The Promotion of User Acceptance and Technology Adoption of MUVEs for Learning in the Workplace: A Social Learning Approach

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work and has not been submitted as an exercise for a degree at this or any other university.

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Abstract

In recent years, corporations have investigated virtual learning technology to offer training programs to an international workforce. Although elearning and virtual communication software have become a common training delivery method, its offer of visual cues and human interaction to ensure a fully engaging experience is limited.

In order to enhance existing eLearning or virtual courses corporations are conducting research in using Multi-User Virtual Environments (hereafter MUVEs). MUVEs provide a rich three-dimensional environment that facilitates human interaction by using avatars as a visual representation of users. Although MUVEs enhance currently used online learning solutions by increasing human interaction and social networking opportunities it does not automatically mean that learning professionals will adopt the new technology in their daily practice. The main factors influencing the adoption and acceptance of technology are the perceived usefulness and perceived ease of use of the technology itself. If a technology is not relevant and useful to learning professionals they would not see the necessity to implement it in their daily practice.

Therefore, this qualitative research study aimed to explore processes and activities designed to positively shift the perceptions of learning professionals towards this medium by designing a virtual learning experience based on Bandura's Social Learning Theory. The virtual learning experience also considered the two primary determinants influencing user acceptance and technology adoption; the perceived usefulness and perceived ease of use as established by Davis (1989). The virtual experience was implemented in Second Life for 9 learning professionals from Xerox's Learning and Development organisation. The virtual experience included 4 activities: (1) an orientation to learn navigation skills, (2) an observational activity to observe video example of existing learning experiences in Second Life, (3) an imitation activity to practiced the observed behaviour in a contextualised environment, and (4) a behaviour modelling activity to use the previous experiences to create ideas how the technology could be used in the daily practice of learning professionals.

During this study 2 questionnaires, 8 hours of voice recordings and 7678 words of text-chat were collected and analysed. The findings demonstrated that the perception of the majority of participants has shifted in favour of MUVEs for learning in the workplace. It also provides a list of considerations for the implementation in MUVEs for learning in the workplace.

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Abbreviations

MUVE - Multi-User Virtual Environment

US – United States of America

UK – United Kingdom

1 Introduction

The globalization of business has led corporations to investigate new ways of providing learning events to a workforce located in different geographical locations. A variety of social collaboration, i.e. Wikis, discussion forums or blogs, and virtual communication software, i.e. Microsoft LiveMeeting or Adobe Connect Pro, enable corporations to conduct learning experiences virtually. Although virtual training delivery allows more flexibility with lower financial investments it is difficult to support similar opportunities for human interaction and group dynamics as in face-to-face learning event.

Fully engaging learners in virtual training programs is limited due to a "lack of visual cues and multi-sensory interaction," (Fortney, 2007, p. 83). Although visual interaction is available by using webcams the learner becomes isolated from the group. Not all learners may have a webcam or may feel uncomfortable in being exposed video stream. Thus, they are only connected to the group through a conference call facility. While in an eLearning courses the learner has no connection to other learners at all.

In the attempt to explore new ways to enhance existing eLearning or virtual courses corporations are exploring Multi-User Virtual Environments (hereafter MUVEs). MUVEs, also called virtual worlds, provide a rich three-dimensional (hereafter 3D) environment that creates representation of the real world (Walker, 2009). Virtual worlds facilitate interaction with others and the environment itself by using avatars, a visual representation of the user. Virtual worlds are "a globally shared playground and workspace," (Messinger et al., 2009, p. 204) which still provide the accessibility independent of time and location but cold overcome the limitations of eLearning or virtual courses (Childress & Braswell, 2006).

Although MUVEs enhance currently used online learning solutions by increasing human interaction and social networking opportunities it does not automatically mean that learning professionals will adopt the new technology in their daily practice. Learning professionals are not only required to learn how to use the virtual environment but they also need to accept it and understand its benefits to their immediate professional context. The acceptance and adoption of technology innovations involve changes in the daily practice of learning professionals as well as in their educational philosophies and approaches (Sugar et al., 2004). The study focused on exploring the user acceptance and technology adoption of MUVEs for learning in the workplace. The following sections provide more detailed information about

the purpose of this study, the research questions, the MUVE used during this study and an overview of the findings.

1.1 The Purpose Statement

The purpose of this qualitative research study was to explore learning professionals' acceptance and technology adoption of MUVEs for learning in the workplace. The study was using a case study design to explore the shift of the perception of learning professionals by designing a virtual learning experience based on Bandura's Social Learning Theory. The virtual learning experience also considered the two primary determinants that influence user acceptance and technology adoption perceived usefulness and perceived ease of use as established by Davis (1989). Hence, the study aspired to answer the following research questions:

1. How effective is an experience in a virtual world designed based on Bandura's Social Learning Theory in shifting learning professionals' perception of MUVEs for learning in the workplace?
2. What are their main considerations of adopting MUVEs in their daily practice based on the virtual learning experience?

1.2 The Present Study

The virtual experience designed to explore the shift of learning professionals' perception of MUVEs for learning in the workplace included four activities. First, an orientation was created to train participants in navigating Second Life, the MUVE used during this study. Second, an observational activity demonstrated two example of how other organisations use Second Life for learning. Third, an imitation activity contextualised one of the examples to the participants work context and allowed them to practice the observed skills and behaviours. Lastly, a behaviour modelling activity provided an opportunity to generate ideas of how Second Life could be applied to the participants' daily practice.

This study was implemented with 9 learning professionals from Xerox's Learning and Development organisation. Due to the relatively limited number of participant the findings of this study should be viewed critically and need to be extended to a larger community of learning professionals across a variety of organisations to solidify the results. The perception of all 9 participants was examined prior to the activities by using an online questionnaire. The virtual learning experience was run over a period of 5 hours equally spread over the curse of

two days. It was run twice whereby two groups were observed and individual interviews were conducted afterwards in order to explore their shift in perception of adopting MUVEs for learning in the workplace.

1.3 The Multi-User Virtual Environment

The virtual experience needed to demonstrate the usefulness to the participants' daily job. Therefore, Linden Lab's Second Life, which was launched in 2003 (Linden Research, Inc., 2009), was selected due to its flexibility to create a learning environment tailored to the participants' professional context. It allowed its users to create a free user account and offered an extensive support system for educators. Second Life was already used by a variety of educational institutions and organisations; hence, it provided multiple example of how the environment could be applied to different subject matter. The Xerox Corporation already had a presence in Second Life and the Xerox Innovation Island was available to the researcher for this study. Participants would also have the opportunity to use it in their daily practice immediately.

1.4 Findings Overview

The data collected during this study included 2 questionnaires, 8 hours of voice recordings and 7678 words of text-chat. The findings revealed a shift in perception of MUVEs for learning in the workplace for the majority of the participants. It also produced six main considerations for implementing MUVEs for learning in the workplace. The findings demonstrated that although the learning professionals would consider using Second Life for future training programs, they were concerned about the technical skills of their learners, the control mechanisms of Second Life and the availability of equipment with required technical components.

1.5 Thesis Roadmap

The present study starts with the review of the literature related to the purpose outlined in 1.2. It is followed by the description of the design of the artefact informed by the literature implications. The methodology chapter provides details on the implementation of the study and the framework for the analysis of the data collected followed by the presentation of the data analysis and findings. It concludes with a discussion of the findings compared to the literature and a conclusion including limitations of the study as well as recommendations for future research.

2 Literature Review

The purpose of this literature review is to discuss existing theoretical frameworks and approaches for the promotion of user acceptance and technology adoption of MUVEs for learning in workplaces. In order to build a theoretical foundation for the present study the author starts with an analysis of the literature discussing the user acceptance and technology adoption theories. She continues with exploring the affordances and constrains of MUVEs including the discussion of Bandura's (1977) Social Learning Theory and its application to learning in MUVEs.

2.1 Methodology

The literature review was mainly supported by online journals accessed through Google scholar and online resources available at the library at Trinity College Dublin. Books, articles and dissertations also provided valuable material that contributed to this analysis of existing literature. The main search terms used were virtual worlds, virtual environments, learning in virtual worlds, workplaces in virtual worlds, learning in workplaces, corporate learning environments, user acceptance, technology adoption, technology acceptance, social learning theories.

2.2 User Acceptance and Technology Adoption

An innovative technology does not guarantee its successful integration in the daily practice of learning professionals in the workplace. So what factors effect learning professionals' decision to adopt a technology and integrate it into their daily work life? Extensive research has been conducted to explore the determinants of technology adoption amongst different user groups including learning professionals from a variety of backgrounds. Thus, this section seeks to identify the factors that influence users' decision to adopt technology with a particular focus on learning professionals in the workplace. Therefore, it firstly explores Rogers' (2003) theory of the diffusion of innovation followed by Davis et al.'s (1989) Technology Acceptance Model.

2.2.1 The Theory of the Diffusion of Innovations

The theory of Diffusion of Innovations, developed by Rogers in 1995, offers a theoretical framework for the analysis of technology adoption patterns amongst users. Rogers' (2003) approach focuses on the social process rather than on the technical elements and it tries to

explain the determinants that influence users' decision to adopt innovations. He defines innovations as an idea, practice or object which the individual perceives as "new", and diffusion as a "special type of communication in which the messages are about a new idea" (p.11) which is distributed over time amongst the members of a social system. Communication and social system are, besides the innovation itself and time, the main elements of the diffusion of innovations. He suggests that the majority of individuals do not evaluate an innovation based on scientific research but on the opinion of peers that have adopted the innovation. These peers function as role models whose innovation behaviour will likely be imitated by other members in their system (Rogers, 2003).

According to Rogers the structure of a social system provides guidelines and norms that form behaviour patterns for its members. Consequently, the norms and beliefs of learning professionals need to be understood as they play a critical part in the successful adoption of technology (Sugar et al., 2004). Learning professionals are interested in the impact the use of "new" technology has on their learners (Higgins & Moseley, 2001). Therefore, they would be more open to adopt a technology that has been used by other learning professionals as they share similar beliefs and norms, and thus, they can provide a valuable assessment of the impact for learners.

Not only does the adoption of technology have an impact on learners but also on learning professionals themselves. Rogers argues that the adoption and rejection of technology cause changes for the individual and/or the social system which influence the diffusion process. Therefore, the impact the adoption or rejection has on both, learning professionals and learners, needs to be considered by learning professionals during the adoption process.

Nevertheless, there are always individual that adopt technology quicker than others without concerns about possible changes for themselves. Rogers traces this behaviour back to the individual's level of innovativeness and differentiates the members of a social system into five categories: (1) Innovators, (2) Early Adopters, (3) Early Majority, (4) Late Majority, and (5) Laggards. The individuals of each category share common characteristics which influence the rate of their adoption, meaning the pace in which each member of a social system adopts an innovation (Rogers, 2003). According to Rogers not all members adopt the technology at once. Therefore, he illustrates in Figure 1-1 the adoption of an innovation as an overtime process in which each adopter category accepts the innovation at a different time.

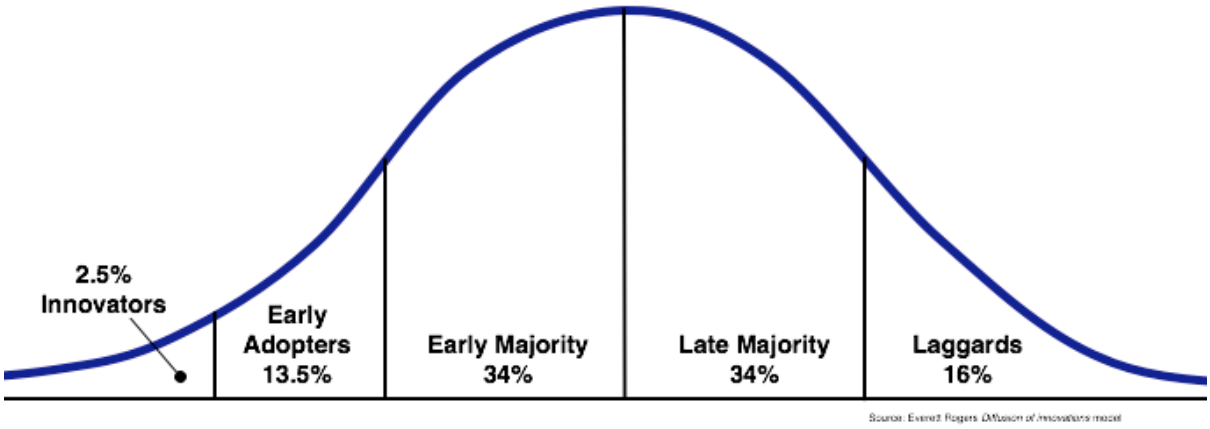

Figure 1 - 1: Rogers' (2003) Diffusion of Innovations model

According to Rogers' (2003) Innovators category, which only accounts for 2.5% of the members of a social system, are able to comprehend and utilize complex technical knowledge and do not fear risky decisions. They are adventurous and usually not as integrated into a social system as Early Adopters are. Early Adopters are seen as role models amongst the members of a social system. Their opinion is highly respected by their peers and thus, they lead the majority towards the adoption of innovations. Their attitude is more in favour towards change and their sense of rationality allows them to consider the usefulness of the technology compared with the desired end result. With their positive attitude towards science and change in combination with their respected social status and participation in the social system Early Adopters function as a connection between Innovators and the majority of the members of the social system.

Rogers equally divides the majority into two categories, the Early Majority and the Late Majority. Both categories together make up two thirds of all members of a social system. The Early Majority adopts innovations right before the average members and rather follows the adoption of an innovation intentionally and cautious than leading it, whereas, the Late Majority is more motivated by peer pressure and economic necessity. Rogers defines their view of innovations as more sceptical and cautious. Laggards are the last group to adopt innovations due to their traditional views and values.

Rogers' categorization provides the basis for understanding the human component and their motivation for adopting innovations. It enables the researcher of the present study to analyse the social system and its current adoption process of MUVEs in learning. Consequently, the current adoption process in the workplace used in this study determines which participants are needed to drive the adoption of MUVEs for learning in the workplace.

However, not only the social process plays a vital role in the adoption process but also the technical component influences individuals' adoption decision. Therefore, the next section discusses Davis' (1989) Technology Acceptance Model to identify technology factors and considerations that affects learning professionals' adoption of technology as a learning environment.

2.2.2 Technology Acceptance Model

The Technology Acceptance Model was developed by Davis (1989) based on the Theory of Reasoned Action by Fishbein and Ajzen (1975). Davis used the generic components of Theory of Reasoned Action and applied it to the user acceptance of computer technology (Igbaria et al., 1997). Davis et al. (1989) assume, similar to Fishbein and Ajzen (1975), that the behaviour intention of users determines the use of computer technology but, in contrast to the Theory of Reasoned Action, they believe that the behaviour intention is influenced by the users' attitude towards the usage and perceived usefulness of a system.

Davis (1989) has extended the Theory of Reasoned Action by replacing its attitudinal determinants with perceived usefulness and perceived ease of use in order to predict system usage satisfactory and intentions (Igbaria et al., 1997). However, the Technology Acceptance Model excludes the Subjective Norm which played a role in the Theory of Reasoned Action and represents the norms and beliefs in Rogers (2003) social system. Davis et al. (1989) justify their decision by acknowledging Fishbein & Ajzen's (1975) position that it is "difficult to disentangle direct effects of SN [Subjective Norm] on BI [Behaviour Intent] from indirect effects via A [Attitude]," (p. 986).

Davis (1989) focuses on perceived usefulness and perceived ease of use as the two primary determinants of system usage instead of the external factors influencing these determinants. He defines perceived usefulness as "the degree to which a person believe that using a particular system would enhance his or her job performance," (p. 320), whereas perceived ease of use "refers to the degree to which a person believes that using a particular system would be free of effort," (Davis, 1989, p. 320). Figure 1-2 demonstrates that perceived ease of use has a direct influence on perceived usefulness and both determine the users' attitude towards using a system.

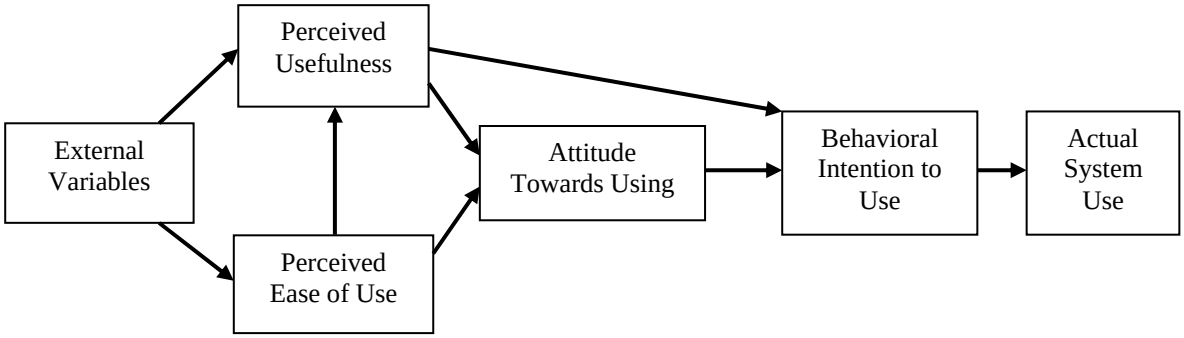

Figure 1 - 2: Technology Acceptance Model (Davis et al., 1989)

Goodwin (1987) agrees that the usability of a system determines its effective usage, meaning that if a system is useful but not easy to use the usefulness does not automatically indicate that learning professionals would adopt the system. Adam et al. (1992) confirm that perceived usefulness and perceived ease of use are the primary determinants of system use. Rogers (2003) and Mathieson (1991) have reported similar findings.

Igbaria et al. (1997) declares that exogenous factors, meaning intra- and extra-organisational factors, also influence perceived usefulness and perceived ease of use. They list internal support, internal training and management support as intra-organizational and external support as well as external training as extra-organisational factors. However, if management support as an intra-organisational factor is not provided then other organizational factors will not even play a role. To provide either internal or external training the management of an organisation needs to support the technology adoption decision. Although Igbara et al. (1997) claim that the management has a stronger position in small firms, without the management support in larger organisation the adoption of any kind of technology is also not possible. The management support is also influenced by external factors such as economic climate or internal factors such as financial situation of the organisation.

Furthermore, learning professionals' educational philosophies and beliefs have a strong effect on a successful technology adoption (Sugar et al., 2004). As Higgins & Moseley (2001) point out, educators are interested in the affects the technology has on their learners. The technical skills and knowledge of learners and the equipment available to both, educators and learners, also impact the perceived ease of use. Research has shown that learning professionals need to be personally convinced of the benefit and the usefulness of a particular technology before using it for instructions (Lam, 2000). The use of technology in learning also brings along changes for both, educators and learners. The educator takes on a facilitating role whereas the

learner becomes more proactive (Sugar et al., 2004). Therefore, educators must be open to a change in their role to achieve a successful technology adoption (Hardy, 1999).

Additionally, learning professionals need to be open-minded to new things and re-evaluate their learning strategies in order to adopt and embrace MUVEs as learning platforms (Smith & Berge, 2009). To understand the advantages and disadvantages of MUVEs as learning environments the next section will explore the affordances and constrains of MUVEs as well as introduce a learning theory that applies to learning within virtual environments.

2.3 Multi-User Virtual Environments (MUVEs)

Multi-User Virtual Environments (MUVEs) are 3D-virtual environments that create a representation of the real world (Walker, 2009). They are often referred to as synthetic, persistent, simulated, virtual or digital worlds, Massively Multiplayer Online Role-Playing Games (MMORPGs) or Metaverses (Gomes de Andrade, 2009) and interactive virtual reality (Dickey, 2005) . Virtual worlds have not just been created for gaming purposes, i.e. World of Warcraft, Aeon Online or Star Trek Online, but also for social networking and educational purposes, i.e. Second Life, Habbo Hotel, ActiveWorlds and there.com (Dickey, 2005; Lee, 2009). The MUVE Second Life has become popular in recent years and has attracted a large community of educators (Herold, 2009; Mon, 2009). Approximately 300 educational institutions are already present in Second Life (Jones, 2008). However, limited research has been conducted in evaluating MUVEs as learning environments. Therefore, Dickey (2003) suggests that to evaluate MUVEs as learning environments it is relevant to consider Gibson's (1977) Affordance Theory.

The main focus of the Affordance Theory (Gibson, 1977) is the correlation between the perceiver (human) and the perceived (the environment) and its influence on the construction of particular behaviour. Affordances and constraints of MUVEs as a learning environment impact perception of learning professionals and thus, need to be understood to successfully support the adoption of MUVEs for learning in the workplace.

MUVEs generally share a set of common features. According to Book (2004) these commonalities are (1) a space where many users can participate with each other, (2) a graphical user interface that provides a 3D immersive environment, (3) real time interaction with other users, (4) interactivity with the worlds and its content, (5) persistence as the world exist despite whether a user is logged in or not, and (6) the formation of social groups.

These characteristics afford organisations to use this social collaboration environment for synchronous and asynchronous distance learning programs (Carpenter, 2009; Dickey, 2005; Lim, 2009; Walker, 2009). Therefore, educators from a variety of backgrounds have developed a vast interest in MUVEs for the use in education (Jones, 2008). The virtual environment allows training activities similar to face-to-face environment (Walker, 2009), and encourages engagement and role-playing (Delwiche, 2006).

Another affordance of MUVEs is their persistent nature which enables learners to access the environment synchronous and asynchronous (Carpenter, 2009). This enables learning professionals to provide a learning environment that can be used outside training hours not only to allow group interaction and project work but also to accommodate support for learners on an individual basis.

The constraints of virtual environments in general are mainly of technical nature. Using MUVEs effectively requires high bandwidth and a powerful graphic card (Herold, 2009). If these requirements are not met the system may run slow or not at all which could frustrate learners and influence their motivation and attention. If the equipment uses components that are not specified in the technical requirements of a MUVE, the usage of the environment may be limited or not possible at all.

This constraint has a high impact on the use of MUVEs in corporate settings as it depends on the information technology and financial strategies of an organisation. Consequently, the investment in sufficient information technology requires management support and thus, may impact the adoption of MUVEs as learning environment in workplaces. Although integrating MUVEs in a corporate learning environment requires an initial financial investment (Dickey, 2005) it also replaces the travel and logistic costs for learning professionals and learners.

Besides the geographical separation distance learning approaches also create a “psychological or transactional distance” (Moore, 1983, p. 155) relationship between learners and learning professionals. So, if geographical distance causes psychological distance then MUVEs would support these learning approaches. By using avatars, as a visual representation of users, the learners and learning professionals are connected in a virtual geographical location and thus, would also establishes a psychological connection.

2.3.1 Visual Representation of Users

An avatar is a 3D-virtual representation of a user in MUVEs. Gomes de Andrades (2009) defines avatars as "digital human representation, a projection of one's self in the virtual world (into an avatar body) and persistent extension of the correspondent human user, whose behaviours are executed in real-time by a human being," (2009, p. 13). Users can customize their avatars to their personal preferences from body shape, eye and skin colour to clothes and accessories. Avatars connect users with the virtual world and allow them to explore the environment, share experiences with others by using different types of communication such as voice-chat or text-chat.

The use of avatars as a visual representation in a learning environment affords learners and learning professionals to communicate and collaborate with each other using verbal and non-verbal communication. Peters (2004) sees the avatar as a "media carrier" (p. 87) that transfers the learning from the virtual space into the real world. Based on the above explanation of avatars and their function in virtual worlds, users project themselves onto the avatar through its appearance, behaviour and communication style (Gronstedt, 2007; Kellogg, Ellis, & Thomas, 2007; Lim, 2009).

In contrast to the previous discussion the avatar as a visual representation also has its limitations. Although the learner can move the avatar forward, backwards, sideways or even upwards (flying) the learner cannot control individual limbs (Papargyris & Poulymenakou, 2009). Furthermore, the customization of the avatar is controlled by the learner. Therefore, learners could attend class in form of an animal (Smith & Berge, 2009) or other creatures which could distract others or decrease their attention to the subject that is being taught.

In addition, the anonymity gained by using a different name for the avatar can empower introverted learners to feel more comfortable to get involved in the learning activities than they would in face-to-face learning events (Joseph, 2007) by using a different communication style.

The communication style depends on the personal preferences of the user but also relies on the communication tools available in the virtual environment. As communication is a vital part in the learning process the next section analyses the affordances and constraints of the communication tools provided by virtual worlds and their influence on learning activities.

2.3.2 Communication

The previous section focused on the visual representation of learners, whereas this section concentrates on the communication channels available to learners and how these channels influence the learning process.

One of the affordances of using MUVEs in education is the availability of verbal and non-verbal communication tools. Non-verbal communication is displayed through the avatars appearance, posture and movement and non-verbal sound effects (Robbins, 2007). These support learning professionals in indentifying the learner's mood or attitude. However, caution should be taken by interpreting non-verbal communication within virtual worlds as technical knowledge and skills of the learner need to be considered. The movement or posture a learner displays in the virtual world may not be intended as he/she may not know how to change the posture or move differently. To overcome this constraint learning professionals should use verbal communication channels to clarify the intentions of the learner.

The variety of verbal communication channels available in MUVEs supports collaboration and discourse amongst learners (Dickey, 2003). MUVEs offer text-chat, private instant messaging, group instant messaging, player-to-player system emails, group announcements and voice chats as verbal communication channels (Robbins, 2007). Robbins (2007) affirms that not all virtual environments offer all communication channels but support at least one non-verbal and one verbal method. The importance for learning activities in using the communication channels available lies in the real-time occurrence of some of those methods.

The communication tools available in MUVEs combined with the visual element encourages collaboration and supports social learning theories (Smith & Berge, 2009). The next chapter will explore Bandura's (1977) Social Learning Theory in the light of a learning process that supports learning in MUVEs.

2.3.3 Bandura's Social Learning Theory

Bandura's (1977) Social Learning Theory is based on the concept that people learn new behaviour by observing others and model the observed behaviour. The main components of his theory are observational learning, imitation and behaviour modelling. Bandura (1977) defines that during observational learning the learner is exposed to "symbolic representations of the modelled activities" (p. 24) which will serve as a guidance for suitable performance.

However, he clarifies that people can only learn from observation if they intent to learn a new behaviour. Once the intention is present several factors influence the behaviour. For example, the model that will be observed by the learner and what behaviour and information will be retained.

Similar to Rogers' (2003) theory of Diffusion of Innovation, the position of the model in a social system and the interpersonal relationship determine which models a learner will observe. The learner's situational requirements and past experience influence which elements will be selected from the observation and how they will be interpreted (Bandura, 1977, 1986). So the learner must become an observer before adopting the displayed or observed behaviours or actions.

Bandura (1977) also indicates the necessity to retain the observed information or behaviour. Thus, he establishes that visual and audio representation of the behaviour is necessary during observational learning. He suggests that a varied and ample symbolic representation such as television, film or other media is used to guide the leaner more effectively towards imitating the observed behaviour.

The learner would only imitate the perceived positive and beneficial behaviour and practices those until he/she becomes more proficient (Bandura, 1977; Smith & Berge, 2009). Bandura (1977, 1986) sees the imitation of behaviour highly influenced by the leaner's skills. If a learner possesses the required skills it is easier to produce new behaviour. However, if the learner lacks the required skills the reproduction of the behaviour will be faulty (Bandura, 1977).

Once the learner feels comfortable with the adopted behaviours and actions he/she will start modelling the behaviour. The learner acts according to the behaviours which he/she perceived as positive experiences during his or her observations and imitations (Foster, 2006). The behaviour modelling is the result from the inspiration and motivation learners have received through the actions and behaviours of others.

Smith & Berge (2009) examined the applicability of Bandura's (1977) Social Learning Theory in the MUVE Second Life. They conclude that Bandura's Social Learning Theory can be seen in action in Second Life as its three main components: observational learning, imitation and behaviour modelling manifest themselves in the virtual environment. The social

environment in MUVEs allows for learning from each other and thus, provides a variety of opportunities for interaction which is a main component of observational learning.

MUVEs provide a rich environment for learners to not only learn from others but also to use experiment to an extent that is not possible in the real world (Cooper, 2007; Herold, 2009; Lim, 2009; Walker, 2009). To fully comprehend the possibilities in MUVEs learning professionals need to be able to observe other educators in action. For example, the MUVE Second Life accommodates a variety of events, classes or conferences in-world that can be freely joined by educators. Thus, it supplies a platform with a variety of observational opportunities that help educators to start their learning process according to Bandura's Social Learning Theory.

2.4 Summary

The previous investigation identified that the adoption of MUVEs as learning environments in the workplace depends on a variety of determinants. First, the management of an organisation needs to support the technology adoption decision of MUVEs for learning in the workplace. It highly depends on information technology and thus, it may impose financial investments for the organisation.

Furthermore, the evaluation of MUVEs as learning environment of respected members in the social system of learning professionals have a strong influence on the user acceptance and technology adoption. Learning professionals also need to see the usefulness of MUVEs in their work context as well as experience the ease of use of the system as it has an impact on themselves and their learners.

In order to promote the adoption of MUVEs as learning environments in the workplace the next section will use the literature implications to build a virtual experience based on a combination of Bandura's Social Learning Theory and Davis' perceived usefulness and perceived ease of use.

3 Design Chapter

The design chapter illustrates the design of the virtual experience in Second Life which was used to explore learning professionals' acceptance and adoption of MUVEs for learning in the workplace. The chapter begins with a discussion of the implications from the literature review. It continues with a description of the artefact and concludes with a logistic section which explains circumstances that influenced the implementation of the experience and thus, the design.

3.1 Literature Implications

The purpose of the artefact was to facilitate a shift in the perception of learning professionals of MUVEs for learning in the workplace. In order to achieve this purpose the literature provided a variety of implications that informed the design of the artefact. In order to capture these implications a design table was created (see Table 3-1). The paragraphs following the table discuss each row of the design table in more detail.

Table 3 - 1: Design table

Element from Literature	**Implication** for Design	**Implementation** in Artefact
Abstract →		→ Concrete
The perceived usefulness and perceived ease of use determine the attitude towards using a system (Davis et al., 1989) and are the two primary determines of system use (Adams et al., 1992; Davis et al., 1989; Goodwin, 1987; Mathieson, 1991; Rogers, 2003) Igbaria et al. (1997) declares that exogenous factors, meaning intra- and extra-organisational factors, also influence perceived usefulness and	It implies that learning professionals will more likely adopt the technology based on the level of technical skills needed to navigate the system. If they find the system is navigation easy to use it will increase their attitude towards using it in their daily practice. It implies that training should be provided as it influences the perceived ease of use of learners.	An orientation will be designed to teach participants playfully the basic navigations involving useful features of the MUVE to demonstrate their easy use. Also provide a user guide to support participants in installing the software.

perceived ease of use. They list internal support, internal training and management support as intra-organizational and external support as well as external training as extra-organisational factors.		
"Observational learning is hindered by deficit, and increased by improvements, in its component function," (Bandura, 1977, p. 29)	If the learner does not have the skills necessary for imitating the observed behaviour learning will be hindered.	Orientation to learn the necessary skills for navigating SL
Most individuals evaluate an innovation not on the basis of scientific research by experts but through the subjective evaluation of their near peers who have adopted the innovation. (Rogers, 2003, p. 36) Results suggest a significant and prominent core influence path from job relevance to perceived usefulness and then to user acceptance (Hu, Clark, & Ma, 2003)	The need for authentic application of the technology by others in the field of expertise (i.e. IBM use of virtual worlds for learning and development). An educator is likely to consider a technology to be useful when it is relevant to the job. Therefore, example should also show the application in a training environment.	Display videos of learning experiences designed and used by other IT companies or for training purposes.
These near peers serve as role models whose innovation behaviour tends to be imitated by others in their systems (Rogers, 2003, p. 36)	If peers that are part of the community and who influence the opinion of others demonstrate the benefits of the technology the group will be more open to accept and adopt the technology.	Design an activity based on one of the examples to demonstrate it can be used in the participants' context as well.
"People cannot be much influenced by observation of modelled behaviour if they do not remember it." (Bandura, 1977, p. 25) "Observational learning relies mainly upon two representational systems –	The observation is the first step. In order for people to learn most effectively the observation needs to include a visual and audio representation of the behaviour to be learned.	Using videos with visual and audio information.

imaginal and verbal," (Bandura, 1977, p. 25) "Another influential source of social learning is the abundant and varied symbolic modelling provided by television, films and other media,"(Bandura, 1977, p. 39)		
According to Bandura, imitation involves the actual reproduction of observed motor activities. In Second Life this could be as basic as learning how to navigate an avatar so as to not fall off a wall or into a body of water. (Smith & Berge, 2009, p. 440)		Imitating the IBM examples with making the avatar run through a digital document from the computer to the printer to understand the process.
"By observing a model of the desired behaviour, an individual forms an idea of how response components must be combined and sequenced to produce the new behaviour," " new patterns of behaviour are created by organising responses into certain patterns and sequences," (Bandura, 1977, p. 35)	Once the learner has successfully imitated the observed action they will be able to use the observed and imitated actions and create new, their own, actions.	Include a chat round where participants can use the video examples and the printer exercise to generate new ideas for their own daily practice.

Davis et al. (1989) determined that the perceived ease of use and the perceived usefulness of a system impact the attitude towards using this system. Therefore, they are two primary determinants of system use and thus, user acceptance (Adams et al., 1992; Davis et al., 1989; Goodwin, 1987; Mathieson, 1991; Rogers, 2003). Accordingly, learning professionals would more likely adopt a technology that requires less technical skills to navigate the system. If they would perceive a system's navigation as easy it would increase their attitude towards

using it in their daily practice. Their attitude is also influenced by how useful and relevant they perceive a system. The implications suggested two important considerations.

First, the perceived ease of use in combination with Bandura's (1977) conclusion that "observational learning is hindered by deficit, and increased by improvements, in its component function," (Bandura, 1977, p. 29) implied that the learner would need to acquire necessary skills to imitate the observed behaviour. In the case of technology adoption the learner should possess sufficient technical skills to be able to imitate the observed behaviour. Previous research identified training as a factor that highly influences the perceived ease of use of a system (Davis et al., 1989; Igbaria et al., 1997; Redmann & Kotrlik, 2008). Therefore, an initial training needed to be organised to provide participants with the necessary skills to navigate Second Life.

Secondly, the perceived usefulness of MUVEs for learning in the workplace also depends on how relevant learning professionals perceive a system for their daily job. Hu et al. (2003) confirmed that an educator is likely to consider a technology to be useful when it is relevant to their job. Hence, the artefact needed to demonstrate how MUVEs benefit learning in the workplace, especially in the specific work context of the participants. In order for learning professionals to accept these benefits it was also important to understand their attitude and characteristics as adopters of new technology.

Thus, Rogers' (2003) theory of Diffusion of Innovations and its characteristics of the five categories of adopters offered a theoretical basis for understanding learning professionals' adoption or rejection of new technology. He reported that "most individuals evaluate an innovation not on the basis of scientific research by experts but through the subjective evaluation of their near peers who have adopted the innovation," (p. 36). Consequently, the artefact required examples of how other organisations have used MUVEs for learning.

Hu et al. (2003) suggested that the job relevance of using a system leads to perceived usefulness and hence, to user acceptance. Learning professionals would be more open to accept and adopt MUVEs for learning if their peers, meaning learning professionals of other organisations, demonstrated the benefits for learning and professional development (Rogers, 2003).

Bandura (1977) believed that film or other media should be used as it provides a variety of symbolic representation. This improves the likelihood of the user remembering what was

observed and therefore, videos were used in the design of the artefact. The symbolic representation supports the learner reproducing observed motor activities during the imitation which can be done through the navigation of an avatar (Smith & Berge, 2009). The artefact included an observational and imitation activity to allow the participants to apply and practice their observations.

Bandura established that once the learner has successfully imitated the observed behaviour that he/she will create new patterns of behaviour. The observation in combination with the imitation enables the learner to develop actions or behaviours on their own. In addition to the observational and imitation activities a third activity was necessary to allow the participants to generate ideas on how MUVEs can be used in their daily practice.

After discussing the implications from the literature the next section will describe the artefact that has been designed to explore the shift in learning professionals' perception of MUVEs for learning in the workplace.

3.2 The Artefact

The artefact was a virtual learning experience designed based on the implications from the literature as previously discussed. From the literature implications four activities for the virtual experience were identified: (1) orientation, (2) observational activity, (3) imitation activity, and (4) behaviour modelling activity. The activities were sequenced in a logical order according to the literature implications (see Figure 3-1) and were held over a period of two days.

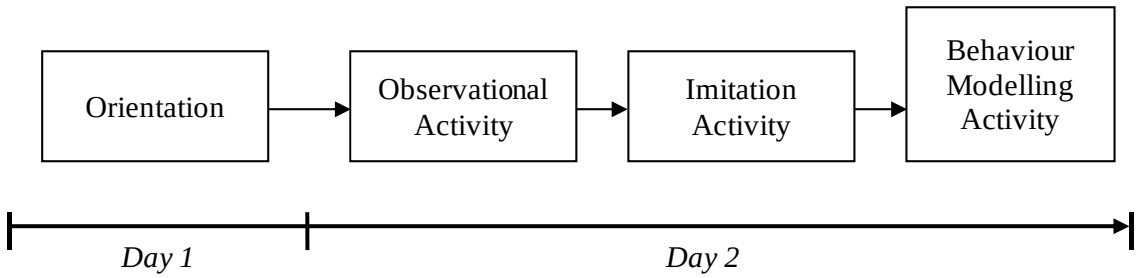

Figure 3-1: Activity Sequence of Artefact

The following sections describe each of the four activities in chronological order as demonstrated in Figure 3-1 and include figures for visual illustration. The last section explains logistical considerations and their impact on the design.

3.2.1 Orientation

The orientation was designed to provide participants with basic navigation skills to use Second Life. During the orientation they were also introduced to the Xerox Innovation Island, one of the organisation's islands in Second Life, and its available resources.

Prior to the orientation all participant received supporting material to prepare their computers and themselves for their virtual experience in Second Life. This supporting material included a simulation created by the researcher to provide visual instructions on how to install Second Life on their computers (see http://xerox.acrobat.com/secondlifeinstallation/) and access to a web portal created by Xerox, the organisation used for this study. This web portal provided interesting resources for Second Life usage and instructions on how to gain access through the organisation's internal procedures.

The starting point of the orientation was a pre-existing meeting room on the Xerox Innovation Island (see Figure 3-2). It was chosen to start in a setting that was familiar to the participants from the real-world. All participants received a Second Life Uniform Resource Locator (SLURL) and instructions on how to use the SLURL to teleport to the starting location in Second Life. The SLURL was sent as a link via email to provide an exact location within Second Life.

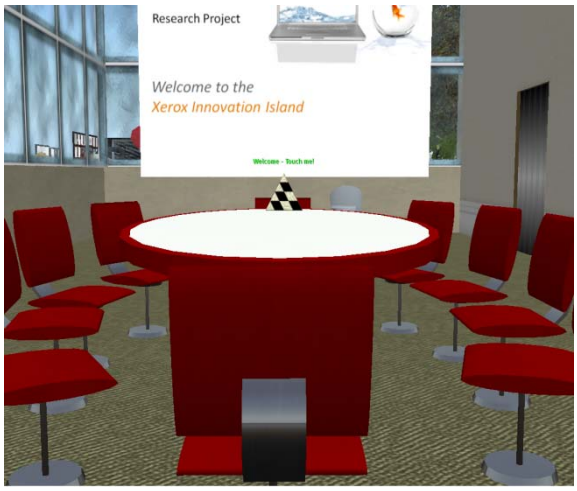

Figure 3-2: Meeting Room

In the meeting room the researcher introduced participants to Second Life and basic features that were needed for this study, i.e. environmental settings and sitting, as well as communication methods. Before continuing outside the meeting room each participant was instructed to take a notecard from a notecard giver in the middle of the table to obtain further information about the island.

The participants completed ten tasks focusing on particular skill and feature as a main part of the orientation. A list of all tasks including the skills addressed, the functionality used and the intention can be reviewed in Appendix I. However, during the first run of the virtual experience all participants identified task number nine (see Appendix I) as particularly

difficult as it required advanced orientation and navigation skills. Thus, it was eliminated for the second run.

The tasks started with basic skills like walking and increased in difficulty. Participants needed to use skills acquired from previous tasks to complete the next. Furthermore, each task utilized pre-existing resources and objects on the Xerox Innovation Island. The information boards and the instructional design of the orientation were created by the researcher.

3.2.2 Observational activity

The observational activity was designed to provide participants with the opportunity to observe examples of how other organisations were using Second Life for learning. In order to provide participants with a geographical orientation of the three activities of day two, a THiNC book was purchased in-world and modified by the researcher (see Figure 3-3). THiNC book was created by Toneless Tomba (avatar name) including full page animation and sounds (Tomba, 2005). The pages of the book could be modified after purchase by adding in-world photographs or textures (Girvan, 2008).

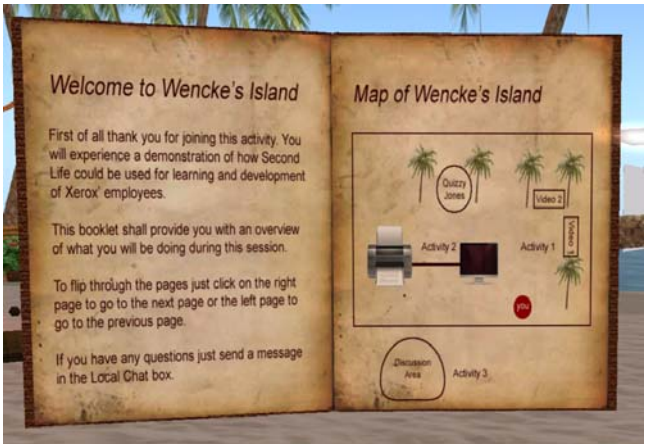

Figure 3-3: Introduction Book

The book included a map of the location of each activity and a brief description. The participants were able to change pages by touching a page. The book served as a central reference point for the participants during the virtual experience on day two.

During the observational activity two examples were chosen in video-format for more effective visual and verbal representation as suggested by Bandura (1977). Video 1 demonstrated how a hospital used Second Life to simulate situations in a daily routine of paramedics as an example of scenario based learning using virtual worlds. To view video 1 the integration of web resources in Second Life was used. To play the video the participants

clicked a link on an instruction board (see Figure 3-4) which opened a YouTube video in a web browser on their own computer screen.

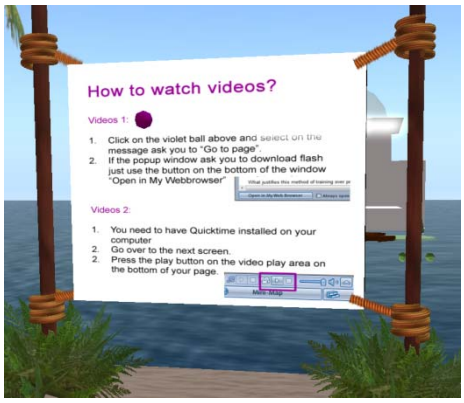

Figure 3-4: Instruction on how to watch videos

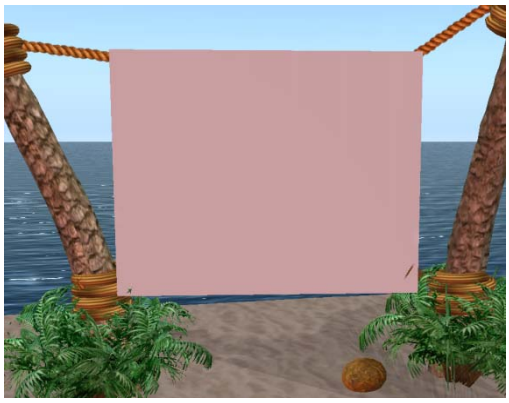

Figure 3-5: Instruction on how to watch videos

Video 2 illustrated a technical training event designed by IBM for their employees to learn about a new technology. Video 2 used the option of integrating YouTube videos in Second Life. It was displayed on a movie screen inside Second Life (see Figure 3-5).

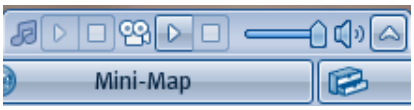

Figure 3-6: Media play bar

For video 2 the participants were instructed to use a media play bar on the bottom of their Second Life window (see Figure 3-6). As video 2 occasionally did not play during the testing phase, it was necessary to build a contingency into the scenery. If video 2 did not play a sign advised participants click on a coconut below the movie screen which triggered a web browser to open. The participant could then watch the video via the internet.

The movie screen, the instruction board including the ropes and poles, and the contingency plan were created by the researchers. The palm trees were purchased in-world.

Once the participants finished watching the videos they had two options to proceed: (1) to go back to the introduction book and read about the imitation activity or (2) walk over to the start of the imitation activity which was located right next to the video area.

3.2.3 Imitation Activity

For the imitation activity the IBM example was conceptualized to Xerox's core business domain in the printing industry. The activity was designed to demonstrate the general printing process used in monochrome laser printers developed and produced by Xerox. The printing

process, also called Xerography, was combined with the document transfer process from a computer through a printer cable to the printer.

To fully engage the learner in the activities and to interact with the environment tasks were given to the participants either through notecards received by touching an object or from an instruction board.

Figure 3-7: Instructions for the Imitation Activity and computer

Figure 3-8: Print Data Package

The first part of the activity was to enter the printer cable by using the keyboard to elevate up to the computer screen and to press the print button (see Figure 3-7). At the entrance to the printer cable each participant needed to retrieve a print data package to be delivered to the printer (see Figure 3-8). Two figures, called Liesel and Walter, were placed along the printer cable to provide guidance and to add a fun element to the activity (see Figure 3-9).

Figure 3-9: Figure 1 in Printer Cable

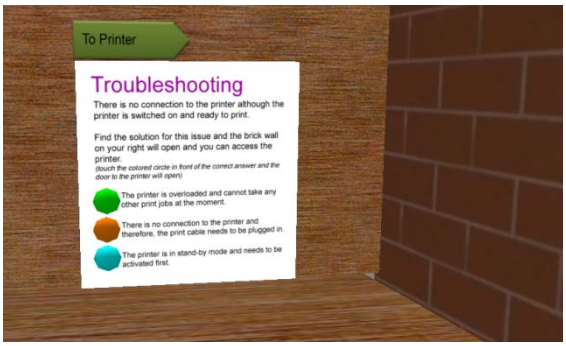

Figure 3-10: Printer Troubleshooting Exercise

At the end of the printer cable, the participants were unable to enter the printer due to a connection issue with the printer. Liesel, the second figure in the cable, and an instruction board (see Figure 3-10) provided information about the circumstances of the printer. Once the correct solution was selected the brick wall to the printer opened.

At the entrance of the printer the participants were instructed to drop the print data package into the Data Transmission Box to simulate the data transfer (see Figure 3-11).

Figure 3-11: Data Transmission Box

After the data package was delivered the participant continued up the stairs to the print engine. Inside the print engine (see Figure 3-12), notecards were provided for each step of the printing process. Teleporting links were included in particular notecards to support the participants in navigating in narrow spaces. The notecards also indicated which parts of the print engine could be touched to start an animation. Animations such as a rotating drum (see Figure 3-12 for the turquoise drum) create a more engaging and interactive experience for the participant (Bricken & Byrne, 1994).

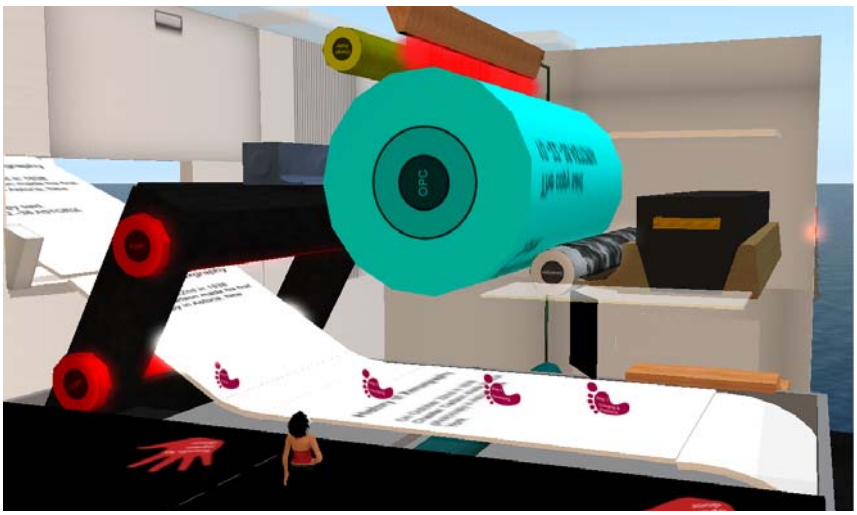

Figure 3-12: Print Engine

The final aim was to reach the output tray where the participants could see the document completely printed with the same text that was written on the computer screen.

From the output tray the participants teleported to the quiz which was located next to the printer. The quiz was included by the researcher to demonstrate how knowledge can be tested in fun and rewarding way within virtual worlds. Therefore, a beach hut besides the printer was setup with a colourful surf board, both purchased on XstreetSL (https://xstreetsl.com/).

The quiz was bought as a trivia quiz and the appearance was by using the surf board to suit the beach hut (see Figure 3-13). The questions were adjusted according to the information included in the notecards within the print engine. Only the researcher could start the quiz and trigger new questions. Furthermore, the quiz used a reward system and therefore, it was a group challenge as the fastest answer received one Linden Dollar (the Second Life currency). The questions were provided in the local chat channel which was also used by the participants to answer.

The beach hut also provided participants with the opportunity to test a hammock, books and other small components to keep them occupied while they were waiting for the other participants. At the entrance of the beach hut another THiNC book was placed holding instructions on how to answer the quiz.

All components of the imitation activity were created by the researcher except for the beach hut, the surf board and the quiz.

Figure 3-13: Knowledge Quiz

3.2.4 Behaviour Modelling Activity

The purpose of this activity was to use the positive experiences from the observed and imitated behaviours to generate new ideas and behaviour of how to use MUVEs in the

participants' daily practice. The activity was conducted in a pre-existing facility on the Xerox Innovation Island (see Figure 3-14) which was created by Dekah Mah (avatar name). The facility consisted of five breakout areas that teleported to different sky locations to allow for group discussions without interruptions from other groups.

A THiNC book with instructions was placed at each sky location (see Figure 3-15). The groups were instructed to use the local chat box to generate ideas of how they could use virtual worlds for learning in their work context. A time limit of 5 minutes was set for this activity. Each group was asked to create a notecard using the chat logs from the discussion. The creation of a notecard demonstrated a simple but effective use of the system for learning events.

Figure 3-14: Breakout area on Xerox Innovation Island

Figure 3-15: Platform 2 in sky

A semi-structured discussion about the entire experienced was led by the researcher when the groups descended to the common area, prior to the conclusion of the experience.

3.3 Logistic

The first structure of the artefact included three sessions held on different days, to provide participants enough time to process the experiences and to explore the virtual environment further. Many employees from the Learning and Development organisation in Xerox were interested but could not spare three days of their time. Therefore, the three days were reduced to two days with each including a 2.5 hours session.

3.4 Summary

This chapter described the design of the virtual experience which was informed by the literature underpinning this research study. The next chapter outlines the methodology and research design of the present study.

4 Methodology

The design chapter outlined the structure of the artefact based on the literature implications. This chapter presents the research implementation and design. Therefore, it starts with discussing why a case study design was chosen followed by stating the research questions for this study. It then provides an overview of the ethical considerations for this research project and outlines the data sets collected and the analysis methods for the data sets.

4.1 Research Design Methodology

The present study sought to explore how a designed experience in a virtual world shifts the perception of learning professionals of MUVEs for learning in the workplace. It focuses on a particular group of individuals in a specific environment meaning learning professionals in the workplace. This research project addressed an explanatory question (Yin, 2008) and aimed to gain a first-hand understanding of a case (Yin, 2004). It examined an "in-depth exploration of a bounded system (i.e. an activity, event, process, or individuals)," (Creswell, 2007, p. 476). Creswell (2007) defines bounded as a case that is viewed separately "in terms of time, place or physical boundaries," (p. 476).

In this research study the case was represented by a designed experience in a virtual world that was used to explore the shift of perception of learning professionals. Due to the exploratory nature of this study and the specific group of individuals in a particular environment a case study was the most suitable research design. Therefore, the grounded theory was not appropriate as it is used if a "broad theory or explanation of a process," (Creswell, 2007, p. 432) is required. Furthermore, this study did not seek a solution for a particular problem and thus, the action research did not apply either.

In addition, a qualitative research method was used to gain a deeper understanding of the perceived changes in the perception of learning professionals and thus, qualitative data sets such as interviews and group discussions provided a richer source for finding perceived opinions of the individuals. However, quantitative data as part of a questionnaire completed prior to the experience was analysed to understand the participants' perception of and attitude towards MUVEs as corporate learning environments prior to the virtual experience. The analysis of both, quantitative and qualitative data, led to answer the following research questions.

4.2 Research Questions

This exploratory case study examined how the perception of learning professionals of MUVEs for learning in the workplace could be changed through the provision of a virtual world experience. Therefore, it addressed the following research questions:

1. How effective is an experience in a virtual world designed based on Bandura's Social Learning Theory in shifting learning professionals' perception of MUVEs for learning in the workplace?
2. What are their main considerations of adopting MUVEs in their daily practice based on the virtual experience?

These research questions built the basis of the data analysis and were the central focus of this study.

4.3 Procedure

4.3.1 Participants

The participants for this study needed to possess prior knowledge in using virtual learning technology. The prior exposure to virtual learning technology ensured a level of technology proficiency required for navigating Second Life (Richter et al., 2007). It also implied a more open attitude towards virtual learning environments.

As the study was conducted in the Xerox Corporation the participants were chosen from specific group within Xerox's Learning & Development organisation. The group consisted of employees that were trained in virtual learning technology such as Adobe Connect Pro, Adobe Presenter and Adobe Captivate and thus, provided the necessary characteristics for this study. This type of participant selection is also called homogenous sampling (Creswell, 2007).

From the specific group only 9 participants could be selected for this study due to a lack of time. The participants were located in the United States of America (hereafter US), United Kingdom (hereafter UK) and Ireland. The group consisted of 4 female and 5 male participants between 35 and 50 years of age. Six participants were instructors of different subject matters, i.e. leadership and management, sales, technical training. One participant worked as a learning technology specialist who was involved with the roll out of virtual classroom technology in Europe. Another participant was involved in various global learning

projects and one participant supported Learning and Development department in communications and learning strategies.

All participants received an information sheet about the strategy and interests of this study as well as an invitation to the virtual experience. They all returned the signed Consent Forms to the researcher. Furthermore, all communication was distributed via email or phone calls.

The researcher facilitated activities in-world and provided the necessary support structure for the participants before, during and after the experience. The participants' Second Life accounts were setup by an internal team in Xerox and included their real names in the username.

4.3.2 Location

The physical location during the experience was chosen by the participants themselves, i.e. office or home. In Second Life Xerox's Innovation Island was used and was restricted to employees of the company. On the days of the experience participants were provided with teleport links to specific locations on the island. On day one the group met in a meeting room on the island and on day two they met directly at the activities which were located on a floating island on the shores of Xerox's Innovation Island.

4.3.3 Time

The participants were located in different time zones and therefore, the scheduling of the experiences depended on the availability of the participants in their respected time zone.

4.3.4 Pilot

A pilot session was run with four Xerox employees who belonged to different departments. However, three of the employees only tested the imitation activity and provided feedback for adjustments to the activity. The feedback suggested using teleport links within the print engine to simplify the navigation in narrow spaces. It also advised to use the figures in the cable to provide more guidance to participants.

One employee tested the entire experiences. She identified that the second video in the observational activity did not play. Hence, a contingency plan was implemented.

4.4 Ethics

All participants were informed of the researcher's objectives and asked for permission to use their answers in the study. The participants' information sheet is attached as Appendix VI and the consent form as Appendix VII. The participants were also given the option to decline their participation. The use of direct quotes from any of the data sources was confirmed with each participant and thereby, they were also assured full anonymity.

4.5 Researchers bias

The researcher holds an instructor position in the same organisation as the participants but does not have any influence on their performance reviews.

The experience in Second Life was designed, built and organised by the researcher with support from the Xerox research team located in the US. The researcher had little experience in using MUVEs in educational settings but she had experiences in using virtual learning technology such as Adobe Connect Pro. Hence, she understood the benefits of virtual environments for learning.

Furthermore, the researcher is convinced of the usefulness of MUVEs for learning in the workplace. However, she is aware that due to her position in the same organisational team she may be seen as a respected peer amongst the participant and thus, may influence their perception of MUVEs for learning in the workplace.

In addition, all communication and supporting documentation were designed, created and distributed by the researcher. It is also important to mention that the researcher is inexperienced in conducting research.

4.6 Data Collection

In a case study an extensive data collection is necessary to explore the phenomenon studied from a variety of different angles (Creswell, 2007) to understand its full complexity (Yin, 2008) and to support the triangulation of data to ensure the accuracy of the analysis (Cohen, Manion, & Morrison, 2007; Creswell, 2007).

The following subsections explain in more detail the types of data that have been collected during this study and how the data supported the researcher in answering the research questions.

4.6.1 Questionnaires

During this study two questionnaires were sent to the participants. The first questionnaire was sent to all participants a few days prior to the virtual experience to capture their initial perception of MUVEs for learning in the workplace (see Appendix III). The information gained provided the starting point for understanding whether a shift in perception has taken place.

The second questionnaire was sent after the experience and focused only on the attitude of the participants' towards MUVEs for learning in the workplace before and after the experience. It contributed quantitative data due to the use of rating questions. Therefore, it displayed a more conclusive view on the shift in attitude towards MUVEs for learning. The results also supported the researcher in understanding the participants' perception of the usefulness of MUVEs in learning as attitude is a main influential factor of perceived usefulness.

4.6.2 Interviews

After completing the experience a semi-structured interview with each participant was conducted because interviews are "one of the most important sources of case study information," (Yin, 2008, p. 106). Interviews allow for a two-way communication offering the interviewer to pose questions and direct the conversation with asking questions as reaction to the answers given by the interviewee (Holstein & Gubrium, 1995). Therefore, the interviews did not only give the researcher control over the information given by the participants but it also permitted the participants to explain their own experience in more detail (Creswell, 2007) without the influence of the group. The interviews were audio-recorded and then transcribed for data analysis.

4.6.3 Chat logs

During the experience the researcher recorded all text-chat logs. The text-chat only ranged up to 20 meters and therefore, the researcher stayed close to the group to capture all possible text-chat data. Some participants experienced technical issues with the voice-chat in Second Life and hence, a conference call facility was used. However, the conference call for the first group was not recorded due to technical issues but the group was asked to primarily use the text-chat facility to compensate the technical issue.

The second group preferred the voice-chat and did not use the text-chat extensively. Thus, the audio-recordings for the second group were transcribed and used for data analysis. Other text-chat data was provided by the group discussions during the behaviour modelling activity. The participants were asked to record their chats in a notecard and to give it to the researcher afterwards.

4.6.4 Researcher's Observations

The researcher's observations were taken during the experience and were recorded on paper, video- and audio-recordings. During the video-recording of the first group the researcher experienced extensive technical issues which resulted in multiple reboots of the researcher's laptop. Thus, only a limited amount of video-recordings from the first group and none from the second group were possible.

The conference calls used to communicate with the participants during the experience were also recorded and used to support the video-recordings for further observations. However, as no video-recordings for the second group were captured and only a limited amount of text-chat data was available the audio recordings for the second group were transcribed.

4.7 Data Analysis

For the data analysis each data set was prepared and anonymised. All data sets were then read twice and notes were taken to gain a general sense of the data (Creswell, 2007). The analysis of the data was conducted in three phases.

Phase one aimed at establishing the perception of the participants of MUVEs for learning in the workplace before the virtual experience. The analysis of the questionnaire data identified a starting point for the analysis of a shift in perception. Phase two addressed the first research question (see section 4.2). Thereby, the data was first searched for evidence of a shift in perception of learning professionals. Afterwards the data sets were searched for evidence of how their perception was shifted and what influence Bandura's (1977) Social Learning Theory had on the shift. Phase three concentrated on answering the second research question (see section 4.2).

During all phases codes were created and ideas of possible themes were listed. The codes were listed in a spreadsheet according to their source, i.e. chat-log, interview. The spreadsheet also included which participant the codes were taken from to understand whether

it reflected the opinion of one or more participants. Following this process codes were grouped according to their source until general themes emerged in order to view the research question from different angles. To ensure the validity of the data analysis the researcher triangulated the data. The triangulation supported a deeper understanding of the shift in the participants' perception of MUVEs for learning in the workplace.

4.8 Summary

This chapter outlined the methodology of this study and discussed the data analysis tools used. The next chapter will describe the data analysis of each data set in more detail.

5 Data Analysis

The data analysis chapter extends the data analysis section from the previous chapter by describing how each data set was collected, prepared and analysed. It will start with an overview of all data sets collected and continues with a description of each data set.

5.1 Overview of Data

During this study different sets of data were collected in order to explore the research questions from multiple angles as it provided more convincing and accurate findings and conclusions (Yin, 2008). Table 5-1 illustrates the data sources and the amount collected whereas the measure correlates to the data type. The amount of data was listed according to the group it was collected from. The next sections describe in more details how the data was collected, prepared and analysed.

Table 5-1: Overview of data sources and amount

Data Sources	**Amount of data**	
	Group 1	**Group 2**
Questionnaire	5 demographic questions 5 content questions in total - 1 with 2 rating options - 1 with 7 rating options - 1 with 2 rating options - 2 text box option	
Interviews	115.90 minutes	74.36 minutes
Chat Logs	5597 words	2081 words
Researchers Observations		
- *Paper*	442 words	10 487 words (transcription of audio)
- *Audio Recordings*	98.42 minutes	198.48 minutes
- *Videos Recordings*	11 minutes	0 minutes

5.2 Questionnaires

All participants completed a pre-questionnaire to indicate their perception of MUVEs for learning in the workplace prior to the virtual experience. The results from the questionnaire should be viewed critically as questions were not set to mandatory and therefore, not all participants have answered all questions. Furthermore, the answers were not traceable to individuals as the researcher intended to gain a general understanding of the perception. However, she noticed afterwards that tracing the answers back to each individual would have been necessary to ensure validity of the data.

Additionally, the researcher was counted in the total number of participants that completed the pre-questionnaire due to testing. Therefore, the total number showed 10 participants instead of 9. However, the researcher only answered demographic questions and thus, the results from the content questions, which were used to answer the research questions, were only answered by the participants. The demographic information was used to provide detailed information of the participants for the methodology chapter.

After the completion of the pre-questionnaire the researcher noticed that a question about their attitude towards the usefulness of MUVEs for learning in the workplace was not included. The attitude towards the usefulness is a determinant of the perceived usefulness of a technology and thus, important for answering the research questions. Therefore, the researcher sent a second questionnaire after the virtual experience to measure the participants' attitude towards the usefulness of MUVEs for learning in the workplace before and after the virtual experience.

The rating questions of both questionnaires were converted into graphs to visualise the data and the comment (text-box) questions were coded and themed. The findings are presented in the next chapter.

5.3 Interviews

A semi-structured interview of 15 - 20 minutes was scheduled with each participant using a conference call facility. The researcher informed each participant in the beginning of the call that it was recorded and explained that the researcher would ask 7 to 8 questions but would also add question to explore interesting points during the interview. Table 5-2 lists the main questions asked during the interviews.

Table 5-2: Questions from semi-structured interview

Interview Questions
1. How did you like the activities? 2. What role do you see virtual worlds talking on in learning and education? Or could you see any role they could take on? 3. Did the activities actually trigger your interest in virtual worlds? a. If not, why not? b. If yes, what triggered your interest? 4. Would you use virtual worlds for Learning & Development? a. If not, why not? 5. What are the main characteristics that you see have potential for learning and which ones have least potential? 6. What could have been done differently? 7. Did the technical skills required for this environment impact your perception of using virtual environments? a. If yes, how?

For the data analysis all interviews were transcribed by the researcher. During the transcription process all names mentioned during the interview were changed to Participant#. The number corresponded to a number in the researcher's participant list to identify the source of data for any necessary clarifications. All interviews were coded and themed according to the research questions and the results are presented in next chapter.

5.4 Chat Logs

The participants were asked to use the text-chat for communications. However, during the virtual experience the second group preferred to communicate via telephone and therefore, the word count of their chat logs is smaller. However, to gain more data their call recordings have been transcribed. The chat logs and call transcriptions were anonymised prior to the analysis. They were coded and themed according to the research questions and the results are presented in next chapter.

5.5 Researchers Observations

During the virtual experience the researcher took written notes on observed behaviours and comments made by participants. In order to validate her observations videos of the virtual

experience and audio-recordings were taken. Due to technical difficulties with the audio- and video-recording software particular data could not be recorded.

For the first group day one could not be audio-recorded but as they preferred the text-chat for communication sufficient data was provided by the chat logs. The audio-recordings from the second day were used in conjunctions with the video-recordings to allow for a retrospective observation. Unfortunately, the video-recording software caused the researcher's laptop to freeze and multiple reboots were necessary. Therefore, only a limited amount of video-recordings were available for the first group and none for the second group. Due to a lack of chat logs the audio-recordings from day two of the second group were transcribed to provide more data.

The transcriptions were anonymised before coded and themed according to each research question. The themes were triangulated with other data source and the results are presented in the next chapter.

5.6 Summary

This chapter has described the preparation and analysis of each data set in more details whereas the next chapter will present the findings of the data analysis.

6 Findings

This chapter presents the findings from the data analysis in order to answer the research questions stated in the methodology chapter. To identify a shift in perception of the participants it was necessary to first establish their perception of MUVEs for learning in the workplace prior to the virtual experience. Thus, this chapter starts with the analysis of the questionnaires and continues with the presentation of the findings for the first research question. It concludes with the findings for the second research question.

6.1 Baseline Data

This section seeks to establish the participants overall perception of MUVEs for learning in the workplace before the virtual experience. The findings provided a baseline for identifying a shift in their perception of MUVEs as learning environments in their daily practice. However, as stated in the previous chapter the findings should be viewed critically as they are not traceable to individuals and some questions were not answered by all participants (see section 5.1).

In the questionnaire 3 out of 9 participants confirmed they had prior experiences with virtual worlds. This indicated that the perception of the 3 experienced participants may have already been influenced negatively. Furthermore, it implied that the other 6 participants may need more support in learning navigation skills in Second Life.

Additionally, the participants were asked to rate their agreement with a list of statements (see Figure 6-1). According to the results the majority of the participants (5 out of 8 participants) agreed that virtual worlds are useful for learning in the workplace but the same number of participants (5 out of 8) disagreed that virtual worlds would be easy to use. However, 4 out of 9 participants disagree that virtual worlds would not be useful for learning due to the high level of skills needed to navigate the system.

Furthermore, 6 out of 8 participants agreed that using virtual worlds increases motivation for learning and offers a fun element to learning events. However, only 4 participants believe that the skills learned in virtual worlds could be transferred over to the real world and that it would enhance the possibilities for learning in the real world. Nevertheless, 5 out of 9 thought virtual worlds could be a good addition to their current learning content.

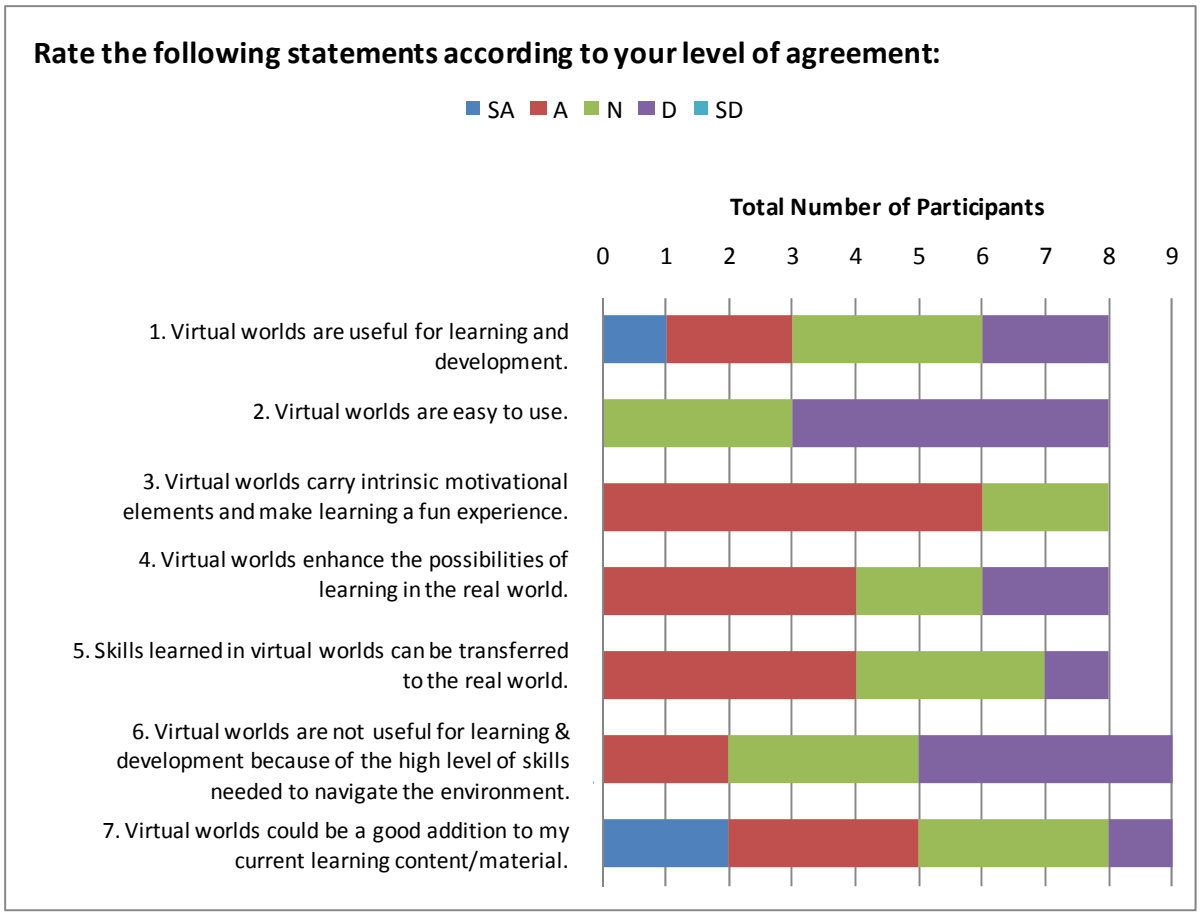

Figure 6-1: Pre-Questionnaire Rating Questions

After the rating questions the participants were asked to comment on what role they thought virtual worlds could play in learning. Table 6-1 lists the codes extracted from the 9 answers to the question. The second column shows the number of appearances of each code. The codes showed that 3 participants were not sure what role virtual worlds could play in learning whereas 1 participant correlated the usefulness to the subject matter. Other participants indicated that it could be useful for simulations, role play and collaboration. One participant made a distinction of the usefulness based on the age of the learner and thought it was useful for younger generations. Another participant stated that it would be useful but recognises that there are still technical issues with the system whereas one participant identified the distraction of the learner as an issue.

Retrospectively, all participants were asked to rate their attitude towards using virtual worlds for learning in the workplace prior to the virtual experience on scale of 1 to 10 (see Figure 6-2). The value 1 represented the opinion “I don’t think it is useful” and 10 represented “I think it is useful”. The results showed that only 3 indicated a positive attitude towards the

usefulness of virtual worlds for learning in the workplace (values 8-10). The majority (6 out of 9) rated their attitude low to medium (values 2 to 5).

Table 6-1: Codes from pre-questionnaire

Code	Number of appearances within 9 responses
Not sure	3
Roleplay	2
Simulations	1
Useful but Technical issues	1
Depend on Subject	1
Distract learners	1
Useful for young people and global reach	1
A collaboration tool to share experiences	1

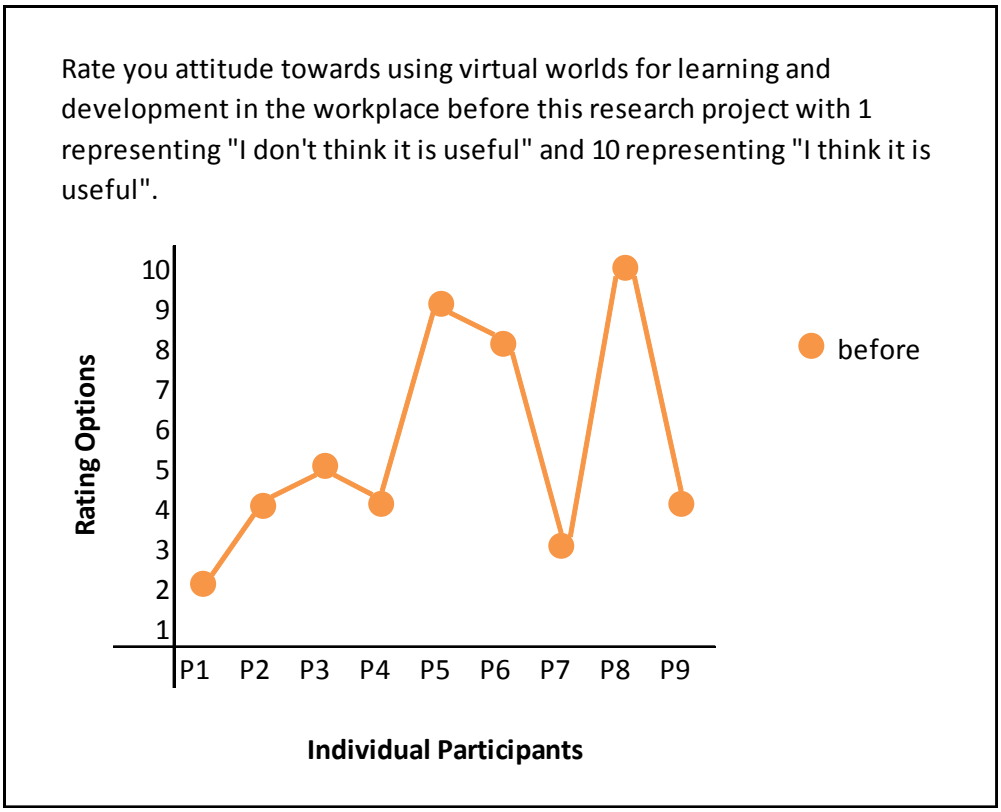

Figure 6-2: Attitude Prior to Experience

Based on the findings above it seemed that the majority of the participants were not sure about the usefulness of virtual worlds in learning which may have correlated to the inexperience with virtual worlds. The findings provided a basis for identifying a shift in the perception of the participants of MUVEs for learning in the workplace. Therefore, the following section presents the findings to answer the first research question.

6.2 Research Question One

The main research question of the present study was:

> **How effective is an experience in a virtual world designed based on Bandura's Social Learning Theory in shifting learning professionals' perception of MUVEs for learning in the workplace?**

In order to answer the question the researcher divided the findings into two phases. The first phase analysed the data based on the question: *Has a shift in perception occurred?* In the second phase the researcher examined the data again to search for evidence on how the perception was shifted.

6.2.1 Phase One

This section investigates if a shift in perception occurred. Accordingly, two main data sets contributed the evidence to answer the question. First, the questionnaire which measured the attitude towards the usefulness of MUVEs for learning in the workplace before and after the virtual experiences provided quantitative data for answering this question. Secondly, the semi-structured interviews and chat logs supplied the qualitative data.

Shift in Attitude

All participants were asked to rate their attitude towards using virtual worlds for learning in the workplace before and after the virtual experience. The majority of participants rated their attitude between low and medium (values 2 – 5) before the virtual experience as illustrated in section 6.1. The comparison of the overall attitude before and after the virtual experience (see Figure 6-3) showed that the attitude of the majority of the group (7 out of 9) changed positively. The illustration of the individual shift direction (see Figure 6.4) highlighted the drastic negative shift of 2 participants.

The results confirmed that a shift in attitude occurred. It implied that a shift in the participants' perception of MUVEs for learning in the workplace happened. To explore the reasons for the negative and positive shifts further, and to investigate if the shift in attitude reflected a shift in the perception as well, interviews and other sources were analysed.

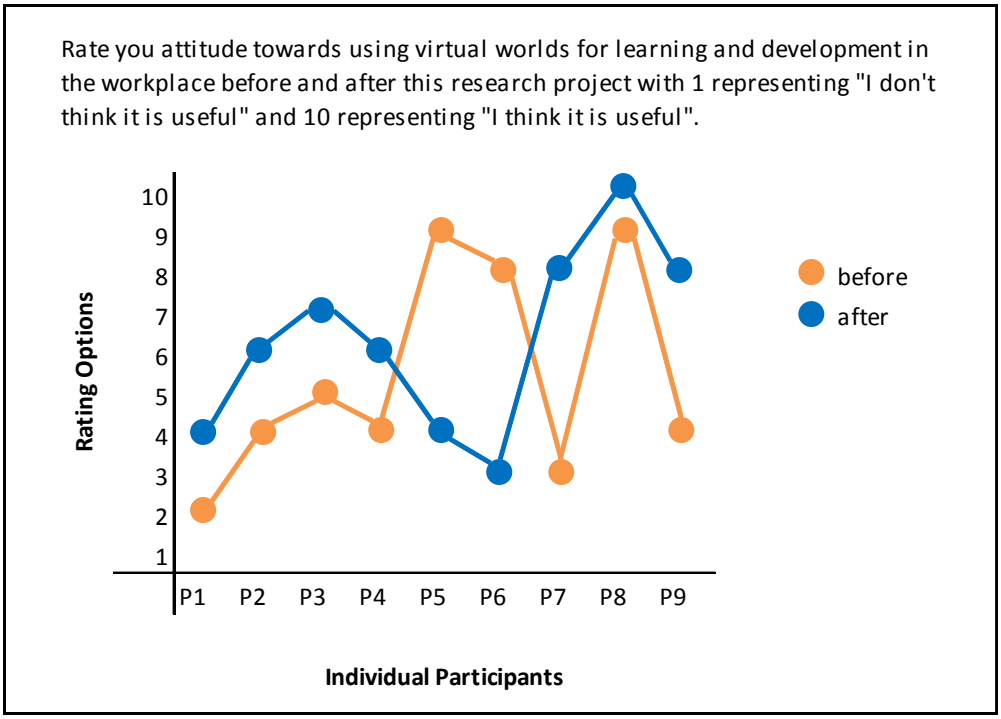

Figure 6-3: Overall Shift in Attitude

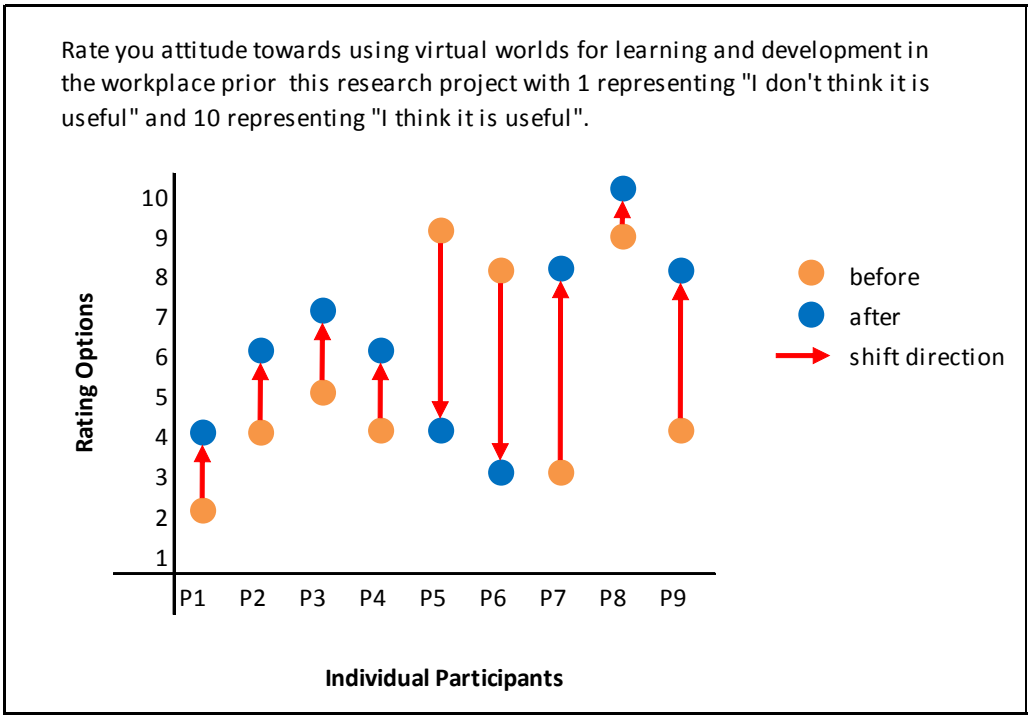

Figure 6-4: Individual Shift in Attitude

Shift in Perception

This section investigates if a shift in the participants' perception of MUVEs for learning in the workplace also occurred. Therefore, two questions from the interviews supplied valuable information to answer the research question:

1. Did the activities trigger your interest in virtual worlds?
2. Would you use virtual worlds for learning in your job?

Accordingly, 8 out of 9 participants confirmed that the virtual experience triggered their interest in virtual worlds. However, only 5 out of 9 stated that they would use virtual worlds for learning whereas 2 participants would not use virtual worlds for learning and 2 participants were not sure (see Table 6-2).

The codes from the data provided by the two questions revealed that participants would use virtual worlds for learning if it was the most appropriate technology for the subject matter and if it would add value to the training program. Nevertheless, only 1 participant could imagine using virtual worlds for current training programs. However, the majority would consider it for future training courses. Participant 1 said that the development time of a training environment in Second Life would be too time consuming but he would use it in simpler ways.

Participant 2 was an interesting case as he said that the activities did not trigger his interest in virtual worlds and he would not use it for learning. However, he indicated a positive shift in attitude towards using virtual worlds for learning in the workplace. The researcher explained his negative responses towards the use of Second Life for learning with the characteristics of Rogers' (2003) Late Majority adopter category. Thus, participant 2 would only adopt an innovation as a result of peer pressure and economic necessities. However, he was a key person in implementing virtual classroom technology in the organisation and he is a highly respected person in the Learning and Development department for his extensive knowledge of learning technologies.

The codes from his interview revealed that his answers were associated with using Second Life for learning as he explained that Xbox and Playstation were easier to use for younger generations and he would be interested in a simpler version of Second Life (see Table 6-2). It indicated that he would be interested in exploring other virtual worlds for learning in the workplace which would place him more in the Early Adopter or Early Majority category.

Table 6-2: Interview questions for perception change

Participants	Did activity trigger your interest in using virtual worlds?		Would you use virtual worlds for learning?	
	yes/no	Codes	yes/no	Codes
Participants 1	yes	- Development time - Simpler ways to use SL	yes	- Add value - Appropriate - Future
Participants 2	no	-Struggle to use - Xbox & Playstation easier - SL complex interface - hardware platform - process to learn SL	no	- Existing Programs - Other tools - Simpler Version - Technical Issues
Participants 3	yes	- Long time - Multiple media - Visualization - Fun - Constant Interactivity	yes	- more examples
Participants 4	yes	- Technical support - technical skills	not sure	- Appropriate subject - technical support - technical skills
Participants 5	yes	- benefits - younger generations - immersion	not sure	- effort worth preparation
Participants 6	yes	- in social sense	no	- Distraction - no enhanced learning - group formation - time
Participants 7	yes	- reinforced capabilities	yes	- Xerox network
Participants 8	yes	- own classroom	yes	- more personal - no exposure - immersion - effective learning
Participants 9	yes	- system improvement - no hard learning curve - versatility	yes	- Appropriate - Integration in program - technology gap

A variety of codes regarding the technical side of using virtual worlds, in particular Second Life, emerged from the interviews. Participant 4 was not sure about using virtual worlds for learning as he was concerned with the technical skills of his learners. He indicated that the organisation would need to provide the technology to ensure a virtual learning program without major technical difficulties. The organisation's current technology demonstrated a large amount of technical issues for 3 participants during the virtual experience. In addition, participant 7 and 9 also commented that the organisation's network would need to provide better access to Second Life as some participants could not use certain features, i.e. play audio or video, due to network restrictions.

Participant 5 and 6 indicated a drastic negative shift in their attitude towards using MUVEs for learning in the workplace although they both indicated that they enjoyed the experience and that it triggered their interest in virtual worlds. Participant 5 was not sure if she would use

virtual worlds for learning. She questioned if the effort was worth the preparation time. Nevertheless, she acknowledged the benefits of the system for learning, especially for younger generations.

Participant 6 identified the possible use of virtual worlds in a social sense and group formation exercises but would not use it for learning. She reasoned that using the system for learning would rather distract the learner than enhance the learning. However, group formation also supports a learning program, especially distance learning programs. Therefore, it could be argued that she may use it as part of a learning program in the future. One of her main concerns was the time needed to learn the required navigation skills for Second Life. The perception may have been influenced by the orientation session which took 2.5 hours. However, group 1, which she belonged to, took double the time than group 2 due to technical issues with 3 out of 6 participants.

The data discussed above proved that a shift in the perception of the participants of using MUVEs for learning in the workplace occurred. The majority of the participants (5 out of 9) indicated they would use it. The next section takes a closer look at how the perception shifted.

6.2.2 Phase Two

Evidence was found that the participants' perception shifted positively towards using MUVEs for learning in the workplace. This section explores how the shift happened and how Bandura's Social Learning Theory supported the shift. The following findings are presented based on the groups of the behaviour modelling (see Table 6-3) in order to discuss the results from the activity to identify evidence for the shift in perception. It also serves to structure the findings in smaller units.

Table 6-3: Behaviour modelling groups

Groups	Sub-groups	Participants
1	1.1	Participants 1, 3 and 4
	1.2	Participants 2, 5 and 6
2		Participants 7, 8 and 9

Evidence was found that the examples of business applications of virtual worlds supported the participants to recognise the potential of virtual worlds for learning in the workplace. Two out of three groups stated during the behaviour modelling activity that they could see the

usefulness of MUVEs for hardware training whereas one group struggled to generate ideas at all.

Group 1.1

All participants in group 1.1 indicated a positive shift in their perception towards MUVEs for learning in the workplace. During the behaviour modelling activity the group identified MUVEs as useful for hardware training. Thus, the imitation activity did trigger the shift in their perception towards the subject matter used in the virtual experience. However, they struggled to see benefits beyond hardware training and participant 3 stated:

> *"I guess we would have to see a lot more possible apps before we can make a better call."*

During this activity he also mentioned that process training may also benefit from the use of virtual worlds but stated in the interview that he would like to see examples of process training in Second Life. His comments indicated that the observational and imitation experience supported him in perceiving virtual worlds as useful for hardware training. Thus, he would investigate observational opportunities for process training in order to generate ideas.

Participant 1 liked the video integration functionality although the flash did not work on his screen. He also stated that he was impressed with the object creation possibilities in the environment and the task oriented learning process used during the orientation. However, he was concerned with the time needed to develop effective training courses in Second Life and therefore, would rather concentrate on simpler ways of applying it to future courses.

Participant 4 mainly evaluated the usefulness of the system based on his learners. In the discussion and in the interview he stated that his learners would not possess the technical skills to navigate a system like Second Life. Hence, the ease of use had a major impact on his perception of the usefulness although he indicated a positive shift in perception. The positive shift may have resulted from his view of the effectiveness of virtual worlds for social interaction. Furthermore, he mentioned that the examples could have been more relevant to his job. Thus, he could see the usefulness for hardware training based on the imitation activity but would also need more examples based on his daily tasks.

The main theme emerging from the interviews of the three participants was the group dynamics. They evaluated the group interactions as more effective and engaging than the virtual classroom technology currently used by them. Participant 1 stated:

> *"I mean it was interesting actually I found that even though we didn't have to be standing as a group looking at you when you were introducing the next part of the training we all made our avatars turning around as a group even though we did not have to do this at all as it didn't affect the training in any way. "*

So their sense of peer pressure and sense of group connectivity seemed to impact the positive shift of their perception of MUVEs for learning in the workplace.

Group 1.2

The discussion of this group was primarily led by participant's 2 negative view of the use of Second Life for learning. The observational experience was negative for him as he stated that the examples could have been done better and easier with other tools. Thus, he could not understand why Second Life would be used to train hardware. Therefore, he would not use virtual worlds for learning. However, he indicated a positive shift in his attitude towards using MUVEs for learning in the workplace. During the interview he compared Second Life with Xbox and Playstation and explained that he would be interested in a simpler version of Second Life. So, he did not rule out virtual worlds completely for learning. The reasons for his negative view of Second Life could have been influenced by his initial technical difficulties and by his opinion of the outdated graphics and complex user interface.

The other two participants of this group tried to consider the use of virtual worlds in their environment but did not find a use for it. Participant 5 explained that she mainly works with older generations and as she struggled with the navigation herself it would not be useful for her learners. Therefore, she indicated a drastic decrease in her attitude towards using MUVEs for learning in the workplace. Nevertheless, she acknowledged the benefits for using for virtual worlds to train younger generations and she could imagine the use for meetings especially due to the feeling of presence and group dynamics.

Participant 6 envisioned the use of virtual worlds for social interactions and group formation. However, her attitude towards using MUVEs for learning in the workplace decreased drastically. She expected to use the system for role play activities for soft skills training. Therefore, the hardware training example did not meet her expectations which could have

affected her attitude and thus, her perception. Nonetheless, she perceived the video examples as useful because they demonstrated how the system could be used for simulations. Additionally, she stated that she enjoyed the imitation activity but she did not retain the information as she could not answer the quiz questions. Thus, she agreed that Second Life added a fun element to a learning event but she questioned its effectiveness.

Equal to group 1.1 the major theme emerging from the interview data was the group dynamic. The sense of presence and peer pressure were seen as advantages compared to other virtual learning technologies currently used in the organisation. Although participant 6 felt pressured by the group presence which made her rush through the activities instead of following her own pace, she acknowledge the benefits for learning.

Overall it was interesting that all members of this group stated they would not use MUVEs for learning in the workplace but one showed a positive increase in the attitude towards the usefulness of MUVEs for learning. The negative tone of the group discussion may have influenced participant 5 and 6 in their perception.

Group 2

Compared to the other two groups, this group showed Bandura's Social Learning Theory in action. The group applied the use of virtual worlds beyond learning in the workplace (see Table 6-4). They provided a range of possible applications for virtual worlds and applied the video examples to their work environment. Participant 9 applied the paramedics' simulation to the manufacturing environment in Xerox:

> *"It would be really good to conduct training where people could get hurt if they don't do things right – say in the manufacturing environment."*

They also acknowledged technical barriers but did not see them impacting the usefulness of the environment. Although participant 7 was forced to withdraw from the first group due to extensive technical issues, he showed a positive shift in perception. The positive shift correlated to the imitation activity as he is a hardware instructor and could apply the virtual environment to several subject matters in his job.

Table 6-4: Behaviour modelling results group 2

Learning	Business
- Role play for new hire sales & executives - Client Associate Operator Training - Sales and customer situation - create demo videos - Product training - New product features - Soft Skill programs - Hardware Training - Prerequisites for technical services - Blended learning - service offerings - Build a chart and have avatars take an action and see how the chart changes - Solid Ink Basics - Print process - Electric theory - Simulate dangerous situations - productivity scenarios - Manufacturing training - Productivity settings and see how they affect output	- Conduct Presentations - Sales Launches - service offerings - Data presentation - Survey - One to ones -

According to the interview participant 8 was inspired by the entire experience. Especially the video examples gave her ideas on how to use the virtual environment for learning. Additionally, her perception was positively influenced by the interactivity with the environment and other group members.

Participant 9 identified the imitation activity as the trigger for her thoughts around the usage of the system in her daily job. She stated that the activities went well beyond what she thought the system was capable of.

The findings showed that Bandura's Social Learning Theory positively influenced the perception of the participants. The majority agreed that virtual worlds are useful for hardware training. However, more research is needed to solidify the results due to the relatively small number of participants.

6.3 Research Question Two

The second research question is:

> **What are their main considerations of adopting MUVEs in their daily practice based on the virtual experience?**

In order to answer the question the researcher coded the data sources according to the research questions. From the codes six main themes emerged which are individually discussed in the following subsections.

6.3.1 Control

The main consideration for the participants was the control of the environment and the learner. They perceived the environment as distracting for learners and feared the loss of control over the learners and the environment. Although they recognised the usefulness of video integration and other features they were concerned about level of distraction these features would add to a learning event. Furthermore, the distractions of the virtual environment would divert the focus from the subject. Even though the learners would enjoy the learning event the participants questioned if they would retain the subject itself. Therefore, they recognised that more guidance would be needed for learning events in virtual worlds than in other virtual learning technology. It would also involve more time and effort for instructors and learning developers.

6.3.2 Usefulness

Usefulness was the second most reoccurring theme including controversial codes. On one hand 6 out of 9 participants struggled to apply the virtual environment to current training programs. Although 3 of the 6 would consider Second Life for future training programs if the subject would be appropriate for the technology. On the other hand 3 out of 9 participants identified multiple possibilities to use virtual worlds in their daily practice and did not allow technical issues or limitations to impact their view on the usefulness of the environment.

6.3.3 Interaction

Although the majority of the participants struggled to recognise the usefulness of MUVEs for learning they agreed that the experience was more engaging and interactive than other virtual learning technology they currently use in their daily practice. They identified the interactivity as the most beneficial characteristic of virtual worlds for learning.

6.3.4 Technology

The theme of technology emerged from two different angles. The first angle was the hardware and connectivity requirements. During the virtual experience 3 out of 9 participants had difficulties to participate as their computers constantly froze. One participant even had to withdraw from the first group due to technical issues with his computer. However, he joined the second group and continued with minor technical issues. One of the 3 participants changed from his work computer to his private computer and did not experience any technical issues afterwards.

Two other participants who worked from within the organisation's network experienced technical issues; no voice-chat was possible. Accordingly, the participants were concerned that the financial investment required by the organisation to ensure adequate equipment was available for using virtual worlds as learning environments would not be supported by the management. Thus, it would hinder the implementation of MUVEs for learning in the workplace.

The second angle was the technical skills required by learners. In the pre-questionnaire the majority of the participants indicated that they did not believe the technical skills would impact the usefulness of MUVEs for learning. However, after the experience they recognised that MUVEs would not be useful for a particular type of learner due to a lack of required technical skills.

6.3.5 Time

The fifth theme was time which was also considered on different levels. The participants were unsure if the value the virtual environment would add to learning would justify the investment of time needed to develop learning experiences. They calculated that conducting a learning experience in a virtual world would not only involve a long development period but would also require a time consuming orientation program.

Learners would need more time to acquire the necessary navigation skills for MUVEs than for current virtual learning technologies. However, they mainly voiced concerns about the time spent on the orientation day but did not mention the time used during the virtual experience on day two. The time theme emerged mostly from the first group which consisted of 6 participants. Their orientation took double the time than the second group due to technical setup issues in the beginning which took approximately 40 minutes to resolve. The

second group which consisted of 3 participants took an hour for the orientation and did not see the time in training learners on Second Life as a main issue.

6.3.6 Other Tools

The theme other tools emerged from a variety of data. All participants have been using virtual learning technology in their daily practice and therefore, compared them with virtual worlds. Although the theme emerged mainly from codes mentioned by one participant it was also acknowledge by others. The main advantages of virtual learning technology used by them, i.e. Adobe Connect Pro or Adobe Presenter, are (1) easier navigation for learners, (2) cheaper implementation and (3) current availability.

However, they also agreed that it was easier to get distracted by external elements, i.e. emails or other work related tasks, in a virtual classroom than in virtual worlds. Virtual worlds would keep learners more interested in the virtual environment as the immersive nature provides more interactivity and engagement. The majority of the participants (8 out of 9) felt more connected to the group and thus, rated the group dynamic created through the use of avatars as a main consideration for using MUVEs for learning in the workplace.

6.4 Summary

The findings presented above showed that Bandura's Social Learning Theory had a positive effect on the shift of the participants' perception of MUVEs for learning in the workplace. The majority of the participants would use MUVEs for learning in their daily practice. However, they have also voiced concerns about using virtual environments for learners due to the systems complexity. In order to connect the findings with the literature the next chapter discusses the results and describes the limitations of the study. The final section suggests directions for future research studies.

7 Discussion & Conclusion

The previous chapter presented the findings from the data analysis whereas this chapter discusses the findings compared with the literature underlying this study to provide a conclusive answer to the research questions. Therefore, this chapter first discusses the effect Bandura's Social Learning Theory had on the learning professionals' acceptance and adoption of MUVEs for learning in the workplace. It continues with discussing the findings for the second research questions based on the perceived usefulness and perceived ease of use of MUVEs by learning professionals. It concludes with research limitations and future research suggestions.

7.1 Research Question One

This study was designed to explore the user acceptance and technology adoption of MUVEs for learning in the workplace. Therefore, the first research question investigated the effect a virtual experience designed based on Bandura's Social Learning Theory would have on learning professionals' shift of perception in accepting and adopting MUVEs for learning in the workplace.

The findings demonstrated that a shift of the majority of the participants towards using MUVEs for learning in the workplace occurred. The participants acknowledged the benefits of using MUVEs for hardware training but struggled with applying the usage to other subject matters. The observational stage of Bandura's Social Learning Theory supports "the idea that individuals cannot learn for themselves," (Smith & Berge, 2009, p. 440) and thus, individuals need the interaction with others to learn from their behaviour through observation. During the imitation stage the learner would then take the behaviour they perceived as positive and practice those until they become proficient. Therefore, the combination of observing peers in completing a hardware training course followed by imitating the behaviour in a Xerox context supported the shift of learning professionals' perception of MUVEs for learning in the workplace.

However, evidence was found that the negative experiences during the observational and the imitation activity resulted in the participant not understanding why MUVEs would be used to provide hardware training. Another participant evaluated one of the video examples as "cheesy". Both stated that they would not use MUVEs for learning in their daily practice. These results demonstrated the importance of positive observational and imitation

experiences in order to support the shift of learning professionals' perception of MUVEs for learning in the workplace.

Following the positive experiences from the observational and imitation stages, in the behaviour modelling stage the learner would be able to create new behaviours or ideas. However, only the second group was able to apply their experiences from the previous stages to a variety of existing training programs as well as other business areas. Although the other participants struggled with applying the use of MUVEs to current training program some would consider MUVEs as a learning environment for future training courses if the technology would suit the subject matter. These findings support the necessity of observational experiences that provide a variety of examples in different subject matters.

An interesting fact was that the second group consisted of three participants from the US whereas the majority of the first group was European with only one person located in the US. This indicated that cultural influences may also have impacted the perception of learning professionals of MUVEs for learning in the workplace. Research has already been conducted to investigate if the Technology Acceptance Model applied to different cultures. Straub et al. (1997) tested the model in Switzerland, Japan and the United States and found that it applied to Switzerland and the United States but not to Japan. Therefore, future research should investigate what effect cultural differences have on Bandura's Social Learning Theory for user acceptance and technology adoption of MUVEs for learning in the workplace.

7.2 Research Question Two

The second research question aimed to identify the main considerations of learning professionals to adopt MUVEs in their daily practice. The findings support Davis' (1989) theory that perceived ease of use is a dominant determinant of the adoption of technology and influences the perceived usefulness of a system. Although some of the participants stated that the system was easy to use they still considered the usefulness of Second Life based on the technical skills required from their learners. Therefore, they identified the ease of use as a barrier for implementing MUVEs for learning in the workplace.

Furthermore, the majority of the participants would use virtual worlds for learning if it would be the most appropriate technology for the selected subject matter. Nevertheless, the findings also showed that the attitude of two participants decreased drastically after the virtual experience. It demonstrated that a positive attitude towards the usefulness of a technology

does not necessarily result in the adoption of the technology. In order to solidify these results further research needs to be conducted using a larger sample of learning professionals.

Another main consideration was the control of the environment and the learner. Thus, the perceived usefulness was also evaluated on a learning professional's ability to control the learning event and guide the learner through the learning process with maximum retention of the subject matter. It indicated that a more detailed understanding of the features of virtual worlds is necessary to demonstrate how learning professionals can restrict virtual learning events and thus, ensure maximum retention of the subject. However, learning professionals may also need to adjust their own training skills and educational beliefs to adapt to the new learning environment offered by virtual worlds (Cross et al., 2007).

7.3 Limitations

There are a variety of limitations to the present study. The first limitation was the technical skills of the participants. Although they were selected according to their technical skills the virtual experience revealed that the participants had different skill levels. This resulted in more effort and time needed to guide them.

The equipment used by some participants also limited them in fully engaging in the activities and interactions. One person could not take part in this research project at all as he discovered on the orientation day that he could not gain access to Second Life from within the organisation's network. The experience demonstrated that other participants struggled with using their computers throughout the experience. Although the researcher instructed the participants to ensure their equipment meets the technical requirements for using Second Life, the technical issues during the experience indicated that the researcher should have conducted a technical setup session prior to the virtual experience.

Furthermore, the study included a small sample of participants although a larger number of learning professionals from Xerox were interested in joining this study but could not commit to the time involved due to work commitments. As a result the researcher reduced the time involved in the activities from 6 hours over three days to 5 hours over two days.

Additionally, Xerox decided to close the Xerox Innovation Island in Second Life which was used for this study by the end of February. Therefore, the experience could not be extended to March to provide an additional opportunity for other learning professionals to join the research study.

7.4 Future Research

This research showed that the majority of the participants recognised the usefulness of MUVEs for hardware training. Future research could focus on using more industry examples and different subject matter to explore the effectiveness of Bandura's Social Learning Theory for user acceptance and technology adoption of MUVEs for other subject matters.

Furthermore, it would be necessary to extend this study to a larger sample of participants to solidify the findings of this research study. The results also demonstrated a difference in perceived usefulness amongst participants with different cultural backgrounds. Hence, future research could explore the role cultural backgrounds play during the use of Bandura's Social Learning Theory to promote user acceptance and technology adoption of MUVEs for learning in the workplace.

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9 Appendices

Appendix I – Orientation Tasks

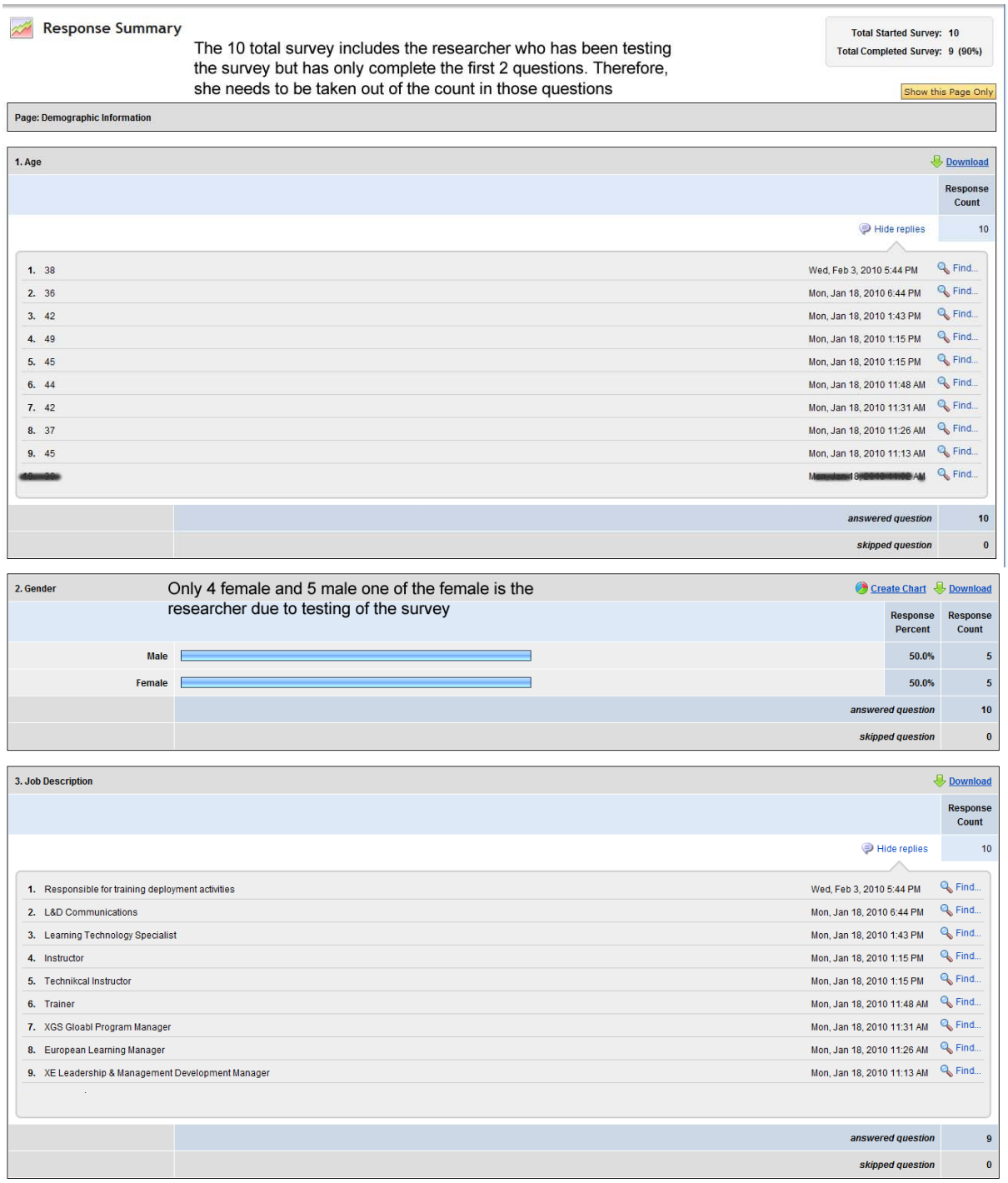
#	Task Name	Skill	Functionality	Intention
1	Movement	Walking	Different methods of walking including autopilot	Enable them to walk
2	Take & Throw	Take objects, touch, throw, attach and detach objects	Inventory, Objects, arrow keys for navigation	Using a dunk ball game already existing on the island to learn in a fun way how to take objects, how to move into different positions by using the arrow keys on the keyboard
3	Send a Postcard	Sit, take notecard, use different camera views	Notecard giver, Snapshot option	To learn how to use different camera options as it is a vital skill to navigate in Second Life and will be used extensively in day 2 of the activities
4	Drink Coffee	Touch, take object, attach and detach object, camera views	Notecard giver, Snapshot option	To practice the camera view to get more comfortable with using it.
5	Teleport	Teleport, touch	Notecard giver, Teleport links in Notecards	To introduce them to another way of moving around in Second Life
6a	Join a group	Search	Search window, groups	To introduce them to how to find groups in Second Life and to show them the usefulness for grouping training participants
6b	Chat to group	Communicate	Text-chat, groups	To demonstrate how communications can be tailored to a particular group of people
7	Instant Feedback	Walk, turn around, flying	Feedback area that was already set up	To introduce them to objects that can provide instant feedback to participants or educators as well as expressing their opinion with their avatar.

				Then flying to the next task
8a	Geographical orientation	Teleport	Maps with teleporter function	To get them used to orientate themselves although they teleported to another location. To show them that interesting locations can be anywhere in Second Life even on the roof of the building
8b	Geographical orientation	Camera views, flying	Snapshot, the option of creating sky platforms	To practice the camera views and to demonstrate them different locations in Second Life such as a sky platform
9	Explore Was taken out for group 2	Walk, camera view, teleport	Display of information within Second Life	To explore the existing information on the sky platform and to see an example of how information can be displayed
10	Add Friends	Search, add friends	Social environment	To demonstrate the social environment options and to enable them to make social connections to their peers

Appendix II - Final Artefact Setup and Schedule

#	Activity	Practice	Functionality	User Acceptance issue
Day 1 – 3 hours				
1a	SL Orientation (2.5 h)	Learning basic navigation features, teleporting, searching	available resources on Second Life island of Xerox, connecting socially (groups and friends), instructional tools (feedback scale)	• Subjective Norm = Showing examples of learning experiences in SL from other institutions • Perceived Ease of Use • Perceived Usefulness
1b	Homework (0.5)	Basic navigation, changing appearance, shopping, teleporting	Use of library resources, availability of artefacts and experiences of other people and organisation	• Subjective Norm = Showing examples of learning experiences in SL from other institutions • Perceived Ease of Use • Perceived Usefulness
Day 2 – 2.5 hours				
2	Videos	Touching and navigating	In-world integration with YouTube videos, internet browser integration in-world	• Subjective Norm = Showing examples of learning experiences in SL from other institutions • Perceived Ease of Use • Perceived Usefulness
3	Digital document transfer	Take objects, navigating, manage inventory, walk, fly, use text chat, touching	Notecards, Notecard drop box and givers, animation of objects	• Relevance to the Job • Usefulness of the technology
4	Chat round – Generating Ideas	Sitting, using text-chat, creating notecards	Text-chat, break out rooms (available on Second Life island)	• Job Relevance • Perceived Usefulness • Perceived Ease of Use
5	Group Discussion	Social networking, communication functionalities	Text-chat	• Perceived Usefulness • Perceived Ease of Use

Appendix III - Pre-Questionnaire



Response Summary

The 10 total survey includes the researcher who has been testing the survey but has only complete the first 2 questions. Therefore, she needs to be taken out of the count in those questions

Total Started Survey: 10
Total Completed Survey: 9 (90%)

Show this Page Only

Page: Demographic Information

1. Age — Download

	Response Count
Hide replies	10

1. 38	Wed, Feb 3, 2010 5:44 PM	Find...
2. 36	Mon, Jan 18, 2010 6:44 PM	Find...
3. 42	Mon, Jan 18, 2010 1:43 PM	Find...
4. 49	Mon, Jan 18, 2010 1:15 PM	Find...
5. 45	Mon, Jan 18, 2010 1:15 PM	Find...
6. 44	Mon, Jan 18, 2010 11:48 AM	Find...
7. 42	Mon, Jan 18, 2010 11:31 AM	Find...
8. 37	Mon, Jan 18, 2010 11:26 AM	Find...
9. 45	Mon, Jan 18, 2010 11:13 AM	Find...
[redacted]	[redacted]	Find...

answered question	10
skipped question	0

2. Gender — Only 4 female and 5 male one of the female is the researcher due to testing of the survey — Create Chart — Download

	Response Percent	Response Count
Male	50.0%	5
Female	50.0%	5
answered question		10
skipped question		0

3. Job Description — Download

	Response Count
Hide replies	10

1. Responsible for training deployment activities	Wed, Feb 3, 2010 5:44 PM	Find...
2. L&D Communications	Mon, Jan 18, 2010 6:44 PM	Find...
3. Learning Technology Specialist	Mon, Jan 18, 2010 1:43 PM	Find...
4. Instructor	Mon, Jan 18, 2010 1:15 PM	Find...
5. Technikcal Instructor	Mon, Jan 18, 2010 1:15 PM	Find...
6. Trainer	Mon, Jan 18, 2010 11:48 AM	Find...
7. XGS Gloabl Program Manager	Mon, Jan 18, 2010 11:31 AM	Find...
8. European Learning Manager	Mon, Jan 18, 2010 11:26 AM	Find...
9. XE Leadership & Management Development Manager	Mon, Jan 18, 2010 11:13 AM	Find...

answered question	9
skipped question	0

4. Training Subject — Download

		Response Count
	Hide replies	6
1. XGS CA's - variety of subjects	Mon, Jan 18, 2010 1:15 PM	Find...
2. Technical repair	Mon, Jan 18, 2010 1:15 PM	Find...
3. XGS	Mon, Jan 18, 2010 11:31 AM	Find...
4. Pre-Sales and Implementation	Mon, Jan 18, 2010 11:26 AM	Find...
5. Leadership & Management	Mon, Jan 18, 2010 11:13 AM	Find...
	answered question	6
	skipped question	4

Show this Page Only

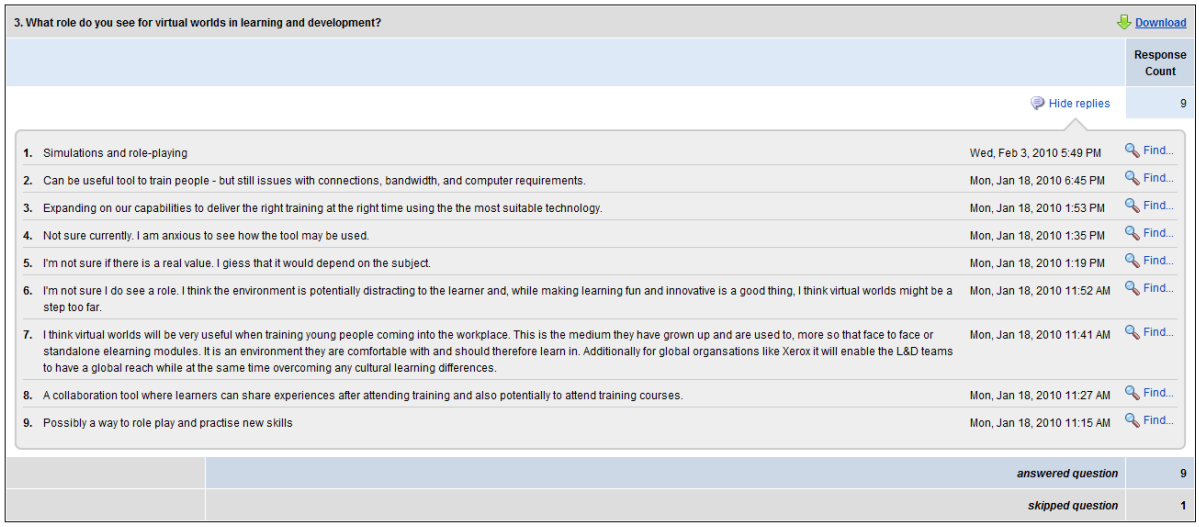
Page: Virtual Worlds in Learning & Development

1. Do you have any prior experiences with virtual worlds? — Create Chart — Download

	Response Percent	Response Count
Yes	33.3%	3
No	66.7%	6
Unsure	0.0%	0
answered question		9
skipped question		1

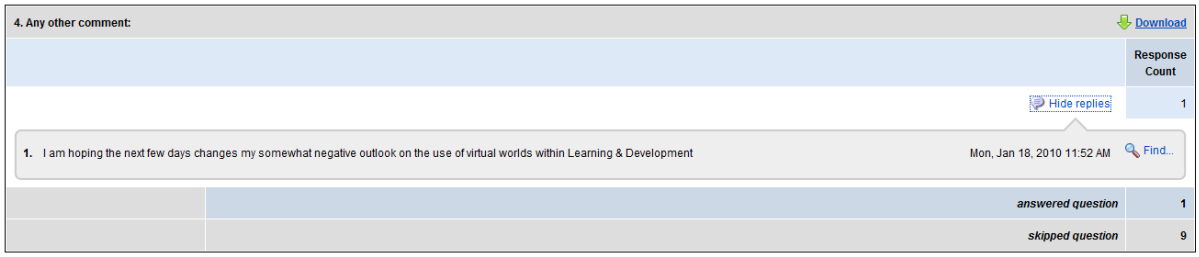
2. Rate the following statements according to your level of agreement: — Create Chart — Download

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Rating Average	Response Count
Virtual worlds are useful for learning and development.	12.5% (1)	25.0% (2)	**37.5% (3)**	25.0% (2)	0.0% (0)	0.0% (0)	2.75	8
Virtual Worlds are easy to use.	0.0% (0)	0.0% (0)	37.5% (3)	**62.5% (5)**	0.0% (0)	0.0% (0)	3.63	8
Virtual worlds carry intrinsic motivational elements and make learning a fun experience.	0.0% (0)	**75.0% (6)**	25.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2.25	8
Virtual worlds enhance the possibilities of learning in the real world.	0.0% (0)	**50.0% (4)**	25.0% (2)	25.0% (2)	0.0% (0)	0.0% (0)	2.75	8
Skills learned in virtual worlds can be transferred to the real world.	0.0% (0)	**50.0% (4)**	37.5% (3)	12.5% (1)	0.0% (0)	0.0% (0)	2.63	8
Virtual Worlds are not useful for learning and development because of the high level of skills need to navigate the environment.	0.0% (0)	22.2% (2)	33.3% (3)	**44.4% (4)**	0.0% (0)	0.0% (0)	3.22	9
Virtual worlds could be a good addition to my current learning content/material.	22.2% (2)	**33.3% (3)**	**33.3% (3)**	11.1% (1)	0.0% (0)	0.0% (0)	2.33	9
						answered question		9
						skipped question		1



3. What role do you see for virtual worlds in learning and development? Download

		Response Count
Hide replies		9
1. Simulations and role-playing	Wed, Feb 3, 2010 5:49 PM	Find...
2. Can be useful tool to train people - but still issues with connections, bandwidth, and computer requirements.	Mon, Jan 18, 2010 6:45 PM	Find...
3. Expanding on our capabilities to deliver the right training at the right time using the the most suitable technology.	Mon, Jan 18, 2010 1:53 PM	Find...
4. Not sure currently. I am anxious to see how the tool may be used.	Mon, Jan 18, 2010 1:35 PM	Find...
5. I'm not sure if there is a real value. I giess that it would depend on the subject.	Mon, Jan 18, 2010 1:19 PM	Find...
6. I'm not sure I do see a role. I think the environment is potentially distracting to the learner and, while making learning fun and innovative is a good thing, I think virtual worlds might be a step too far.	Mon, Jan 18, 2010 11:52 AM	Find...
7. I think virtual worlds will be very useful when training young people coming into the workplace. This is the medium they have grown up and are used to, more so that face to face or standalone elearning modules. It is an environment they are comfortable with and should therefore learn in. Additionally for global organsations like Xerox it will enable the L&D teams to have a global reach while at the same time overcoming any cultural learning differences.	Mon, Jan 18, 2010 11:41 AM	Find...
8. A collaboration tool where learners can share experiences after attending training and also potentially to attend training courses.	Mon, Jan 18, 2010 11:27 AM	Find...
9. Possibly a way to role play and practise new skills	Mon, Jan 18, 2010 11:15 AM	Find...
	answered question	9
	skipped question	1



4. Any other comment: Download

		Response Count
Hide replies		1
1. I am hoping the next few days changes my somewhat negative outlook on the use of virtual worlds within Learning & Development	Mon, Jan 18, 2010 11:52 AM	Find...
	answered question	1
	skipped question	9

Appendix IV – Example Individual Interviews

Interview – Participant 1

Researcher: How did you like the activities?

Participant1: I thought the activities worked very very well. I liked the idea of having sort of little adventures to do, you know, so you have instructions on a board. You had to complete that before you could move on the second activity, so I quite liked the idea of that adventure trail, treasure trail type of teaching that seems to work very well. Obviously a great deal of effort had gone into the second activity the big printer. Although I found it a bit disorientating once I have been inside it. I thought perhaps it may have worked better if we have stood on the open door to it and you could see everything that was happening. I don't know if you could put something like a transparent wall up something you can actually walk into it. But when you are actually inside the machine it is very easy to get lost as you know I did. No but I think it worked very well at all.

Researcher: What role do you see virtual worlds talking on in learning and education? Or could you see any role they could take on?

Participant1: I am struggling to find a use for it I have to admit. I was still quite impressed with has been done and I say I was very impressed with the way you taught us how to use Second Life on the first day. But I am still struggling to think of a way to apply it to what we do within Learning and Development. My fear is that people can just sort of run amok within world. It doesn't seem to be any way of stopping people doing things and I know from experience that people will very quickly get bored if you like and they will go off exploring and will not stop unless we are able to and potentially they are sort of destroying the area you set up for training. I don't know whether it is possible but if you could sort of trap them in a room or in a large building that may be a way of getting around it. But I am struggling of thinking of a way of how I can apply it to what I am doing in Learning and Development certainly.

Researcher: You actually can do that you can stop people from for getting out or setting rules I am pretty sure you can set up rules for that.

Participant1: In that case I mean I can certainly it is being a more entertaining way of having meetings I'd liked the breakout areas we had where you could chat amongst a small group and then share it with a large group. So perhaps if you could have sort of large conference room that may work quite well you could still have the view out of the window and if you just trap people in there then you would some sort of level of control to get them sit down, watch the presentation and then have discussions and that type of things. So that may work very well for meetings but I am not sure how I can identify that to skills training or product training.

Researcher: Does that also have to do with the fear of losing control of the group?

Participant1: To a degree yes. Because with Face-to-Face training it is part of the skills of a trainer is keeping control of the group and different personalities. With using virtual classrooms like Adobe Connect you are losing that face-to-face it becomes more difficult to keep control of the group and I can see in Second Life that goes back to another stage how you can keep control because you can do so much more in there. In an adobe connect room there is a limited play opportunity for these guys when they sit home at their laptops. Where is within Second Life there is being discovered examples of opportunities to play. Okay you can give them the opportunity and just let them test their system but, I don't know, as an example when we explored on the latch and we were looking at the printers in the showroom I clicked on one of the printers and it let into the edit mode and I could then see the skeleton of this printer with all the different modes, I did not touch anything but there is the opportunity for you to spend an awful lot of time creating a virtual classroom and then the delegates just keep on ragging it for you. It is a very real risk.

Researcher: They wouldn't actually be able to change thing I mean if you set it up correctly nobody would be able to change my stuff or would be able to modify it because it is mine. So you may have seen edit and you could see the structure but you would not be able to move it or delete it or anything. That would not be possible.

Participant1: Right ok, well I certainly did not try to do so but so you can exercise full control over the delegates then. Can you then set up sort of basic accounts where they can't put cars on their shoulders for example or dump a bag inside the conference room?

Researcher: I am not 100% sure but I think you can limit what they can do in the environment.

Participant1: Right, that would be my biggest fear. Certainly knowing the people that I train, it would be an absolute riot.

Researcher: Just to getting back to that system you know when we use Adobe Connect people are connected via Web browsers to get into the virtual classroom; did you actually find having avatars changed the perception of the group and they you felt about being with the group in training?

Participant1: Yes, yes, it definitely felt like I was part of a group when you can actually physically see people there. It makes you more aware of people within the group. I mean it was interesting actually I found that even though we didn't have to be standing as a group looking at you when you were introducing the next part of the training we all made our avatars turning around as a group and even though we did not have to do this at all as it didn't affect the training in any way. So yeah, you definitely feel more involved in what is going on by having these avatars and then you discover the inventory and that's when you start playing and going silly.

Researcher: Did the activities actually trigger your interest in virtual worlds?

Participant1: (pause) No, ahm (Pause), in some thoughts yes it would be nice to have a sort of play with Second Life and start creating these things because I was so impressed with the Apple Mac screen, you know, and the elevating keyboard and the giant printer and stuff like that. I could imagine it was an awful awful lot of work involved in creating things like that and I could see me loosing hours and hours of my life in the strive of perfection in creating these things so, no, I leave the development to other people and find simpler ways I could use it for training I think otherwise I would just get complete lost in there.

Researcher: I have to say actually, I have never really done anything in Second Life before and it took me 2 weeks to set that up and I was quite amazed and quite impressed actually by myself how quick you and how easy it actually is to build and to learn the scripting language in Second Life because there is so much material out there that you can use for free like scripts and stuff like that, so it actually looks very aehm, well there was a lot of effort into it I do not want to minimize that but just the amount of time I actually needed to set that up I was quite amazed how little that was and that was just evening work at home.

Participant1: So has somebody already done kind of a builders pack or scripting packs or things like that for you to use.

Researcher: There is so much online like help or tutorials also inside Second Life as well where you can go. I am part of a support group as well and when I have a question I just send them a question and it is a network of people that like to build and learn to build as well so they come back and say:" hi look here" or "hi this script is this and this and this" or they send you stuff. So it is kind of an environment where once you understand the material that is out there and you can use and how the communities work and you get part of a community, all of the sudden things seems so much easier. And there is a lot of scripting available for free and I got help for changing script like rotating the drum and I could modify scripts for what I wanted and after that things just fell in place.

Participant1: Ah that is actually interesting.

Researcher: If you need any help I can send you so much like tutorials or there are so much classes you can do with instructors in Second Life. You have online resources, you have YouTube videos that help, you have self-paced learning tutorials in Second Life, there is so much out there. If you are interested in start building and start trying things out feel free to ask. I think they are gonna close the Xerox island in the end of February and they are looking to have an open sim environment within the firewall so we would not run across the problems with the VPN connection.

Participant1: No yeah it was very interesting, very interesting.

Researcher: Well we covered this already. Would you use virtual worlds for L&D in training but you said already no.

Participant1: I would if I could find, I would if I thought it would add something. If you balanced the development time against the actual learning that takes place and how many people you need to train and that sort of thing. I still (pause) even though Second Life was very entertaining and it was most certainly a very interesting couple of days I still struggle to think of a program that would really really benefit from using Second Life, but certainly if I was asked to work on a project in the future and I thought that Second Life was the best way of doing it then I would not hesitate to use it. I don't want to be completely negative. I would use it but I just can't think of a way to use it at the moment.

Researcher: Okay, and what do you think were the main factors that you see have potential for learning and the ones that have least?

Participant1: Most potential, I suppose the novelty of it, is a good thing and that it will hold people's attention. It could keep their interest and is lot less chance for them to wander off checking emails and making coffee and sort of things. Having said that, that could also be a negative thing in that you then need to turn that focus to whatever it is you are trying to or what got them there for, if that makes sense. They'd be very interested in the world, the environment they find themselves in. You then got them to focus on what it is you brought them there for. But I think that would certainly keep people's attention and something that mentioned earlier as well you do feel more of a group of real people even though they are clearly avatars and the way they behave is very weird, ahm, jumping on the tables and sitting inside the table and things like that but you are more conscious of being part of a group and having responsibilities to your peers within that sort of virtual environment. I think when you are on your own at home in a virtual class it is very easy to just mute your phone and go off make yourself a cup of coffee. Whereas in this sort of virtual worlds is that peer pressure almost like face-to-face where you feel part of the group and you want to behave responsibly within that group. So that is a good thing.

Researcher: And the least one that would add value.

Participant1: I think, it takes an awful lot of work to orientate yourself within Second Life. I mean you have a group of people who wanted to be involved because we all volunteered and we are interested in exploring and validating this for learning. An excursion course that took 2.5 hours to get to a sort of level there we could navigate our way around but we are far far away from expert on it. But I think the orientation within Second Life is training in its own and stuff you have to learn for half day courses you have to get people fluent in Second Life before you can use it for various learning events. Having said that the way you did it was very very good I must add. It would have been to easy for you to just say: "okay this how you fly, right this is how you walk, right this is how you do this and that. I loved your idea of having the tasks and you had to complete one task before you could move on to the next and that type of thing. I liked having little things to do where you just go off and do it in your own pace and that sort of treasure trail, the way of training worked very well indeed, I have to say. So it was very very good.

Researcher: And did the technical skills required for this environment influenced your perception of using virtual worlds in learning and development?

Participant1: The way you say technical skills are you talking about the person rather than the equipment.

Researcher: You can actually comment on both if you want. On the technical side I mean navigation and also the technical requirements.

Participant1: The technical navigation it is quite easy to navigate your way around, I think. Just using the arrow keys on your keyboard I mean it is not really that difficult. Orientating the camera takes a little bit to get used to it is sort of counter intuitive. I think you don't need that much technical skills to navigate your way around and I think also if you constrained the environment a bit more, aehm, in, hmm what am I trying to say? It was great to be able to explore freely but perhaps if you had more fences or invisible walls or corridors you could sort of force people down the path you want them to take a little bit more which I think you would have to do to allow for the less technical people, aehm I cannot remember the girls name but there was one who often got lost and stuck inside things, aehm, So I think perhaps she should have rather done a proper learning so to say, not that this was an inproper but you need to constrain what people can do a little bit more and put more rules on stop them flying from all over the place. And then the less technical people should be able to navigate their way around with not too much trouble at all. From the technical requirements we did struggle. I mean I didn't but I ahve a fairly new pc that seems to work okay but the sort of technical equipment that we have within Xerox is almost a little bit out of date and probably adequate for checking your emails and that sort of things we need to do in the day but anything like this requires quite a big investment I think in terms of hardware.

Researcher: Okay that was my last question if you have anything else to say? Just one thing if you want to explore some more just for your own interest I found a professor who is a doctor who teaches some medicine in the States and he actually build a giant ovary and a giant testical to show his students, very interesting actually, but he was saying to restrict his students on what they can see what he is done is, if you want to explore it let me know and I send you the location in Second Life, he has done a tour where they have to take a little vehicle and the vehicle basically drives them around where they should be and he has a audio tour as well.

Participant1: That is a very very good idea.

Researcher: Well I asked him how long it took him and he told me it took him quite a lot of time in his lunch break but if you are interested it is really really interesting to see how he has done it. I just did not have the time to put a tour together but that was one thing I thought we could do with a giant printer you know, have them maybe sit on the toner or a piece of paper and have them fly around but that would require obviously much more programming .

Participant1: I do think it went very well. I mean when you fly out what i did later on I sort of flew high above it and from a distance then you get the idea of what is happening and how impressive it was. It is just when you right inside it, it is all a bit confusing, you are a little bit too close to everything what is happening and you are not quite sure should I walk down this way or that way or then I was onto the paper path and ran down the piece of paper myself. Yeah I think you need to restrict people sometimes, so people like me I suppose, to stop them from wandering off. No but I thought it went very well overall.

Researcher: Thank you very much. And I will have a little meeting in May when my thesis is finished to show you what I came up with and what the outcome actually was.

Appendix V – Example of Group discussions

Group 1 (January 20th)

[7:19] Participant 1: Agreed

[7:19] Participant 4: Thanks Guys

[7:19] Participant 4: Participant 3, got the card?

[7:20] Participant 3: yes

[7:20] Participant 1: Was interesting to compare notes

[7:20] Participant 1: And see Participant 3's latest shirt change

[7:20] Participant 3: quick change act over here

[7:21] Participant 3 gave you Group 1 Notes.

[7:21] Participant 1: Those breakout areas were quite cool though, only chatting amongst ourselves

[7:21] Participant 3: I thought it worked really well

[7:22] Participant 2: But we can do this already!

[7:22] Participant 6 gave you New Note.

[7:22] Participant 3: :-)

[7:22] Participant 1: (nods) :-)

[7:22] Participant 4 is Offline

[7:22] Participant 2: It's a complicated, clunky environment

[7:23] Participant 2: I didn't enjoy the activities today

[7:23] Participant 4 is Online

[7:23] MystiTool HUD 1.3.1: Entering chat range: Participant 4 (9m)

[7:23] Researcher: why not Participant 2

[7:23] Participant 1: The printer made sense when viewed from way way up in the sky, but very disorientating when inside it

[7:23] Participant 6: I was a bit distracted by the technology and owdering if i was doing the right thing to really absorb the information

[7:23] Participant 2: We seemed to be using SL just for the sake of it. I didn't experience anything that would have been easier/quicker/more effective using other tools.

[7:23] Participant 4: i liked the way that I had to read and think about where i was to go and what I was to do.

[7:24] Participant 1: Clearly lots of work went into that though, it's a work of art!

[7:24] Participant 4: It made me have to be engaged not just following along.

[7:24] Participant 1: Agree with Participant 2, this world looks great, but it feels like playing

[7:24] Participant 1: Agree with Participant 4 too, it's good to be immersed in the learning

[7:24] Researcher: isnt playing a good way to learn

[7:24] Participant 2: Surely a lot of this "interaction" and having to think could be done in other tools?

[7:25] Participant 4: I could see some applications that we could use it for L&D

[7:25] Participant 2: I didn't feel like I was playing. I felt like I was learning how to use SL rather than learning about printers

[7:25] Participant 1: I'm concerned with the development time versus the usefulness

[7:25] Participant 4: I agree with PARTICIPANT 2

[7:25] Participant 2: I'm VERY concerned about the user-base.

[7:25] Participant 6: I think in our area, I could see it as a way to get virtual groups to interract socially - but the time it takes to get up to speed is a huge barrier

[7:25] Participant 1: Yes ... I'm very nearly a SL wiz now, but just kept getting trapped under the fuser earlier

[7:25] Participant 3: I agree Participant 6

[7:26] Participant 4: I could see people being turned off by the technology barrires

[7:26] Participant 2: Getting people up to speed, making sure their computers are up to the task....and making sure we're using SL for something worthwhile.

[7:26] Participant 3: I think a lot of practice will be rewuired to get used to the environment

[7:26] Participant 3: and also to spell :-)

[7:26] Participant 4: I could see a large population of our CA's having issues with using it

[7:27] Participant 4: Lack of Skill set

[7:27] Participant 1: For social networking, and general fun, it's excellent ... but I'm still struggling to see a real world application that cannot be done well using other tools

[7:27] Participant 2: Ease of use (or lack of) is going to have a massive impact. If it takes HOURS to get up to speed then we're going to waste a lot of time.

[7:27] Participant 2: We'll end up training on SL itself....

[7:27] Participant 1: Yup

[7:27] Participant 6: Yes, it takes too long to get people up to a suitable skill level to get benefit from it educationally

[7:27] Participant 4: That would be the first task. training SL

[7:27] Participant 2: I couldn't care less about dressing my avatar up. I just wanted to get on a do something.

[7:28] Researcher: is it relevant for or job

[7:28] Participant 1: I can't honestly see how I could train using SL

[7:28] Researcher: for our job

[7:28] Participant 2: Relevant? Not at the moment, but maybe a bit for awareness

[7:28] Participant 4: I am struggling to find a practical application.

[7:28] Participant 1: May be good for year start meetings?

[7:28] Participant 2: I would look for a job elsewhere if I had to use this every day.

[7:28] Participant 6: I can't see an application in leadership & management

[7:29] Participant 2: Can you imagine a year start meeting through this? Seriously?

[7:29] Participant 6: I thought the paramedics example was better, the IBM was really cheesy!

[7:29] Participant 2: I had trouble yesterday when there was more than 3 people close to me!

[7:29] Participant 1: Didn't see the IBM at all

[7:29] Participant 1: We lost phones btw?

[7:30] Participant 4: back obn

[7:30] Participant 2: Paramedics and IBM could just as easily be done BETTER using other tools.

[7:30] Participant 2: Better, faster, cheaper

[7:30] Participant 4: I think that learners would walk away thinking that SL is cool but What did they learn?

[7:31] Participant 1: It does feel as though we are bending this to fit our needs, using a social networking 'escape from real life' tool for training

[7:31] Participant 2: ^^^ agree

[7:31] Participant 4: Technology is going to be a huge barrier. I dont see the investment in the technology to make it useful.

[7:31] Participant 2: I think I'll wait until Fourth Life arrives....

[7:31] Participant 1: Which is a shame, because I loved Researcher's 'treasure trail' yesterday to teach us the SL basics

[7:32] Participant 4: I plan to stay active in SL its really cool.

[7:32] Participant 2: Agree - Researcher's put a LOT of effort into this which really shows.

[7:32] Participant 2: I plan to stay well away from it!

[7:32] Participant 4: Thank you for your efforts.

[7:32] Participant 6: I have really enjoyed the session Researcher - lots of fun and really interesting - thank you

[7:32] Participant 3: Thank you Researcher,

[7:32] Participant 2: Cheers Researcher!

[7:33] Participant 6: byeeee!

[7:33] Participant 2: I'm going back to my First Life!

[7:33] Participant 1: Thank you Researcher ... lots of effort made by you and it worked really well.

[7:33] Participant 1: Off to First Life now

[7:33] Participant 1: It's called 'doing the dishes'

[7:33] Participant 2: Can you come and do mine?

[7:33] Researcher: enjoy Participant 1

[7:33] Participant 6 is Offline

[7:34] Participant 1: Yes Participant 2 - virtually

[7:35] Participant 2: You're too kind! Can I teleport them up to you?

[7:35] Participant 1 is Offline

[7:35] Participant 2 is Offline

Appendix VI – Participants Information Sheet

INFORMATION SHEET FOR PARTICIPANTS

Project Title: Using Multi-User Virtual Environments (MUVEs) to promote perceived user acceptance and adoption of MUVEs for teaching and learning

Introduction

Virtual training is an important component of our learning & development strategy. Learning & Development organizations have benefitted from the technologies used to deliver virtual learning activities globally using different types of media. In recent years, Multi-User Virtual Environments (MUVEs) have attracted a variety of educational institutions and corporations worldwide.

MUVEs have proven to enable learning professionals to develop learning activities beyond the possibilities of the real world. Therefore, the purpose of this study is to promote the acceptance and adoption of MUVEs as a learning environment amongst educators.

Learning activities

During this study you will be asked to participate in a learning activity which will take place in the MUVE Second Life (SL). The activity allows you to practice navigation skills in SL, experience different functionalities of the virtual environment and provide authentic examples of already existing learning activities created by other educational institutions and organisations. Please find below a table with the activities, a short description and the estimated time per activity:

Name	**Descripton**	**Time in hours**
Second Life Orientation & Introduction	This activity provides you with the necessary navigation skills for Second Life and also introduces you to the Xerox Innovation Island in Second Life.	2.5
Homework	This shall support the development of the navigation skills by providing instructions on how to change appearance of the avatar.	0.5
Main Activities	The activities will focus on how Second Life is used in different businesses and how we could use Second Life in our environment. It will display movies of existing	2.5

	educational use of other companies, demonstrate the document transfer from computer to a printer, and provides collaboration environment through text-chat.	
Discussions	Provides the opportunity to discuss the experience you had in Second Life with your colleagues and enables you to make social connections to your colleagues in Europe and the US.	1

Your Participation

Your participation is completely voluntary and you are not compelled to volunteer by virtue of pressure from interpersonal relationships or professionals management asymmetries. You can withdraw from the activity at any time without penalties imposed. If you decide to withdraw, all collected information from their participation will be removed and not included in the research documentation.

There are no anticipated risks to your involvement in this study. It is anticipated that during the activity you will not only experience a new technology for future training opportunities but also collaborate and share your experience as well as make social connections with colleagues from different countries.

In addition each participant needs to provide their consent in written form by signing a consent form provided by the researcher. As part of this study, you will be required to install the Second Life software which is freely available online. Further technical instructions will be sent out after you have sent a copy of the signed consent form to the researcher.

Information collection

During the learning activity the researcher will collect information via screen captures, log files from text-based communication, questionnaire and interviews. The information will be anonymised and stored in accordance with the Data Protection Act at Trinity College Dublin in Dublin. The information will be analysed and interpreted based on the pedagogy and learning theories underpinning this research project.

In the extremely unlikely event that illicit activity is reported to the researcher during the interview the researcher will be obliged to report it to appropriate authorities. Therefore, please do not mention third parties during the activity or interviews.

The documentation of the findings will be published and disclosed to a body of examiners in Trinity College Dublin as well as external examiners. The researcher will hold a debriefing session after the findings of this project have been published. During this session the collected data and a summary of the analysis will be presented. This session shall also provide you the opportunity to examine how your contributions to the study have been used and interpreted, and to ensure that your contributions have not been used inaccurately or out of context.

Conflict of Interest

Although the researcher is conducting the learning activity herself, she is unaware of any conflicts of interest regarding this research. The data collected during this study will not be used against you in any way.

If you require further information or have questions during or after the research project, please do not hesitate to contact the research at Wencke.Adrian@xerox.com or 00353-1-608-6844.

Appendix VII – Participants Consent Form

INFORMED CONSENT FORM

LEAD RESEARCHERS: Wencke Adrian

BACKGROUND OF RESEARCH:

Virtual training is an important component of our learning & development strategy. Learning & Development organizations have benefitted from the technologies used to deliver virtual learning activities globally using different types of media. In recent years, Multi-User Virtual Environments (MUVEs) have attracted a vast interest from educational institutions and corporations worldwide.

MUVEs have proven to enable learning professionals to develop learning activities beyond the possibilities of the real world. Therefore, the purpose of this study is to promote the acceptance and adoption of MUVEs as a learning environment amongst educators.

PROCEDURES OF THIS STUDY:

During this study you will be asked to participate in a series of activities which will take place in the MUVE Second Life (SL). The activities allow you to practice navigation skills in SL, experience different functionalities of the virtual environment and provide authentic examples of already existing learning activities created by other educational institutions and organisations.

Your participation is completely voluntary and you can withdraw from the activity at any time without penalties imposed. If you decide to withdraw, all collected information from your participation will be removed and not included in the research documentation.

In addition each participant needs to provide their consent in written form by signing this document and return it to the researcher. As part of this study, you will be required to install the Second Life software which is freely available online. Further technical instructions will be sent out after you have sent a copy of the signed consent form to the researcher.

PUBLICATION:

The results of this research will be published in a dissertation as part of a Master degree in Technology and Learning at the Department of Computer Science and Statistics at Trinity College Dublin in Dublin.

Individual results will be aggregated anonymously and research reported on aggregate results.

DECLARATION:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.

- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- *<If the research involves viewing materials via a computer monitor>* I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
- I have received a copy of this agreement.

PARTICIPANT'S NAME:

PARTICIPANT'S SIGNATURE:

Date:

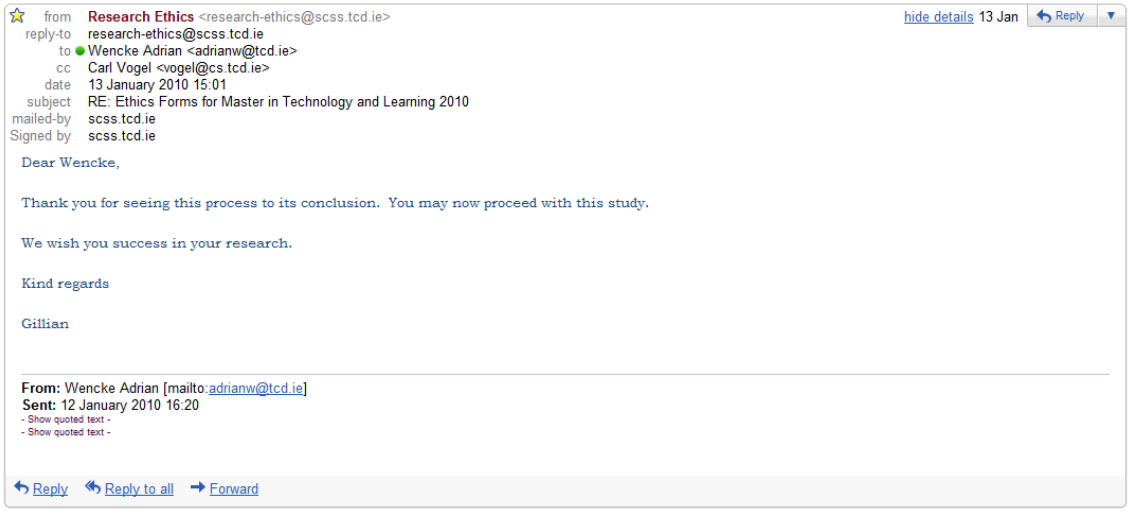
Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

RESEARCHERS CONTACT DETAILS:

INVESTIGATOR'S SIGNATURE:

Date:

Appendix VIII – Ethical Approval



from **Research Ethics** <research-ethics@scss.tcd.ie>
reply-to research-ethics@scss.tcd.ie
to Wencke Adrian <adrianw@tcd.ie>
cc Carl Vogel <vogel@cs.tcd.ie>
date 13 January 2010 15:01
subject RE: Ethics Forms for Master in Technology and Learning 2010
mailed-by scss.tcd.ie
Signed by scss.tcd.ie

hide details 13 Jan Reply

Dear Wencke,

Thank you for seeing this process to its conclusion. You may now proceed with this study.

We wish you success in your research.

Kind regards

Gillian

From: Wencke Adrian [mailto:adrianw@tcd.ie]
Sent: 12 January 2010 16:20
- Show quoted text -
- Show quoted text -

Reply Reply to all Forward