-life. (Jasmine, U)

Notably both (Familiar and Unfamiliar) cohorts were very positive about the discovery learning features in the MUVE. However, the Familiar participants who had conducted classes in a MUVE explained that the level of success depends on the effectiveness of the tools selected, and the creativity of the educator. Sanders and McKeown (2007) noted that for educators it would be a challenge to work in virtual environments. Although unfamiliar cohorts agreed with the available benefits of discovery learning features in the MUVE, 5 unfamiliar participants indicated that it is unlikely to completely take over or replace real-life experiences.

Role Projection

Luff (2000) noted that achievement of behavioural patterns would assist students to avoid entanglement with current norms and beliefs. The interview participants identified different attributes that contributed to acceptance of the MUVE as an educational tool due to the role projection features available there. These attributes are: exploring day-to-day social phenomena, anonymity, subject selection, students' involvement, different identities, and non-applicable situations (where role projection would not be applicable). These attributes are discussed under the respective headings.

Role Projection - exploring day-to-day phenomena. Eila explained the advantage of role projection in MUVE:

> A colleague of mine uses this unique opportunity in a MUVE to explore issues of racism, sexism, prejudice, and injustice. In my experience, it has enabled more reticent students to express themselves and participate more substantially than in the real-life classroom. (Eila, F)

Victor and Manik who were both familiar with conducting classes in MUVE, agreed with Eila's sentiments.

Role Projection - anonymity. The participants who were familiar with the MUVE indicated that students would be able to speak freely due to the anonymity of the avatars in a MUVE.

> A student can feel safer and have confidence in Second Life with a degree of anonymity behind the avatar. A normally shy student is free to experiment socially in Second Life. (Biyanka, F)

Role Projection - subject selection. The participants who were familiar with the MUVE and who work with adult students indicated that the effectiveness of role projection would depend on the audience and the subjects to be conveyed through the MUVE.

> It depends on what you teach. In what I have been doing with my students, they were not required to do role projection. But in subjects like business communication, role projection is very important. (Cameron, F)

Joe thought role projection "may be relevant when working through issues such as motivation, budgets, and internal control"

Role Projection - students' involvement. Bruce provided examples of educators who are already working in Second Life for pre-school students involving role projection.

> I think there are possibilities. I know that Maggie Marat in Second Life has been working with pre-school students and has done very interesting things in the teen grid involving role playing and identity in relation to avatars. (Bruce, F)

Sandra indicated that with role projection she would be able to attract both primary and secondary students – especially in storytelling.

> My primary students will really love this. We can use this to do storytelling and so many other things. Looks very interesting. (Sandra, U)

Mabel indicated that role projection could be important to young students, as the MUVE is very stimulating.

> This can be applied to certain students. It will be very stimulating, I think. Lots of younger students (especially primary) are used to this kind of thing. (Mabel, U)

The participants who were Familiar with MUVE and who work with adult students indicated that the role projection in MUVEs would not be an attraction for their adult students. Sonali's comment exemplifies their concerns.

> All my students are adults. I don't think they are looking for role projection from Second Life. They are more interested in studying the subject content. (Sonali, F)

Role Projection - different identities. Dave revealed that he may consider exploring the capabilities of a MUVE to project diverse identities through role-playing to encourage students to learn history.

> There is little of immediate value to be gained, for my purposes, from the ability to take on different identities in Second Life. In theory, it might be possible to use this element to encourage students to undertake historically relevant role-playing. I might consider exploring this option in the future. (Dave, F)

Role Projection - non applicable situations. Several participants who were unfamiliar with the MUVE indicated that role projection cannot be implemented mainly based on the physical appearance of an avatar. Arnold's comment exemplifies their concern.

> Students will not be able to apply any of the usual social prejudices and role assumptions based purely on physical experience. (Arnold, U)

Bender (2005) pointed out that the virtual environment is particularly well-suited to role-playing activities. Many Familiar participants indicated that role projection capabilities in the MUVE have enabled students to express themselves freely.

Six participants who were unfamiliar with the MUVE indicated that they were not aware of any advantages or disadvantages of role projections in a MUVE; therefore, they did not comment on the topic. Only three participants indicated that the role projection facility in a MUVE would be a benefit. One of them, who was teaching primary and secondary students, indicated that role projection would attract primary and secondary students, particularly in activities such as storytelling.

Situated Learning

In essence, situated learning requires authentic contexts, activities, and assessments coupled with guidance based on expert modelling, situated mentoring, and legitimate peripheral participation. Participants identified different attributes that contributed to the acceptance of the MUVE as an educational tool due to situated learning features it offers. These attributes are: inquiry in authentic settings, special environments, challenge to educators, engagement in the MUVE, and situated learning vs. actual experience. These attributes are discussed under those headings.

Situated Learning – inquiry in authentic settings. Several participants who were familiar with the MUVE indicated that the situated learning facilities it provides have more advantages for students than a real-life classroom does. Callum's comment exemplifies their perceptions.

> Situated learning and inquiry in authentic settings in either MUVEs or in a regular classroom are important methods for student learning. MUVEs have the advantage. (Callum, F)

Chris was an educator who had been teaching engineering subjects for fifteen years. Although he was unfamiliar with the MUVE, he believed that he could use it to teach his subject matter better, and to gain additional knowledge visually.

> This will help students to understand processes better. For example, if water treatment is being taught, a real treatment plant also could be shown, instead of diagrams. (Chris, U)

Sue who was unfamiliar with the MUVE indicated that it could provide visual examples of objects for learners. Visual objects challenge the knowledge of students to engage effectively in critical thinking.

> According to what I can see, we can use this environment to provide visual examples of the subject. (Sue, U)

Several of the participants who were unfamiliar with the MUVE emphasised that the real-life experience in a MUVE would make the learning environment more effective. Sandra's comment exemplifies their perceptions.

> Definitely real-life experiences will make the student's learning environment more effective. (Sandra, U)

Situated Learning – special environments. Eila and Manik had both conducted classes in a MUVE; they agreed on the educational benefits that a MUVE offers. Manik, who had two-and-a-half years' experience in nursing, said that the MUVE was ideal to create environments that could not be created in real-life. He cited an example such as the inside of a human body to show how disease affects various organs. Manik's quotation exemplifies his and Eila's perceptions.

> I feel that the ability to create environments which are not possible in real-life – such as the inside of an organ of a body – to show how disease affects it, is an area that I feel can be used to enhance student learning. (Manik, F)

Victor agreed with Eila's and Manik's sentiments and identified effective learning when "Simulations, representations of molecular structure are much appreciated in effective learning" (Victor, F).

Rod was an unfamiliar educator who identified ways of using MUVEs to teach business students:

> I like the idea of simulated business/enterprise environments. I'd go further, and would require appropriate attire and work attitude / speech / behaviour. (Rod, U)

Situated Learning – challenge to educators. The participants were asked how they felt about situated learning features in a MUVE. Several who were familiar with the MUVE indicated that the success of a MUVE will depend on the educators' ability to identify and build the tools required. However, they emphasised it would be a challenge for educators to implement required tools to provide situated learning features for students in MUVEs. Manik's comment exemplifies their concerns.

> The educators' ability to create environments which are familiar is important to ensure that the student recognises it and feels comfortable. This opportunity is also a challenge for instructors to fully take advantage of what Second Life has to offer. (Manik, F)

Samantha teaches engineering subjects; although she had no experience in MUVEs, she had logged into Second Life on several occasions to join her colleagues' classes. Samantha felt that situated learning features in MUVEs would be an added advantage to students, but she is of the opinion that subject selection is important in using the MUVE as an educational tool.

> No doubt you can make a difference. But we have to select the subject. According to my view, Second Life cannot be used to teach all the subjects. (Samantha, U)

Situated Learning – engagement in the MUVE. According to several participants who were familiar with the MUVE, their experiences had been that benefits like situated learning engaged them with the environment. Dave's comment exemplifies their perceptions.

> The use of a simulated real-life environment is really the primary point of my own engagement with Second Life as a learning tool. I can see a great many possibilities for the use of simulation; for my own purposes, it is the re-creation of a real-life setting that has actually disappeared; e.g. an historical setting that is no longer available. (Dave, F)

Situated Learning – situated learning vs. actual experience. Joe was unfamiliar with the MUVE, but he agreed with other participants (Familiar and Unfamiliar with MUVE) regarding the situated learning benefits that could be derived from a MUVE. However, according to Joe, the best places for a learner to gather actual experiences are summer internships or part-time jobs. Gentry (1990) pointed out that although opportunities similar to internships would be able to provide experience to students, they may fail to provide a learning framework due to lack of necessary structure.

> Although internships or part-time jobs are feasible, only structured or subject-related occupations would provide value to learners. Simulation of the real-life has its place, but there is still nothing like the actual experience through summer internships and part-time jobs. (Joe, U)

As pointed out by Salt et al. (2008), the MUVE provides opportunities for both experiential learning and situated learning. According to the participants in this research, simulations provided by the MUVE could be more realistic compared to real-life experiences, leading to a more authentic learning experience for students. However, although such measures may prove reliable and valid, they are limited to the study of specific subjects. Not everyone in the Unfamiliar cohort had positive perceptions. Experienced participants who had no experience in video games suggested that the best way for a learner to gather actual experience was through a summer internship or part-time job, rather than through a virtual environment.

Immersive Environment

In this section, the perceptions of educators who participated in the research regarding the acceptance of the MUVE as an educational tool due to its immersive features are analysed viz. 3-D construction, interactive scripts, immersive settings, and virtual manipulative – with

the traditional VLE functions of MOODLE, threading of discussions, assignment drop-boxes, and self-scoring quizzes in MUVEs.

Alison, who had conducted classes in a MUVE, emphasised that immersive features are a fundamentally important requirement of the MUVE.

> Fundamentally important. That is why students will be able to engage in the environments. (Alison, F)

According to several participants who were familiar with MUVE, any idea that engages students in learning is desirable. Manik's comment exemplifies their perceptions.

> Any idea that influences the time students engage in learning is to be applauded. If this promotes constructive and social learning then the chances of deeper learning as opposed to surface learning will be achieved. Their ability to scaffold knowledge can greatly enhance their learning. (Manik, F)

Biyanka had eight years' experience in teaching many Information Technology subjects. According to her, the enjoyment she derives from the immersive environments has motivated her to stay in the environment.

> Exhilaration leads to greater motivation to become involved. (Biyanka, F)

According to Eila, who had conducted classes in MUVE, most of the students who experienced MUVE classrooms reported that they could see, feel, hear, and even experience a kinesthetic sensing of the experiences.

> For students, exploring a virtual Egyptian temple is far more satisfying than watching a video of an Egyptian temple. They are fully engaged in the experience, and seem to have a clearer memory of it than alternative media presentations of the same information. (Eila, F)

Cameron had conducted a class in a MUVE to teach computer system architecture. However, he felt that the MUVE would be a challenge to educators as they were called upon to prepare immersive environments for their students.

> This will attract students for the environments. But as educators, we have to do lots of work to provide a better facility to students. (Cameron, F)

Several participants who were familiar with the MUVE felt that proper guidance must be provided to students so that they would not spend unnecessary time immersed in the environment. Tony's comment exemplifies their concern.

> Sometimes this can be overwhelming for students. So, as educators you have to be careful in what you are selecting for students. (Tony, F)

Several participants who were unfamiliar with the MUVE indicated that the richness of a MUVE would reinforce learning and would likely extend the user's time further in MUVE. Mabel's comment exemplifies their perceptions.

> I think it will be very helpful. If they ask questions, they get the answers immediately as it is interactive. I think you can connect the information very easily through this environment. We can access Internet, download the assignment, and distribute the assignment. I think we can manage the flow easily. (Mabel, U)

Several participants, who were Unfamiliar with the MUVE, indicated that they may have to take precautions to ensure that the students would not feel lost in the environment. Sandra's comment exemplifies their concern.

> It will be very helpful for students. But we have to guide them so that they will not be lost. (Sandra, U)

Rudin (1995) noted that virtual reality has introduced a new form of education, allowing students to experience situations, instead of simply reading or hearing about them.

Most of the Familiar participants and five of the Unfamiliar participants indicated that the richness of the MUVE would reinforce the learning, and was likely to extend the time students spend immersed in it. However, participants pointed out the importance of student guidance during their engagement in the environment so that they would not waste their time unnecessarily immersed in it.

Five participants who were unfamiliar with the MUVE did not comment on the immersive quality of the environment, as they were unfamiliar with this type of environment.

Controlled Environment

Participants identified different attributes that contributed to the acceptance of the MUVE as an educational tool due to the ability of the educator to control the environment. These attributes are viz. engagement in the MUVE, ability to control, loss of control, full control, and copyrights and trademark infringements. The attributes are discussed under respective headings.

Controlled Environment - engagement in the MUVE. According to several Familiar participants, the ability to control their own learning environment had been the main reason for them to get involved themselves with MUVEs. Callum's comment exemplifies their perceptions.

> The ability to control my own learning environment has been key for me to stay involved with Second Life. (Callum, F)

Controlled Environment -loss of control. While these participating educators identify positive aspects of the "controlled" environment, others commented on aspects relating to loss of control. According to several Familiar participants, if virtual

environments influence educators to lose control in view of certain constraints it would result in difficulties of navigation in a MUVE. In such situations, educators are required to depend on the services of tool creators or builders to navigate in the environment. Tony's comment exemplifies their concern.

> For educators, control is very important. However, if the educator is not capable of easily navigating around the environment, or building the tools required, they are highly dependent on builders like you. (Tony, F)

Sue had conducted classes in real-life with over 25 students and felt that while being in a virtual environment, she would use a different technique to manage a group.

> When I am in a classroom, I use my personality to control the class. Whereas, in this environment, I would have to learn a different way of doing that. I think in this environment we have to use a different technique to manage a group. (Sue, U)

Controlled Environment - full control. The participants who had conducted classes in MUVE did not believe in full control of the environment. They disliked enforcing control on students. Eila identified the benefits of when students are granted all the rights of access.

> I don't believe in control. Students can become more excited about a learning space that they construct themselves. I work with my classes in a sandbox for that reason. The students often create things in their own time to help the class because they find it empowering and rewarding. (Eila, F)

Alison believed that controlled environments diminish students' attention.

> Might be some of them. I don't think we need to control. We need to provide facilities. Tertiary students are adults; we do not need to

> control them at all. But primary students, it will be a different case. A controlled classroom in Second Life is a red herring. (Alison, F)

Controlled Environment -copyright and trademark infringements. Mabel indicated that control in an educational environment was very important as a MUVE is open to the general public. According to Mabel, before using MUVE as an educational tool, issues such as copyright have to be investigated. This is not only from the educators' point of view, but also from that of the management of the educational institute. Copyright infringement in Second Life has been pointed out by Kerbs (2005).

> Most of our teaching materials are highly copyrighted. We protect them as an intellectual property. We don't like to share them with other universities. Not only from a personal point of view, but also from a management point of view. As an educator, I need to know how much sharing we have to do if we are using an educational tool like this. I understand that we can place inbuilt security into the tools in Second Life, but I think we need to look into copyright issues as well. (Mabel, U)

According to Stuart, who was unfamiliar with the MUVE, the controls that are required to be implemented are more important to the management of educational institutions than to educators. The issues Stuart identified were related to intellectual property and trademark infringements (Schroeder, 2007; Shutkin, 2004).

> I think this actually impacts the business side of it rather than education. The institutes are nervous about the distribution of materials, or people being able to access classes who are not enrolled as students. The institutes will have issues with intellectual property. And people will have concerns as the data are not in the campus server. (Stuart, U)

Kalay (2003) noted that when cyberspace is selected as a teaching medium, it is different from physical space. Controls are needed to regulate its manipulation and appropriation through the interface. The majority of participants agreed with Kalay. However, two participants who had conducted virtual classes in a MUVE indicated that full control in the MUVE is not required as it may impose limits on students' learning.

Participants unfamiliar with the MUVE indicated that they need to look into copyright, intellectual property and trademark infringement issues before accepting the MUVE as an educational tool. Unfamiliar participants who had experience with video games agreed with this view.

Participants who were familiar with the MUVE had positive perceptions of utilising it as an educational tool. They predicted that the MUVE as an educational tool would grow enormously in the future, and that the issues surrounding its use would be gradually resolved. Further, they pointed out that there would be more competitors with existing MUVEs, and more versatile virtual environments would emerge in the future to give educators an opportunity to select the best MUVE for their requirements. The participants also predicted that there would be more sophisticated interfaces available in the future that would make the navigation in MUVEs easier — even for people who are unable to use their hands. According to participants, current support is limited to communities within MUVEs; they pointed out that if support is provided through a university or at the institute level, more educators would accept the MUVE as an educational tool in the future.

Participants who were unfamiliar with the MUVE also predicted that it would evolve in future, and could be adopted as an educational tool. They further believed that the usefulness of the MUVE would improve, and more competitive applications would emerge. Participants who were unfamiliar with the MUVE would prefer to see their students face-to-face rather than within a virtual world; however, they were prepared to use the MUVE as an

educational tool in the same way they would use any other tools which are currently being used in their educational context.

Summary

Undoubtedly, the combination of the many strengths of the MUVE would influence educators to accept MUVEs as an educational tool. However, the educators who participated in the research identified four areas of concern when accepting the MUVE as an educational tool viz. the steep learning curve for newcomers, infrastructure requirements, the challenge to educators to build and implement the tools required to provide the benefits of the MUVE to learners, and security issues related to the environment. These four areas were identified from the TAM factors which guided the research. The Familiar participants indicated that there would be a steep learning curve for newcomers who would be using the MUVE as an educational tool. Furthermore, this particular cohort noted that infrastructure requirements would limit the number of users adopting the MUVE as an educational tool. Nevertheless, the Unfamiliar participants believed that these issues could be resolved if their educational institutions committed to e-learning. According to participants, security issues that relate to any online course would be the same for the MUVE, and they have recommended supervision for younger learners.

Familiar participants considered there would be a challenge to educators in building and implementing MUVE tools, but both cohorts agreed that the MUVE's educational benefits would influence its acceptance.

Familiar participants indicated that there is no serious impact in subjective norms to adopting the MUVE. This perception was in contrast to eight of the Unfamiliar group who felt that subjective norms were significantly related to behavioural patterns. Unfamiliar participants, who had no familiarity with video games, appeared reluctant to pursue new

innovations. Nevertheless, they might feel inclined to work with the MUVE if their institutions adopt the MUVE as an educational tool. One of the Familiar participants expressed the view that he is sceptical about whether these educators would continue their work in a MUVE, due to the steep learning curve.

Both participant groups predicted that MUVEs would continue evolving their versatile features in the future. Many of the Unfamiliar educators felt that they are optimistic about adopting the MUVE as an educational tool.

The differences in opinion between Familiar and Unfamiliar educators regarding the MUVE could not be considered drastic; although some of the educators who were Unfamiliar felt rather cautious about using a MUVE. It was observed that in both cohorts the overall attitude towards using a MUVE for teaching was quite positive.

In the following chapter, conclusions gathered from the research questions, implications, limitations, and suggestions for future research are discussed.

CHAPTER SIX

Conclusions

This chapter is focused on the research questions stated in the Introduction, and presents the conclusions drawn from the responses to each question. The limitations of the study are then outlined, and the thesis concludes by discussing the implications and limitations of the research, and moves on to the consideration of future research into the use of a MUVE in education.

Conclusions of the Research: Question 1

Research Question 1 was: How do the known determinants of Technology Acceptance influence the intention of educators to use the MUVE to conduct virtual classes?

The TAM factors pertaining to this research are viz. Ease of use, Enjoyment, Compatibility, Facilitating Conditions, Subjective Norm, and Security and Trust.

This study clearly shows that one of the key factors essential for user acceptance would be the navigational ease of MUVE when it is being used as an educational tool as Salt et al., (2008) indicated. Familiar participants believed there would be a learning curve for newcomers, especially if they had no prior experience with video games, and suggested that improved navigational support should be made available to lessen the steepness of the learning curve.

The study conspicuously identifies the availability of navigational support as its most compelling feature, (rather than technical support). This is recognised as the most significant factor for educators who are unfamiliar with the environment to have available if they are to adopt the MUVE as an educational tool. Although participants who were Familiar with MUVEs had a positive outlook about the availability of support, they expressed the opinion

that there would be more advocates for use of the MUVE as an educational tool if the required navigational and technical support were to be provided by the educational institutions.

The study recognised the fact that the TAM factor of Enjoyment could not be considered as indispensable, nor is it a pivotal factor in deciding to adopt the MUVE as an educational tool. Familiar educators who identified positive benefits of the MUVE stated that they would eventually adopt the MUVE as an educational tool. Nevertheless, they observed that for conventional students, it would be tedious and technically challenging. Those with even moderate knowledge and experience of video games may possibly get discouraged by the MUVE in the initial stages as they compare the quality of visual objects in the MUVE with that of professionally developed video games which are commercially produced to entertain a target audience. However, it was thought that such emotional behaviours would be temporary until MUVE users get acquainted with the new environment. Educators may need to address these issues when considering adopting the MUVE as an educational tool.

Beliefs regarding the impact of what other educators/institutions do varied considerably. Most of the respondents recognised the fact that the use of MUVEs as an educational tool would apparently build up influence and pressure, especially on the Unfamiliar educators. But eventually, there would be justification for its adoption in the educational environment.

Participants expressed concern over certain issues, including voice control with large groups, subject dependability, affordability, and the lack of sufficient broadband access to engage with MUVEs. Their considered view was that these issues would be properly addressed in due course, and allow institutions and their students and staff to derive the potential benefits of MUVEs as the educational world encounters and deals with its evolving needs.

This study also acknowledges the fact that the availability of facilities would be a major factor in deciding to accept the MUVE as an educational tool. Those educators who were familiar with the MUVE emphasised that the currently available tools were inadequate, and that they had been required to build their own tools to facilitate learning skills for their students. These participants clearly expressed that tool selection depends on each educator's ability to understand the requirements of the learners as well as the assigned subjects to be conveyed through the MUVE. However, the current interactive tools were introduced with a positive approach. These tools were built by a group of educators in collaboration with technical experts who were aware of the needs of the educational environments and the institutions. Educators who participated in this research expressed the need for coordination between the developers and the educators to improve the existing functionalities of MUVE tools.

Educators who participated in the research recommended that younger students should be supervised when they engage in a MUVE. Another concern raised regarding security was the potential for identity deception. Such behaviours may cause emotional suffering for learners; therefore, educators may be required to take precautions to prevent this before adopting the MUVE as an educational tool.

It was found that educators who participated in the research had different interpretations of the meaning of trust in MUVEs regarding matters relating to both technology and personal security. Those educators who were unfamiliar with the MUVE indicated that issues such as power failure and sudden loss of Internet connection are common pitfalls to all other online educational tools, and the MUVE is no exception. In view of the opinions expressed, it is evident that these issues are not confined to MUVEs. Hence, this would not be a factor of paramount importance in influencing the educators to totally reject the

use of MUVE as an educational tool. The respondents pointed out that there would be alternative strategies available in the event of a power or technical failure.

The educators, who were familiar with the MUVE, after perusing the subject matter from a security angle, indicated that trust levels among current users and the communities that provide support would influence their attitudes towards the adoption of MUVEs as an educational tool. The need to supervise younger users to safeguard them from exposure to more adult content was also mentioned.

Conclusions of the Research: Question 2

Research Question 2 was: How do educators perceive the potential benefits of educational use of the MUVE?

As described in the literature review, the features of a MUVE that would provide potential benefits to educational use are; collaboration, awareness, media richness, discovery learning, role Projection, situated learning, immersive environment and controlled environment.

This study confirmed that educational benefits such as collaboration, distance learning, situated learning, and immersiveness could be utilised to provide effective learning environments for learners. The educators who participated in the research noted that facilities provided by the MUVE included space for collaboration, tools to explore and expand knowledge, virtual based task-oriented tools, and kinesthetic sensing experiences. However, participants indicated that the level of success depends to a large extent on the effectiveness of the tools selected and also on the creativity of the educator.

Participants who were unfamiliar with the MUVE and those who were inclined towards traditional teaching methods agreed that the MUVE offers educational benefits.

However, they indicated that it would be highly unlikely for MUVEs to completely take over real-world classroom experiences.

The educators who participated in the research believe that even though the MUVE contains limited combinations of emotional elements, they often find communication to be much more honest and direct in a MUVE than in a real-life classroom. In addition, they said that due to anonymity in a MUVE, learners could feel more engaged in the learning environment and in some cases, even experience the physical presence.

Educators who participated in the research indicated that rich media facilities could be used to create learning environments for learners to engage in and have a real-life experience. However, they expressed concerns about the ability to adapt in students who were unfamiliar with technologies such as video games.

The participants expressed views from different angles with regard to control of the MUVE. The majority of them expressed the opinion that total control of the environment should be entrusted to the educators to enable them to conduct virtual classes effectively. Familiar participants, who had conducted classes in a MUVE, were sceptical about the imposition of total control as it might create a negative impact on students' learning goals and achievements. However, they believed that it was up to them to define the extent of plausible restrictions required to be enforced in the environment. Unfamiliar participants identified examples of restrictions in the environment, such as copyright, intellectual property, and trademark infringement. The participants affirmed the outcomes of their deliberations, reiterating the necessity to scrutinise and dwell upon all pros and cons of the subject matter in order to develop the justification for acceptance of the MUVE as an educational tool.

Implications

There are implications for institutions when educators adopt the MUVE as an educational tool. They may need to consider introducing strategic policies for the use of these MUVEs; they may also need to design and implement specifications and procedures to ensure availability of adequate bandwidth, security measures, and support for the practical incorporation of the MUVE as an educational tool.

Limitations

The first limitation for this study was related to the use of analyst triangulation. The independent researcher who carried out the analysis was not present at any of the research interviews. The analysis was carried out using only the transcripts; therefore, the results of validation may not be as compelling as in the case where an analyst was present at the interviews. If this study is replicated, validation issues could be resolved by ensuring that both analysts are present at the interviews.

The second limitation was that none of the participants were currently involved in teaching in a primary setting. Nevertheless, it was expressed that the MUVE could be a very productive and versatile tool for the primary education sector. Any user who replicates this research could avoid distractions and common pitfalls and use its compelling features to make it more appealing to primary educators.

Future research

The rich description provided in this study could be used to develop a questionnaire for an associated quantitative study and address the perceptions of MUVE acceptance from a much larger number of respondents. The combined study could then be framed as a mixed method study that would yield a broader understanding of user acceptance of MUVEs.

MUVEs provide an on-line learning environment that could be used to teach students with low literacy skills or no literacy skills at all. Therefore, it could be of interest to extend this research to teachers engaged with students with low literacy skills; i.e. primary school children, or adults enrolled in literacy programs.

This research once again highlighted the importance of ease of use in the acceptance of new approaches. It would be of interest to investigate how control alternatives to mouse and keyboard, particularly controls relying on tracking full body movement such as the ones applied in Project Natal (Project Natal, 2009), would change teacher perceptions about the ease of use of MUVEs.

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APPENDIX A

Schedule of Questions

The aim of the following questionnaire is to explore teacher perceptions around accepting MUVE (Multi-User Virtual Environments), such as Second Life, as an educational tool. It is not our aim to promote MUVE or to assert that they should or should not be used. Before presenting the questionnaire, I will demonstrate the virtual classroom I have built in Second Life utilising MUVE as an example for its use in an educational environment.

The questionnaire asks your opinion regarding various issues relating to educational use of MUVE raised in the literature. When answering these questions, please emphasise the relevance and the impact of these issues in the context of your specific work environment - in courses in which you participate, participated in the past or are likely to participate in the future.

Background

1. Please, briefly describe your background as an educator.
2. Please, describe in a few words your experience with computers and Internet.
3. Do you use computers and Internet in teaching? If yes, please, briefly describe your experience.
4. Do you play video games? If yes, please briefly describe your experience.
5. Are you familiar with Second Life or other Multi-User Virtual Environments? If yes, please briefly describe your experience.
6. Are you currently involved with education-related activities in Second Life or any other MUVE? If yes, please describe your experience.

TAM factors

7. How do you find the feasibility of navigation in the demonstrated virtual class?
8. In which ways does the ease of use of MUVE is likely to have an impact in your acceptance of it as a teaching tool?
9. Teachers may find the MUVE's rich multimedia experiences and new opportunities for creativity as an enjoyable medium. In which ways is the enjoyment of MUVE likely to have an impact in your acceptance of it as a teaching tool?
10. As elaborated, many educational institutions use MUVE as a teaching tool. In which ways will your colleagues'/other educator's acceptance of MUVE as a teaching tool by likely to influence your own acceptance of MUVE?
11. In which ways the availability of technical or course design support would likely to have an impact in your acceptance of MUVE as a teaching tool?
12. The use of MUVE in teaching may be more or less compatible with your existing practice – MUVE may more or less "fit" the way you normally conduct courses, or the way your organisation expects you to conduct your courses. In which ways will such a fit (or its lack) likely to have an impact in your acceptance of MUVE as a teaching tool?
13. All electronic environments raise security and trust issues – private information may be revealed, or the environment may suddenly become unavailable due to problems with the provider offering the environment. In which ways would the issues of security and trust have an impact in your acceptance of MUVE as a teaching tool?
14. MUVE presents an environment similar to computer games – an environment highly familiar to many students, and associated with having fun, rather than

with learning. In your opinion, what are the implications of such familiarity for student learning in MUVE?

15. In many cases, avatars in MUVE could use information facilities similar to facilities available to real people in the "real-life". For example, avatars could make PowerPoint presentations or send text messages (via Twitter). In which ways could the availability of familiar information facilities in the virtual world have an impact on student learning in MUVE?

Usefulness

16. MUVE offer a media-rich experience: 3D visual, sound, and interaction via movement, manipulation, speech and text. How do you think the media richness of MUVE is likely to have an impact on student learning?
17. Immersive environments such as MUVE are known to induce a flow experience - participants find that addressing challenges in the environment is highly exhilarating, so that they tend to spend a lot of time immersed in the environment. In which ways would the flow phenomenon in MUVE have an impact on student learning?
18. MUVE could allow students who normally do not meet (e.g., extramural students, or students enrolled in the same course at different campuses) to meet in a virtual space, making them aware of each other, enabling them to collaborate and offering opportunities for serendipitous interactions. In which ways does this would have an impact for students learning in MUVE?
19. MUVE can allow teachers to emotionally connect with extramural students – e.g. via voice intonation and gestures – to convey encouragement, approval, disapproval and so on. In which ways such a capability would have an impact for students learning in MUVE?

20. MUVE can allow educators to conduct teaching in authentic settings reproducing the “real-life”, thus enabling discovery and situated learning. For example, a class studying real estate valuation could valuate virtual houses presented in MUVE. In which ways such a capability would have an impact on students learning in MUVE?
21. In MUVE, students are represented by avatars. A student may assume an avatar that differs from her/his real persona – for example, an avatar corresponding to a different age or sex. This may allow students to experience social situations from different points of view. In which ways such role projection capability would have an impact on student learning?
22. As demonstrated, you could create an environment entirely under your control: virtual rooms, furniture, teaching props, even your own virtual buildings. In which ways does the high degree of control in creating a teaching environment likely to have an impact for your acceptance of MUVE as a teaching tool?
23. MUVE could allow educators to conduct teaching in settings that are highly relevant to the topic under study and conducive to discovery learning, and at the same time not possible in the “real-life”. For example, a group of students could travel inside a model of the Matrix project as shown in the demonstration. In which ways such capability would have an impact on student learning?
24. What are your views in relation to the benefits that a MUVE can offer?
25. What are your perceptions on future of MUVE?

APPENDIX B

Glossary of Terms

Avatars: An avatar is a virtual image that represents a person in Second Life. An avatar can interact with other avatars, prims (objects) and their environment. Avatar can communicate using text or audio.

Bot: An avatar that is controlled by scripts rather than by a human.

Environment: Within the environment of Second Life, users can create landscapes and buildings. These landscapes are on islands (virtual parcels of land representing an area of 256m x 256m - each rendered by a single server). In some ways, the basic environment of Second Life deliberately replicates real-life. It has sky and landscape, plus gravity, light, a setting sun and rising moon, buildings, cities, oceans and a world map. These basic building blocks are used to create places that are very different to real-life.

Gesture: A mix of avatar animation, sound and sometimes special effects activated by a typed command or keyboard shortcut.

Grid: The basic structure underneath the entire Second Life world. The grid is subdivided into thousands of regions simulating physical surface geography. Linden Lab provides the grid and residents build the superstructure and surface infrastructure. Sometimes the grid goes down temporarily for maintenance. Grid also known as *sim*. There is a limit to how many avatars could be on a sim, depending on the sim type.

HUD: Heads Up Display. HUD shows the user important information directly in their field of vision. In Second Life, HUD attachment points have been added to the right-click/pie menu and inventory right-click menu for objects you own.

IM: Instant Messages

Island:A region that is detached from the main continent and accessible only by directly teleporting to it(Jokaydia Island is an example).

Lag: Lag is a term used in Second Life for slow reaction time. Factors such as number of avatars in a sim, number of scripts running in the sim and, number of textures visible in the sim could contribute to lag in Second Life.

Landmark (LM): A shortcut address that enables a Second Life resident to teleport to another place, it has the required coordinates of a location in SL that could be obtained and used by clicking an object the gives LMs.

Linden Dollars: The official and virtual currency in Second Life. Players could use Linden Dollars to buy and sell assets. In the last 30 days the exchange rate of the L$ varied in a small bandwidth just under L$ 270 per US-Dollar. Supply and demand influences the exchange rate.

Notecard:A text document used in Second Life.

Prim (Object): An object in Second Life is known as a prim. Prims could be uploaded, built, scripted, sold or animated. External graphics programs, like Lightwave 3D are used to create objects and they are uploaded to Second Life. These objects (or prims in Second Life) could be animated using scripts.

Region: A named area within Second Life also names as sim. Second Life is divided into square regions, each 256m on a side and assigned a name.

Sandbox: A public area where Second Life residents are allowed to create new objects. There are many sandbox areas scattered around Second Life.

Script: Scripting allows objects to move and communicate with avatars, other objects and the internet can also give objects, a rich and complicated set of behaviours. Scripts in Second Life are written in Linden Scripting Language (LSL).

Second Life: A virtual environment introduced by Linden Lab.

Second Life Inventory: The collection of objects that at avatar possesses in Second Life.

Sim: A square, named region that makes up part of the Second Life (not an avatar or character)

SLURL: Short for Second Life URL. This is a sting that can be entered into most Internet browsers to allow users to locate and teleport to a Second Life location

Teleport: This is a method of moving instantly from point to point on the Second Life Map.

Texture: An image applied to the side of a prim.

APPENDIX C

Educators in Second Life

Table 1: Educators in Second Life

SL avatar name	Educational Area	School Affiliation
Ali Andrews	English Composition	Northern Illinois University
AngryBeth Shortbread	Senior Lecturer Design for Digital Media	Leeds College of Art, UK
Bryan Mnemonic	English	University of Central Missouri
Carbonel Tigereye	Games for the Web	Trinity University
Chang Tuxing	Software Engineering Process Game, Groupthink Game	Ohio University – University Without Boundaries
Corinne Fleury	Managing a Digital Library	University of Chicago
Corwin Carillon	Director of Enhanced Learning and Teaching	Hong Kong University of Science
Danielle Damone	Industrial/Organisational Psychology	Seton Hall University
Deanna Lancaster	English as a Second Language	English Village
Dewey Jung	Technology in Education Culminating Seminar	National-Louis University
Elaine Tulip	Early Childhood Education Educator Support	Chicago Public Schools Dept of Libraries & Information Services
Farley Scarborough	Centre for Teaching and Learning	Wright State University
Fire Centaur	English as a Second Language, Designs Educational Games	ESL in Second Life from South Korea
Gary Hazlitt	Film, Design, AI, Machinima (Just Virtual, 2007)	Australian Film, Television and Radio School, Sydney
Globalkids Bixby, Barry Gkid	Camp Global Kids Child Sex Trafficking Interactive Maze	Global Kids, Inc. New York and Second Life
Isa Goodman	Educational Courseware, & HealthInfo Island Designer	EduForge – Second Life Virtual New Zealand Campus
Jared Pixel	Creative Director of New Media, Multimedia, Virtual Reality Specialist	Case Western Reserve Cleveland Museum of Art

APPENDIX D

Consent Form

This consent form will be held for a period of five (5) years

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree to the interview being recorded by using a digital audio recorder.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature …… Date ……

Full Name – printed

……

APPENDIX E

Information Sheet

Researcher (s) Introduction

This research is conducted by Wadduwage Vimani Eranda Udumalagala Gamage Masters student in Business Studies at the Department Management of Massey University (New Zealand). Her supervisors are Dr. Alexei Tretiakov and Dr. Barbara Crump (Department Management of Massey University, New Zealand).

Applicant Details

Full Name of Student Applicant : Wadduwage Vimani Eranda Udumalagala Gamage
Email Address : vimani@hotmail.com
Full Name of Supervisors : Dr Alexei Tretiakov
Dr Barbara Crump
Email Address of Supervisors : A.Tretiakov@massey.ac.nz
B.J.Crump@massey.ac.nz

Project Procedure

The main purpose of the thesis is to study the perceptions of educators regarding the acceptance of Multi-User Virtual Environment (MUVE) to use as an educational tool. The research questions are as follows.

1. How do the known determinants of Technology Acceptance (according to existing TAM related research) influence the intention of educators to use the MUVE to conduct as an educational tool ?
2. How do the educators perceive the potential benefits of educational use of the MUVE?

The qualitative approach was adopted for this study. Semi-structured interviews were conducted to gather perceptions of educators. The constant comparison method is used to analyse the gathered data. All the participants are selected randomly from the publicly available data. The capability of MUVE was demonstrated to each of the participants, using the virtual class built in Second Life.

We will meet together to view the virtual classroom, which I have created in a Multi-User Virtual Environment, namely Second Life. When we complete the demonstration the

participant will be given a questionnaire to complete. The aim of the questionnaire is to explore teacher perceptions around accepting Multi User Virtual Environment as an educational tool. The personal details of the participants will not be collected during the session.

Analysis of participants' responses will be transcribed and coded using Nvivo software. A summary of the analysis will be provided to all the participants.

All the data gathered will be stored securely under lock and key. Furthermore, I will ensure that no one apart from the researchers involved in the project can have access to the data. After the completion of the research, gathered data will be disposed of by following standard procedures for treating confidential waste and all copies of digital audio recordings will be deleted.

The analysis of the research will be published as part of Master thesis which could be obtained from the library of Massey University (New Zealand). If you wish to receive a digital copy of the thesis, please send an e-mail to vimani@hotmail.com .

Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- Withdraw from the study (specify timeframe);
- Ask any questions about the study at any time during participation;
- Provide information on the understanding that your name will not be used unless you give permission to the researcher;
- Be given access to a summary of the project findings when it is concluded.
- May contact student or supervisors by e-mail to clarify any issues with the research

Low Risk Notifications

This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor Sylvia Rumball, Assistant to the Vice-Chancellor (Ethics & Equity), telephone 06 350 5249, e-mail humanethicsouthb@massey.ac.nz.

APPENDIX F

Independent Researcher's Analysis

Table 5: Independent Researcher's Analysis part I

Theme	Sub Category	Analysis
Bad expectation		
	Expectation resistance	Experienced educators who have been using traditional teaching methods for a long time are resistant to MUVE as this a novel technology.
	Replacing teacher	Educators' role will not be replaced by adopting MUVE because MUVE is just a tool. Educators are adopting the tool to facilitate learning.
Constructivism		
	Anti-collaboration	Younger students need to have adult supervision when they are engaging in MUVE as MUVE is open to the public.
	Isolated students	Students who are isolated would be able to collaborate with educators or peers using MUVE.
	Group learning	Students who are studying in a group will be able to collaborate in a MUVE.
	Involvement of shy students	The students who are shy to speak in a normal classroom will be able to speak freely due to anonymity offered by MUVE.
	PowerPoint not appropriate	Tools such as PowerPoint presentations can limit the educator's use of more MUVE-specific tools and opportunities.
	Social Interactions	Students will have opportunities to meet students from different time zones.
Ease of Use		
	Difficult for students	Students who are not interested in video games may find navigation difficult in a MUVE.
	Unpleasant for teachers	For educators who are not exposed to video gaming, it would be difficult to navigate in MUVE and could lead to frustration.
Impact of Colleagues		
	High profile universities	For new educators this is a motivation factor.
	No impact on the respondents	For the educators who are already conducting classes in MUVE, this can serve as a model and a justification.

Table 6: Independent Researcher's Analysis Part II

Theme	Sub Category	Analysis
Games		
	Bad perception for education	Educators view MUVEs as gaming environments. Therefore the learning materials have to be built from the beginning.
	Distraction	The immersion in MUVE could be a distraction for students. Therefore, educators may need to take precautions to focus students on the subject matter.
	Good for those who are familiar with video games	For those who are familiar with video games, it would be easy to adopt MUVE.
	Less fidelity	The images in MUVE do not have the same standards as those in video games. It will take some time to improve these.
Properties of environment		
	Integration of LMS	The integration tools available allow educators to use MUVE tools without script knowledge. As the current integration tool was built by a group of educators, functionalities of the tool are more suitable for learners.
	Limited realism	In order to simulate real-life situations educators are required to implement tools. Success depends on the educators' ability to understand the requirements and identify the tool.
	Reliability	Reliability of MUVE is based on the connection. If the connection is not available, the educators require alternative plans to conduct classes.
Security and Trust		
	Copyright	Copyright issues which may have legal implications have to be addressed before accepting MUVE as an educational tool.
	Deception via avatars	Avatars can be deceptive; e.g. we are not able to know whether we are talking to a male or a female.
Student inequality		
	Age	MUVE could be used to encourage engagement of both primary and secondary students in their learning. Educators are required to build advanced tools in MUVE to provide an effective learning environment for adult students.
	Availability of bandwidth	Due to technical requirements such as bandwidth, students might not be able to log in.
	Familiarity with video games	Students with video game experience would be able to easily adapt to the MUVE.
	Gender	Male students have more tendencies to adopt MUVE as a learning environment due to their greater interest in gaming.

APPENDIX G

Presentation Schedules

Presentation schedule in City University London Island in Second Life

This presentation was held in City University London Island in Second Life on 17th March 2009. Following is the presentation schedule.

2:00 Dev Parvati (on Open Habitat Island)

The Virtual Emergency Department is a multiplayer online world based on Forterra's OLIVE platform. We use it to simulate catastrophic events such as mass casualty incidents, or mundane medical events such as nurse handoff between shifts. In evaluation studies, we have shown that both learning and confidence increase in these virtual world learning events.

2:25 Gazit Hanan (on Open Habitat Island)

Massively Multiplayer On-line Games (MMOGs), social networked, and three-dimensional virtual worlds (3D), are merging to form the Web3D, known as the Metaverse. This presentation focus on real - virtual worlds engaging learning interactions by using video games, Several Mash-up and video games concept developed on game engines and social networks such as facebook, at the Instructional System Technologies Department at H.I.T-Holon Institute of Technology will be presented.

2:40 Vimani Gamage (on Jokaydia Island)

This presenter will illustrate the success factors that influence the educators to use a MUVE.

3:05 10 minutes break and a change to reconvene on Open Habitat Island for a ‘fun’ building activity (all levels of SL expertise welcome)

3:15 Building Fun!

Includes a 15min ‘Building Basics’ workshop to get everyone up-to speed.

Presentation schedule in University of Melbourne Island in Second Life

This presentation was held in University of Melbourne Island in Second Life on 30th March 2009. Following presentation schedule was sent to the researcher prior to the presentation.

30 Mar 2009 - Vimani Gamage

This presenter will illustrate the success factors that influence the educators to use a MUVE.

20 Apr 2009 - Sharon Collingwood, Ohio State University

Those of us teaching regular classes in Second Life have had the experience of having a planned activity derailed by a rolling restart, voice problems or lag issues. In this seminar we'll talk about how an open attitude to these inconveniences can result in a creative learning experience, for both teacher and student.

APPENDIX H

Presentation in Ontario Island in Second Life

The author received the following letter from the organisers of Ontario Island presentations.

Representing the Ontario Ministry of Government Services, Curious Dover (rl Barbara Schwarzentruber) welcomed everyone to Digital Ontario Island, and introduced the moderator Gillian Morigi (rl Gillian Mothersill), Associate Dean, Faculty and Student Affairs in the Faculty of Communication & Design at Ryerson University.

The first speaker was Emerly Alter (real-life name: Vimani Gamage), a masters student in business studies at Massey University in New Zealand. For her thesis, she is trying to determine the factors that influence educators to use virtual environments as part of their educational programs. At the moment Ms. Gamage is at the data collection stage of her work, and is using a virtual classroom in Jokaydia as part of her study.

The next presenter was Alx Beaumont (real-life name: Alexandra Bal), a faculty member in the new media program in the School of Image Arts at Ryerson University, Toronto. Dr. Bal gave an overview of educational models and how they relate to the change in learning and institutions that has or is maybe coming about due to the presence of social media, of which Second Life is one type.

The final two presentations dealt with interactive projects in Second Life. Ephraim Dalglish (real-life name: Mark McDayter) is an Associate Professor in the English Department at the University of Western Ontario. He described a project called “The Printer’s Devil”, which has been set up on the University’s island in Second Life. It includes 3 buildings – a coffee house, a printer’s and booksellers shop and a Rare Book library and reading room. Dr. McDayter described the area as a laboratory space for the arts and humanities, where the intersection of the material culture and literature of the day can be studied and experienced. Coffee houses of the time were important places where the exchange of ideas took place and literature was read out loud. By recreating the atmosphere of a coffee house in Second Life, students will be able to visit and discuss ideas with each other in much the same way as people would have done in the coffee houses of the Seventeenth Century. At the printer’s, visitors will be able to learn about the methods of printing of the time by accessing information posted throughout the building. They will also be able to interact with a hand press that has been

recreated by following a printer's manual from the 1680's. There are no such hand presses in existence, so this will be an opportunity for people to study, in detail, something that has disappeared.

The last presentation was given by Hilde Hullaballoo (real-life name: Rochelle Mazar), Instructional Technology Liaison Librarian at the University of Toronto. Ms. Mazar has built a sim in Second Life called "Cancerland", an immersive exhibit that allows visitors to follow her through her diagnosis, treatment and recovery from cancer. Ms. Mazar showed a video and spoke about the sim, saying that people found the build the most thorough way of gaining information, more so than by reading her blog. Visiting the sim itself is very strongly recommended, as a description of it pales in comparison.

APPENDIX I

Meeting with SLENZ (Second Life Education New Zealand) group

SLENZ bog (SLENZ,2009) has published the following regarding the author's meeting with SLENZ.Masters student in business studies at Massey University, Wellington, New Zealand-Aotearoa, Vimani Gamage (SL: Emerly Alter), has set herself the difficult task of establishing what factors influence teacher acceptance of multi user virtual environments (MUVEs).Briefing members of the SLENZ Project team last week she said that she was seeking to establish for her thesis how the known determinants of Technology Acceptance (according to existing TAM-related research) influence the intention of educators to use MUVEs to conduct virtual classes and how educators perceived the potential benefits of educational use of MUVEs as claimed in the literature.

Gamage is using a virtual classroom on Jokayadia within Second Life for her study which will involve the use of a questionnaire to explore teacher perceptions.

Although not wanting to compromise the results of her research in anyway, I personally believe the greatest influence on teacher perception of the benefits of MUVEs is directly related, initially, to the informal linkages the teachers form and the networking they do on MUVEs like Second Life when they first enter, perhaps to play.

For early adopters and subsequent promoters of the benefits of MUVEs for education, I believe, the major initial influence is "other people" within the world and the virtual society they become attached/addicted to. For those teachers who "only work" in virtual worlds, MUVEs can apparently be a very boring place indeed. One sees them nitpicking on the SLED list and other lists, complaining about the technology or lack thereof, or being pedantic about educational theory. They sometimes forget that MUVEs are fun and should be fun … that is the easiest way to learn … something the earliest adopters discovered and why many of them are still there. When I consider some of the "reluctant" educators I meet in Second Life I am reminded of a great quote from the Wizard of "Watchmen" – Alan Moore: " All too often education actually acts as a form of aversion therapy, that what we're really teaching our children is to associate learning with work and to associate work with drudgery so that the remainder of their lives they will possibly never go near a book because they associate books with learning, learning with work and work with drudgery.

"Whereas after a hard day's toil, instead of relaxing with a book they'll be much more likely to sit down in front of an undemanding soap opera because this is obviously teaching

them nothing, so it is not learning, so it is not work, it is not drudgery, so it must be pleasure. And I think that that is the kind of circuitry that we tend to have imprinted on us because of the education process."

My great hope is that MUVEs are never viewed like that – by educators or students. Vimani's classroom is worth visiting for the range of educational tools she uses.

APPENDIX J

Presentation of the Virtual Classroom