An exploratory case study in the use of Multi-User Virtual Environments (MUVE) to support and enhance a community of practice

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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.

Signed: _____

Paul J Cronin

2011

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Abstract

This paper describes an exploratory case study investigating how a traditional Community of Practice transitions to and establishes in a Multi-user virtual environment (MUVE) and seeks to understand to what extent the technology would support, facilitate and enhance that community. "Communities of Practice can be defined as groups of people who share concerns, problems or passions about topics and who deepen their knowledge and expertise in an area by interacting on an ongoing basis" (Wenger et al, 2002). Multi user virtual environments are available under different names and possess a number of recurrent features that include: persistence of a three dimensional environment, a networked shared space allowing multiple users to participate simultaneously, virtual embodiment in the form of an avatar (3-D representation of the self which can be personalised), and interactions between users occur in real time. Similarities to the real world such as topography, movement and physics provide the illusion of being there. (Dede et al. 2004). In a virtual world, users also supply the content but the content is not restricted to text or flat images but instead is three dimensional where the environment itself is created by the users.(Rutz, Collins, Mina. 2008) In this case study, a co-located traditional Community of Practice in professional coaching, working within a multi-national corporation was transitioned to a multi-user virtual environment. The community was tasked with establishing its own presence in that environment by following an eight step process and outlines the steps taken to prepare the community in transitioning to and establishing in a MUVE using a participative design approach. The community established a building and artifacts were created sharing the community's background, language, and professional qualification structure. Finally the community attempts to capture its tacit knowledge hoping to make tangible the intangible. The case study uncovers a number of themes which indicate that the usage of MUVE's do support communities of practice within certain criteria.

List of abbreviations

MUVE	Multi User Virtual Environment
VW	Virtual World
CoP	Community of Practice
vCoP	Virtual Community of Practice
Rezzed	Unpack an object in the Second Life MUVE
VLE	Virtual Learning Environment
Voice Chat	Communication through headset with microphone
Teleport	To instantly move to another location in Second Life
SLURL	Second Life URL, an addressing function in Second Life using a proprietary coordinate system
Machinima	Filmmaking within a real-time, 3D virtual environment
Note-card	Transferable object in Second Life usually containing text
Client Viewer	The Second life client viewer is required to view and interact with the virtual environment
In-world	this term relates to happenings within the Multi User Virtual Environment

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Chapter 1 - Introduction to this Study

This study explores the extent to which a Multi User Virtual Environment could support and facilitate a Community of Practice. Communities of practice (hereafter abbreviated as CoP) are groups of people who share a concerns, problems or passions about topics and who enhance their knowledge by conversing on a regular basis. Wenger et al (2002). Communities of Practice can be located anywhere and with the enhancements of technology in the past twenty years, they evolved to become virtual Communities of Practice (hereafter abbreviated as vCoP), using technology to collaborate and share knowledge. Typical technologies currently used by vCoP's might be wikis, forums or shared databases across distributed platforms.

Multi user virtual environments (hereafter abbreviated as MUVE) provide a three-dimensional networked environment populated by multiple users, they provide opportunities for users to collaborate and experience shared environments without requiring physical co-presence. Girvan & Savage, (2010). There are similarities to the real world such as topography, movement and physics, all which provide the illusion of being there (Dede et al., 2004).

The author sought to determine how to transition CoP's into MUVEs and explore how this technology supports, facilitates or enhances a community's collaboration, knowledge sharing and growth. This paper outlines the relevant literature in relation to research on CoP's and their evolvement into vCoP's, then aligned with the literature this research transitions a traditional CoP to a virtual one by enabling it to become established in a MUVE. An eight stage, two phase process was created to manage this transition. Phase 1 scaffolded participants on the technology preparing them for a transition and establishment while phase 2 focused on the establishment and creation of artefacts to represent the community and enhance its knowledge sharing, this phase used a participate design approach whereby the participants led the establishment and creation of artefacts .

The methodology chosen for this research was a single exploratory/descriptive case study as this method provided the best flexibility in allowing for emergent themes unique to the community present themselves for data capture. The data was collected from four sources: participant – observation, direct observation, artifacts, and participant interviews. A detailed analysis of the data and findings is presented along with emergent themes which are discussed in detail. The study concludes with a final discussion answering the research question and sub questions.

1.1 The Research question

Research question:

Given a traditional Community of Practice (CoP) with no experience or presence in a Multi User Virtual Environment, how might that community become established, supported and enhanced in this environment?

Sub questions:

What method can be applied to evolve a traditional community of practice into Multi User Virtual Environment?

How would it represent itself in the Multi User Virtual Environment and how would the technology affordances lend themselves to the creativity of the CoP ?

1.2 Dissertation Roadmap

This is an exploratory study into how a Multi User Virtual Environment might facilitate, support or enhance a CoP. A literature review of current research in this area and applicable areas of research are conducted which inform the research design. The design chapter outlines the design considerations that emerged from the literature and the tools and affordances of the chosen MUVE which may be leveraged to meet these requirements. Following this an overview of the research study is provided in detail. To answer the research question a single case study approach is described in the methodology chapter. The case procedure is outlined followed by the data collection and data analysis methods used..Finally the conclusion seeks to answer the principal research question, discusses the limitations of this study and presents unexpected findings and recommendations for future research.

Chapter 2 - Literature Review.

2.1   Introduction.

The purpose of this literature review is to present and understand current research into CoPs operating in virtual worlds. Communities of Practice are first defined and then virtual Communities of Practice are discussed. Multi-User Virtual Environments are then covered. Participative design and constructivism is explored as the theoretical basis to which the author aligns his research and then the scope comprising of all five areas of literature is applied to the context of this research In the conclusion of the literature review, the author discusses his hypothesis of the effectiveness of utilising MUVE's for supporting and facilitating a community of practice.

2.2   Methodology

During the course of writing this literature review, the researcher used the following resources to access books and online journals: Trinity College Library service, Online Journal databases. Google Books, Google Scholar, Published Literature, IBM Books 24X7,
The following keywords were used in search engines to help identify relevant literature in the area being researched: Communities of Practice, virtual community of practice, Multi-User virtual environment, cop, virtual environment, participative design, communal constructivism, coaching, case study research.

2.2.1   Main Authors.

The following are the principal authors & researchers whose works informed this research study: Wenger, E. Lave, J. Daguid. B, Bandura. A, Brown. J.S, Hildreth.P, McLure Wasko & Faraj, Ardichvili, Emery, F, Vygotsky L, Yin.R.

2.3   Communities of Practice.

'A Community of Practice (CoP) can be defined as being everywhere. We all belong to a number of them—at work, at school, at home, in our hobbies. Some have a name, some don't. We are core members of some and we belong to others more peripherally….Whatever forms our participation takes; most of us are familiar with the experience of belonging to a community of practice'. (Wenger, 1998, p 2)

Communities of Practice are groups of people who share a concern, set of problems or a passion about a topic and who enhance their knowledge by conversing on a regular basis. Wenger, McDermott, Snyder (2002)

Communities of Practice move through various stages of development characterized by different levels of interaction among the members and different kinds of activities (Wenger 1998). Garavan and McCarthy, (2008) describe collective practice as relations among the person, activity, and situation. Brown and Duguid (2001) and Wenger (1998) have emphasized key features of collective practice including the participation of members in communal activities, the social construction of meaning and understanding, and the mutual engagement, negotiation and development of a shared perspective or meaning. Communities of Practice emphasize social constructivist pedagogy and learning as an individual activity is not as prevalent. Handley et al, (2006). Wenger et al, (2002). Wenger & Synder, (2000).

Social learning theorists suggest that communities provide a foundation for sharing knowledge. It is believed that individuals can learn by observing and modeling other people. Vygotsky. (1978). Humans have evolved an advanced capacity for observational learning that enables them to expand their knowledge and skills on the basis of information conveyed by modeling influences. Bandura. (1989). Social constructivists, such as Cobb and Yackel, (1996) understand learning as an individual's responsibility and the community is the means by which people learn. Communities provide a safe environment for individuals to engage in learning through observation and interaction with experts and through discussion with colleagues. Communities of practice are also recognized as groups within which soft or tacit knowledge is shared. Hildreth et al. (2000).

Tacit knowledge can be described as informal. Tacit knowledge collects all those things that we know how to do but don't know how to explain, it is a type of knowledge that is not captured. It can be seen only in action. Polyani, (1958) The Community of Practice is one of a number of knowledge management tools and each organizational environment requires a different set of tools. Additional mechanisms must be developed to manage tacit knowledge. Roberts. J. (2006)

New technologies such as the Internet have extended the reach of our interactions beyond the geographical limitations of traditional communities, but the increase in flow of information does not obviate the need for community. In fact, it expands the possibilities for community and calls for new kinds of communities based on shared practice. Wenger, (2006).
Hildreth et al (2000), state that the increased globalization and internationalisation of business is making operations more geographical thus asking the question; can communities of practice become virtual?

2.3.1   Summary.
Communities of practice are groups of people with a shared enthusiasm or passion. They share knowledge motivated by their passion and learning typically occurs through observation and interaction with experts in a social context. Communities of practice are recognized as groups within which soft or tacit knowledge is shared through collaboration and discussion. Tacit knowledge can be described as informal and not typically captured within communities of practice. Organisations are becoming more globalised through technology and this is expanding the possibilities for a new kinds of communities based on shared practice.

2.4   Virtual communities of Practice (VCoP).
Given the question posed by Hildreth et al, (2000) and now, over a decade after they wrote that paper when technology has progressed since in leaps and bounds, what makes a CoP virtual and how is it defined? Have CoP's taken advantage of the many collaborative technologies available in the last decade? In their 2008 paper, Pat Gannon-Leary and Elsa Fontainha state: A virtual Community of Practice (vCoP) can be defined as a network of individuals who share a domain of interest about which they communicate online. The practitioners share resources (for example experiences, problems and solutions, tools, methodologies). Gannon-Leary and Fontainha,

(2008)

Given this, it is important to explore the types of technology typically used by CoP's over the two decades and some of the motivations for their usage. The Bulletin Board service or BBS was a popular form of communication amongst various groups from as far back as the 1980's, this then progressed to online forums for debate, which are still widely used today to share knowledge. These online forums could be considered communities supported by ICT, thus virtual. In these online communities, Knowledge sharing can be narrowly defined as instances whereby a member responds to a posted problem by sharing what they know. Sharratt and Usoro, (2003). Usenet or Newsgroups saw mass collaboration and conversations occur as people saw the power of connecting to others beyond their usual geographical reach. The early 1990's saw Web 1.0, a browser based point and click interface based on new document protocol: HTTP. McLure Wasko, M., & Faraj, S. (2000) In 2005 the coining of the term Web 2.0 emerged, where new software and tools allowed the end user to be part of the web in ways not seen before; this further led to the rise of Social media as we know it today where hundreds of different technologies support countless groups in all shapes, forms and sizes. Wenger, White & Smith, (2009).

From a technology perspective the needs of any community tend to be simple, any technology that facilitates communication and places to talk, whether person to person, person to group or group to group is important. Technology that helps to identify individuals and groups according to their domains of knowledge is valuable. Gongla and Rizzuto (2001).

Electronic communities can provide access to a group of peers dealing with similar knowledge issues. Through this dynamic process of interchange, knowledge is constantly being regenerated and recontextualized, thus maintaining its relevance to the community. (McLure Wasko & Faraj, 2000). Virtual CoPs can grow up based on interests rather than on physical proximity enabling collaborations Gannon-Leary and Fontainha (2007) Not everyone shares these perspectives however: in their 2005 paper, Huysman and Wulf postulate that one of the major problems in the debate on IT enabled communities is the over enthusiasm toward technological possibilities. The assumption that IT can positively support and improve knowledge sharing while ignoring the social conditions that trigger or hinder people in sharing knowledge is particularly problematic. Huysman and Wulf (2005).

This view, while valid, is somewhat counteracted by the perspective of McLure-Wasko & Faraj

which state "successful communities have members that act out of community interest rather than self-interest"; and further state .."people who participate in electronic communities have a strong desire to engage in intellectual exchange with a community of practice'; (McLure Wasko & Faraj, 2000) This indicates certain motivational factors need to be already present for successful participation in a community of practice whether it is supported by technology or not, this stance is further reinforced by Ardichvili et al who have found in their VCoP-related research that the majority of study participants viewed their knowledge as a public good, belonging not to them individually, but to the whole organization. When such perception exists, knowledge exchange is motivated mostly by moral obligation and community interest considerations, not by narrow self-interest. Ardichvili et al, (2003).

What technologies then are Virtual Communities of practice likely to use today? In their 2009 book, Digital Habitats, Etienne Wenger, Nancy White and John D. Smith outline a number of factors and ways of approach when stewarding technologies for use by communities. Web Boards, Wikis, Blogs, RSS Feeds Voice over IP, Teleconferences, Videoconferences, Shared whiteboards, Instant messaging, podcasts and immersive environments to the social phenomenons of Facebook© and LinkedIn©, with hundreds of millions of users worldwide, each with their own internal group systems. Wenger, White & Smith, (2009).

This list is not exhausted; it is a partial glimpse on some commonly used tools amongst communities today. This paper explores one particular technology for the facilitation and support of a community of practice: Virtual worlds or otherwise known as a Multi-User Virtual Environment (MUVE) and how it might be used to support and facilitate or enhance a Community of Practice.

2.4.1 Summary.

Virtual Communities of Practice are evolvements of standard Communities of Practice; they use the affordances of technology to increase their reach and membership thus receiving input and collaboration well beyond their originating geographies. The technologies themselves facilitate and support collaboration and communication in these vCoP's, relying somewhat on certain motivational characteristics and desire to share within their members in fuelling contributions to their chosen community. There are many technologies in the public sphere today that facilitate communities, some with hundreds of millions of members.

2.5 The Multi-User Virtual Environment (MUVE).

Multi-User Virtual Environments incorporate computer graphics, audio and network connectivity to simulate the experience of real-time interaction between multiple users in a shared, computer generated, three-dimensional virtual world or environment. Each end user runs a control interface program on a ``client'' computer connected to the internet. The interface program is a window to the virtual environment and simulates the experience of immersion by rendering images/sounds/etc. of the environment as perceived from the user's window viewpoint. Each user is represented digitally in the shared virtual environment by an avatar which is rendered on every other users interface. MUVEs are available under many names and possess a number of recurrent features that include shared space allowing multiple users to participate simultaneously. There are similarities to the real world such as topography, movement and physics that provide the illusion of being there.

Dede et al, (2004). In a virtual world, users supply the content but the content is not restricted to words or flat images but rather three dimensional. The environment itself is created by the users. The environment can be part of the content, it can facilitate the content. Rutz, Collins, Mina. (2008)

2.5.1 MUVE Affordances.

Virtual worlds provide participants with the ability to engage in long-term, coordinated action. In these spaces, cultures and meanings are more important among the participants, rather than as part of a predefined story or narrative. Thomas, D., & Brown, J. S., (2009).

Dalgarno & Lee (2010) state that it is the fidelity of the representation, along with the types of interactivity available within the environment, that will lead to a high degree of immersion and consequently, a strong sense of presence. They go on to postulate identification of certain MUVE learning affordances, one of which aligns with this study: Virtual Learning Environments can be used to facilitate tasks that lead to richer and/or more effective collaborative learning than is possible with 2-D alternatives. (Dalgarno & Lee, 2010. p 23).

The growth and functionality of virtual worlds suggests that they might provide a powerful new platform for learning and supporting virtual communities. Virtual worlds have the potential to be valuable platforms for communities of practice in supporting their needs in an idealistic manner

(Goel, Junglas, & Ives, 2009).

2.5.2   Summary.

Multi User Virtual Environments are visual, three dimensional, computer generated spaces in which users, represented by an avatar can traverse and converse with other users through a 'client' interface or window. The environment is created by the users who are immersed in the technology. The environments affordances are deemed to enhance facilitation of collaborative tasks amongst groups and communities.

2.6   Discussion.

The author has outlined the main areas of literature relevant to this study: Communities of Practice, Virtual Communities of Practice and Multi user virtual environments. The literature indicates communities of practice are close knit groups of people where knowledge sharing and learning are at their core. They learn and further their knowledge through sharing of experiences and discussion. With the changing pace of technology Communities of practice have evolved into virtual Communities of practice and can be geographically distributed, vCoP's typically leverage 2D technologies such as forums and wikis or shared databases to collaborate and share knowledge. McLure Wasko, M., & Faraj, S. (2000)

MUVEs offer a domain rich 3D immersive environment. This environment is created by the users and extends the potential to bring added value and enrichment to CoP's or vCoPs by better supporting and facilitating their needs through its affordances. Some potential areas are enhancing knowledge sharing and creating of knowledge artifacts which can be interacted with and the potential also exists in representing a communities' informal or tacit knowledge. In all of the literature explored however, the author did not uncover any recorded examples where a virtual Community of Practice had transitioned from standard technology platforms to MUVEs, nor did the author find any examples of how traditional CoP's might transition to a virtual capacity. The author sees a research opportunity to add to the literature in this area by carrying out a research study into transitioning a traditional Community of Practice to a virtual Community of Practice utilizing MUVE technology.

2.7   Conclusion

This chapter had reviewed the current literature in relation to the areas of study. In the next chapter the author will discuss the design of the research and main artefact.

Chapter 3 - Design

3.1   Introduction.

The author deemed it appropriate for the CoP participants to set their own scene in establishing themselves in the virtual environment and relied on the literature to ensure a selection of pedagogical and technological foundation for the study to proceed. This led to the formation of a process which any CoP could follow to establish itself in a MUVE. The process had to be explicit enough to encourage a reasonable transition and establishment to a MUVE and at the same time allow for emergence of unique attributes of a CoP.

This process is in two phases: Phase one is three structured communal face to face workshops which provide the necessary facilitated steps with introducing a CoP to the technology. Phase two focuses on facilitated establishment through interaction with the technology and construction of artifacts. The process allows for communities being free to choose whatever they wish in support of their establishment while the literature backed strategy provides the overall objectives for the workshops. The formation of the process is outlined in the below table and accompanying text.

3.2   The purpose of the research

Research question:
Given a traditional community of practice (CoP) with no experience or presence in a Multi user virtual environment, how might that community become established, supported and enhanced in this environment?

Sub questions:
What method can be applied to evolve a traditional community of practice into Multi user virtual environment?
How would it represent itself in the Multi user virtual environment and how would the technology affordances lend themselves to the creativity of the CoP ?

3.3   Literature informing design.

The below table illustrates key literature consulted and its implications on the design of the artifact.

Domain Literature reviewed	Element taken from Literature	Implication for Process Design	Implementation in Artefact	Technology Affordance
Social Constructivisim (Vygotsky 1978) Lesser, E. L., & Storck, J. (2001). Communities of practice and organizational performance	Social interaction plays a fundamental role in development	Environment that promotes communication and interactivity with ease of use as close as possible to real-world scenarios.	An environment that allows for synchronous communication and visual clues.	Second Life MUVE. Allows for synchronous text chat and VoIP, residents can see each other.
Bandura (1977). Social Learning Theory. Probst, G., & Borzillo, S. (2008). Li, L., Grimshaw, J., Nielsen, C., Judd, M., Coyte, P., & Graham, I. (2009), Evolution of Wenger's concept of community of practice.	Learning by observation of behaviours; Social setting allowing participants learn from observations and each other.	Attention; Retention;repoduction. Scaffolding on the technology to allow for confidence later in the study.	MUVE that grasps attention of individuals, facilitates retention and understanding through knowledge artefacts in a domain rich context; Allows movement/replication and communication as in real world.	Second Life MUVE allows for creation of items which participants can interact with. Allows replication or construction of any imaginative item. Allows users to interact with each other as in real world
Emery, F., 1989, 'Participative Design for Participative Democracy. Van Eijnatten, Frans .M Shani, A.B. (Rami), & Leary, Myleen M., 2008; Sociotechnical Systems Designing and Managing Sustainable Organizations. Scardamalia, M., & Bereiter, C. (1993). Hinds, P., & Kiesler, S. (1995). Communication across Boundaries: Work, Structure, and Use of Communication Technologies in a Large Organization	Participative Design rests on a democratic model that seeks in developing a ground up design for the organisation without the help of an outside expert, six key elemements should exist to allow for this to happen	The participants should be in control of their own destiny with the understanding of trust between researcher and each other as well as their professional ethos to drive their establishment. Support provided for what the community requires for effective establishment	The participants, once scaffolded on the usage of the technology should take charge of their establishemnt in the MUVE, what they choose, as a group should be implemented. The group should act democratically in their decision making.	Sturctured workshops with instrucitonal scaffolding at the beginning and freedom to choose thereafter. Support tecnically
Communities of practice, Lave & Wenger (1991); Wenger, E., McDermott, R., and Snyder, W. (2002) Tedjamulia et al. (2009); Tynj P. (2008). Perspectives into learning at the workplace. Wright, J. (2005). Workplace coaching: What's it all about?. Lin, H.-F. (2008). Determinants of successful virtual communities: Contributions from system characteristics and social factors	Communities develop their practice through a variety of activities and sharing of experiences	Environment should allow for: Communication, Problem solving, Information and experience sharing, Synergy and coordination, mapping knowledge/Documentation.	Discussion capabilities via voice or text chat of topic chosen by CoP members. Information and experience sharing/mapping of knowledge/Documentation: Design and implementation of artefacts relating to that CoP Synergy/Coordination: Facilitation to meet objectives	Tasks set to participants in each workshop session: Artefacts creation. Best use fo the technology. Teaming & collaboration amongst members of the CoP. Purpose built community that participants are enocouraged to shape as their own (overall task)
MUVE: Pedagogy, Education and Innovation in 3-D Virtual Worlds; Walker V.L. (2009) ; Digital Habitats: Stewarding technology for communities. Wenger, White & Smith(2009); Robbins, S., Roby, T., & Johnson, C., (2007). Zhang, J., Scardamalia, M., Reeve, R., & Messina, R. (2009). Salmon, G. (2009). Oliver, M., & Carr, D. (2009). Ke, F., & Hoadley, C. (2009). Evaluating online learning communities. Chou, C. (2009). Virtual Worlds for Organization Learning and Communities of Practice	Building, Secure Environment, computer literacy.	Prepared environment, Secured against unwanted intrusion. Pre-knowledge of MUVE for participants, formal design with informal experience	Preperation of collaborative workspace in MUVE. Invite only. Scaffolding of participants on usage of MUVE, Formal establishment of a CoP presence.	Secure Island platform. Teaching of participants how to use SL interface, treasure hunt to build confidence in interacting with objects and to promote ideas for establishment within the MUVE
Muve: Communities of Practice and virtual learning communities: benefits, barriers and success factors Gannon-Leary P. Fontainha E, (2007); Digital Habitats: Stewarding technology for communities. Wenger, White & Smith(2009) Messinger, P. R, et al (2009).	Usability of technology; trust in, and acceptance of, ICTs in communication; a sense of belonging common sense of purpose;	prepared environment, Pre-knowledge of MUVE for participants	Scaffolfing of participants on usage of MUVE to enable effective functioning withing the environment.	Instructing participants on how to use Second life interface, overcoming the learning curve of how to use the technology so the technology can be used. Face to face meetings initially, allow participants to learn from each other in structured workshops

Table 1. Literature informing the design.

The relevant literature was explored to help establish a theoretical foundation for the study. Theories in social constructivism, CoPs, virtual CoPs and participative design informed the design of a process consisting of eight communal workshops facilitated over two phases. Phase 1: Scaffolding, Phase 2: Establishment.

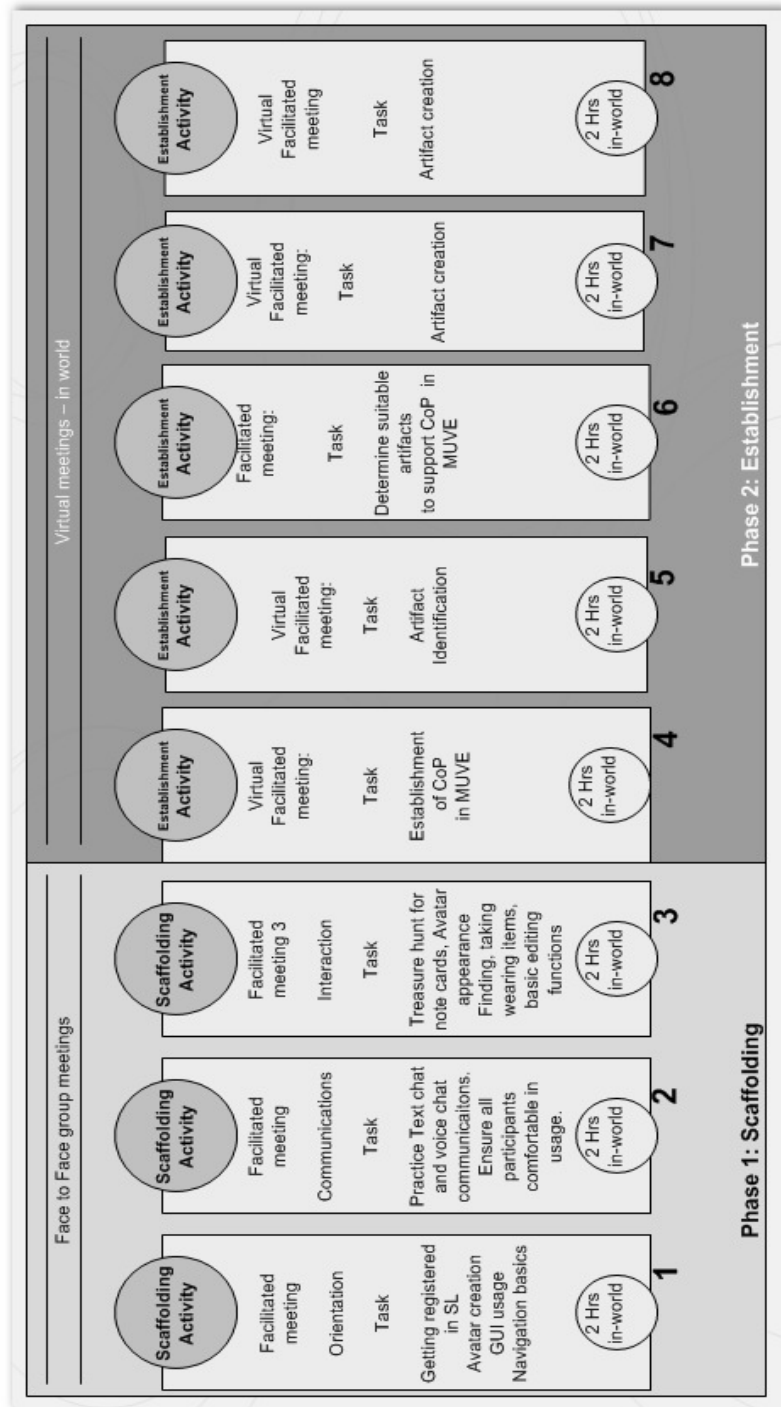Figure 1 below outlines this approach graphically.

Figure 1. Two phase process.

3.4. Phase 1 – Scaffolding.

This phase called for dedicated time spent preparing the CoP participants for immersion in the technology. It was deemed pertinent by the author that this would lead to a more successful establishment as the CoP participants would be more comfortable with the technology and appreciate its potentiality for enhancing their practice. The theoretical fundamentals on how communities come together to share knowledge and a passion for a subject was explored. Social constructionism formed the pedagogical basis for phase 1 and phase 2 as social interaction plays an important role in development. Humans can function, with instruction or the provision of support to promote or enhance learning that then becomes less required as performance or understanding increases. Vygotsky, (1978) People learn through imitation or learning by observation of behaviours. Bandura, (1977, 1988). Constructionism appears to be an obvious pedagogy for use in virtual worlds which have tools that afford the building of objects in a flexible and persistent environment. Girvan & Savage, (2010)

The author then cross referenced some key literature exploring the use of technology in supporting or facilitating communities of practice from a constructionist perspective. Probst & Borzillo (2008). Li et al (2009). One important piece of literature suggests such criteria as computer literacy and maintaining a secure environment aided in the nurturing and facilitation of a community of practice utilizing technology in general. The authors conclude in many communities' registration and orientation are two important and ongoing technology stewarding activities and that small communities may want orientation to be a personal intimate experience. They pose the question: 'What is the minimum they need to know before participating? "Enabling initial participation quickly is the key principle' and furthermore, 'a mix of formal design with informal execution' is usual. Face to face opportunities are also good for spreading technology skills as the people can observe each other. Wenger,White & Smith (2009, p 139).

The author determined the process called for a series of scaffolded instructional workshops to enable a community learn basic functioning in a MUVE. It was also hypothesized by the author, when functional performance in the virtual environment was achieved by the participants that he should 'step back' and allow the participants to learn by doing and from each other through imitation or observation. Vygotsky, (1978); Bandura, (1977)

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Three dedicated scaffolding workshops were designed as the first steps in the process and form Phase 1. The workshops are designed to take place, face to face in a classroom format, each for two hours duration. All participants should be equipped with their own computers and should receive an introductory presentation on Communities of Practice and Multi User virtual environments to set the scene. All CoP participants should receive a workbook which outlines sets of instructions to follow for that particular workshop. The workbooks hold a series of objectives with supporting literature explaining how to meet the objectives. In this case, the workbook literature is made up from dedicated resources from Linden labs support website, the creators of Second Life. (https://support.secondlife.com/)

The following table outlines the details of the phase 1 workshops.

Phase	Work shop	Workshop Objectives	Tasks	Purpose
1: Scaffolding	1	Orientation	• Download and install Second Life client viewer. • Register an account with Linden labs. • Choose Username and Avatar. • Basic avatar personalization. • Navigation Basics (Walk, fly, Teleport etc.).	The purpose of the tasks in workshop 1 are to have CoP participants install the software client viewer and register an account with Linden Labs to gain access to the Second Life platform. Participants then create an avatar, enter the environment and learn the basic navigation movements to allow their avatars traverse the environment.
1: Scaffolding	2	Communication	• Recap on learning from workshop 1. • Communication in Second life using text chat function. • Communication in Second life using audio/microphone chat function. • Person to person communication. • Person to group communication. • Group to Group communication.	The purpose of the tasks in workshop 2 are to ensure the communication functions are working in Second life for all participants. This includes text chat and voice chat through microphone headsets. A recap on Workshop 1 helps retention. All participants shoud be able to send a text chat message to each other and hear each other through their computer speakers.
1: Scaffolding	3	Interaction	• Avatar appearance and editing • Creating a basic object • Taking objects • Wearing objects • 'Treasure hunt' in Second Life to practice the above mentioned tasks.	The purpose of the tasks in workshop 3 are to change the appearance of the participants avatars to give confidence in their self projection in the environment. The treasure hunt allows participants practice navigation and collecting the treasure (notecards, screenshots) helps build object interaction confidence. Basic object creation and editing should be practiced to enhance object interaction and confidence which will be needed when it comes to phase 2 of the workshops where participants should appreciate the potentiality and interactivity with objects and the environment. This will lend itself to thair artifact creation.

Table 2: Phase 1 workshops

These workshop activities, through their nature and face to face context, should allow the CoP participants to socially interact and learn from each other.

3.5.   Phase 2 – Establishment

For phase 2, the author determined another dimension needed to be considered whereby CoP participants are best placed to determine their own establishment in the MUVE. Guidance and facilitation would be required to keep a CoP moving toward an establishment objective however unrestricted enough to allow for emergence of unique attributes of a CoP. The author consulted literature in the area of communities of practice, participative design and MUVEs.
The main elements from this area of literature indicate that communities typically share values, passions and a willingness to share knowledge. Communities develop themselves and their practice through activities such as sharing of experiences and stories. Lave and Wenger. (1991). A community of practice is then a cooperative, and in the instance of this research context, a cooperative in learning. Cooperative learning is process driven; typically a social process and those involved must pay attention to that process to achieve a desired end-point. Cooperative learning has a large social dimension, it is typically enjoyable and as a result, outcomes arise which are not usually considered academic. McConnell, D. (2000). Van Eijnattenet al, (2008). All contributions would be to the collective knowledge of the community. Scardamalia & Bereiter, (1993). The author consulted points outlined in various literatures on supporting Communities of practice experimentation with technology, specifically various areas of the Second Life Environment, Wenger, White & Smith, (2009) Goel et al, (2009). McLure Wasko & Faraj (2000), Robbins et al, (2007) and determined the objectives should be to facilitate establishment and to help focus a community on setting goals and realizing a desirable future. This should be done through facilitated discussion, preferably in world, utilising the technology either through text chat or audio voice chat. Zhang et al, (2009), Chou, C. (2009)
In knowledge building, conceptual artifacts are an important product, used by community members as tools that enable further knowledge advances. Discussion is central to collaborative work and a knowledge building environment needs multiple ways of representing and organizing ideas. Bereiter, C., & Scardamalia, M. (2003). The use of shared artifacts may be able to support communities across distances. Hildreth et al (2000).

3.6.   Participative Design.

To ensure the community was not rigidly driven by objectives alone, the author conceded that there was a need for another element that would allow unique features of a CoP to emerge throughout the establishment. For this the author consulted the works of Fred Emery, an Australian physiologist and researcher in the area of organizational development. Emery detailed an approach called Participative Design which is a model for designing a self-managing organisation and departs from a typical bureaucratic top down management system into one where people essentially structure their own workplace i.e. there are no supervisors, the design is bottom up. Emery, (1989). With good practice, the implementation of such a participative design system requires a specific type of pre-workshop called the Participative Design Workshop, Holman et al, (2007) For a Participative Design Workshop to take place, significant planning beforehand is required, however given the scope of this study and the time limitations involved, the author determined it was not required to implement a full Participative Design Workshop outright, but rather borrow from its design some key elements to better effect his own process. In a Participative Design Workshop, six elements should exist:

1. Autonomy in decision making.
2. Continual learning. With (a) the ability to set goals and (b) accurate and timely feedback.
3. Variety.
4. Mutual support and respect.
5. Meaningfulness by (a) doing work with social value and (b) seeing the whole product
6. A desirable future.

The author included these principles into his own process and formulation of workshops for phase 2 as follows:
1. Elbow room: Autonomy in decision making: The CoP participants must decide on how they intend to establish themselves in the MUVE, only the objective of establishing a presence of their community should be given. What the community decides after this, should be implemented and supported.
2. Continual learning for which there must be (a) the ability to set goals and (b) accurate and

timely feedback: The affordances of the MUVE technology provide for instantaneous feedback and real-time communication. Based on Phase 1, there should be an element of appreciation amongst the CoP for the potentiality of the MUVE.

3. Variety: The affordances of the MUVE technology provide variety in the creativity of objects and their interactions. The variety of communications allow for a variety of choices in connecting with peers or other in-world residents.

4. Mutual support and respect: The members of the Community of practice are already established in the real world where support and respect should already be an element. The democratic nature of CoP's should already be existent in any potential CoP hoping to establish a presence in a MUVE. If this is not the case, the definition of a community of practice must be revisited to understand if a potential group is in fact a Community of practice, otherwise, effective establishment in a MUVE may not be feasible.

5. Meaningfulness consisting of (a) doing work with social value and (b) seeing the whole product or service: The process and workshops must provide the main objectives for establishment while the technology provides for the opportunity for immediate feedback: being able to see the result of its efforts in real time. A CoP should see itself as doing meaningful valuable work for the community as a community.

6. A desirable future. Once the Community of practice has received instruction on how to utilize the technology, a desirable future state using the technology should manifest itself in the CoP discussions. Realisation for the potentialities of the technology should be discussed to encourage this. Based on the literature, the author finally determined the objectives needed to facilitate transition and establishment would be: Establish a presence, determine items/objects to support presence, gather items/objects to construct artifacts, and create artifacts of the community in a MUVE.

Lin, (2008); Fontainha & Gannon-Leary, (2008); Robbins et al, (2007). These objectives, as well as the considerations for participative design led to the formulation of five further workshops which would facilitate a meaningful transition and establishment of a CoP in a MUVE, the details of which are outlined in the following table:

Phase	Work shop	Workshop Objectives	Tasks	Purpose	Participative Design Element
2: Establishme nt	4	Establishment	• Encourage discussion on what is a presence, • Guide discussion on what CoP participants have seen that impressed them and then challenge to formulate their own presence.	Workshop 4 purposes is communication using the technologys facilities which is key to keeping the participants engaged at this early stage. Time should be spent at the beginning to ensure all participants are communicating normally. Begin by casting the question on what their expectation is of presence in the environment - Facilitatre discussion and draw out any reservations. Guide the discussion on what has mpressed the participants so far in the environment. Ask if they have a 'wow' factor story. Guide discussion on what they would see as being suitable for their community becoming established. Allow participants to determine their own presence within the scope of the timeframe and capabilities of the architect.	A desirable future; Meaningfulness; Continual learning, Mutual support and respect, Variety
2: Establishme nt	5	Artifact identification	• Once presence is established, challenge CoP participants to determine what objects should support their community. • Literature and media such as documents and videos as well as any community created items are typical.	Once a presence is established ensure the community is satisfied with their choices. Move to the next action which is to begin a discussion around what objects the community would need to support, enhance or facilitate their community. Literature and Media can be transformed in Second Life and videos streamed from the web; The community should decide how they will go about this as the next workshop requires them to gather, prioritise and submit their materials to the architect or they themselves can create the artifacts if the skills exist.	Mutual support and respect, Variety, A desirable future, Continual learning
2: Establishme nt	6	Artifact literature and media submission	• The CoP participants should prioritise their materials and determine the best way to implement them in the MUVE, facilitate this discussion. • Support should be given in achieving this if technical knowledge on building and scripting in the MUVE is not existent in the CoP, advise on what is achievable in the timeframe available.	All collected materials should be reviewed by all members to ensure the community is satisfied that they are materials of their community or practice. Agreement should be made on what artifacts should be created first (as time may limit all being implemented) and which most represent or enhance the community. Support in building the artifact should be given if no building skill exists in the community, encourage artifact building amongst the participants if they wish. At all times validate the constructed artifacts with the community.	Mutual support and respect

Phase	Work shop	Workshop Objectives	Tasks	Purpose	Participative Design Element
2: Establishme nt	7	Creation of the artifacts	• Implement the knowledge artifacts in the MUVE according to the instructions from the community members. • Provide technical support to implementation and encourage CoP to undertake basic object creation tasks. EG. Building walls, colouring items etc. • Provide assistance where needed to ensure the community is satisfied with their establishment. Encourage a full community review with all members of the CoP	The community should decide what artifact arrangement will be and if possible encourage participants site their artifacts and step back from this action. Support only when needed. Ensure each participant is engaged or has a task by encouraging the community to share the work. Spend time with the less technical participants on simple actions to help build their confidence.	Mutual support and respect, Continual learning, A desirable future; Meaningfulness
2: Establishme nt	8	Creation of the artifacts	Continue the work from Workshop 7 Finalise the artifacts and ensure communal agreement and future objectives. Withdraw support gradually.	The last workshop continues any work left from workshop 7. Artifacts should be finalised and an agenda for the future discussed. If possible the community should have an action or objective for further meetings, if required, participate and at the same time withdraw gradually as participants become further confident with the technology. Spend more time with the non technical participants to ensure they are comfortable with the technology enough to make contributions.	Mutual support and respect, A desirable future; Meaningfulness

Table 3: Phase 2 Workshops

3.7   Conclusion

This section of this chapter outlined the process design for transitioning and establishing a community of practice into a MUVE with reference made to the literature. In the next section of this chapter the author will outline the implementation of this process.

Chapter 4 - Implementation.

4.1   Introduction.

The previous chapter outlined the process created to facilitate the transition and establishment of a Community of Practice into a MUVE. The purpose of this chapter is to provide a rich description of the implementation of the process by describing the transitioning of a traditional Community of Practice into a MUVE and will outline each of the phases and workshops listed providing a detailed description of each.

4.2   The Multi User Virtual Environment (MUVE).

Second Life (MUVE) was chosen to work with this case study for its advantages of being a stable platform with a good end user support system For the purpose of this study, the author was assigned a portion of an island in Second Life belonging to Trinity College Dublin; this land was approximately 4000m^2. To become an inhabitant of the Second Life virtual environment, one must register an account with Linden labs (owners of Second Life) and download a user interface or 'client' which acts as a window into the virtual environment and from which one controls the navigation functions, interactions and virtual representation of themselves in a human like form called an avatar. Avatars begin in a generic form where the inhabitant can then modify the features of the form to suit their preferences such as changing body, head or face shape, adding or removing hair and changing the appearance of generic clothing. Avatars traverse the world by walking, flying or teleporting, the latter being a preferred mode of transporting from location to location due to its immediacy and achieved by using teleporting objects or by sending SLURL's, which function similar to links on a webpage. End users can communicate with one another in Second life through the use of text chat which resembles many of the instant messaging applications on the internet or through audio chat where the end user would speak to other users using a microphone. Avatars can also interact with many objects in the Second Life environment. Second Life uses a system of building blocks named 'Prims' which form the basis of all objects in the environment. Inhabitants of the virtual world can build objects using which they then can go about shaping, coloring and/or applying different actions to those objects. Objects can be packaged and subsequently transferred to another inhabitant where they can be

'rezzed' or unpackaged into their original structure. There are many architects of objects in Second life, inhabitants can create a diverse array of objects such as clothes for an avatar, furniture, buildings, cars and many more creative and inventive items which sometimes may be given freely with no charge or in exchange for Linden Dollars ($L) the in-world currency which is linked to the US Dollar.
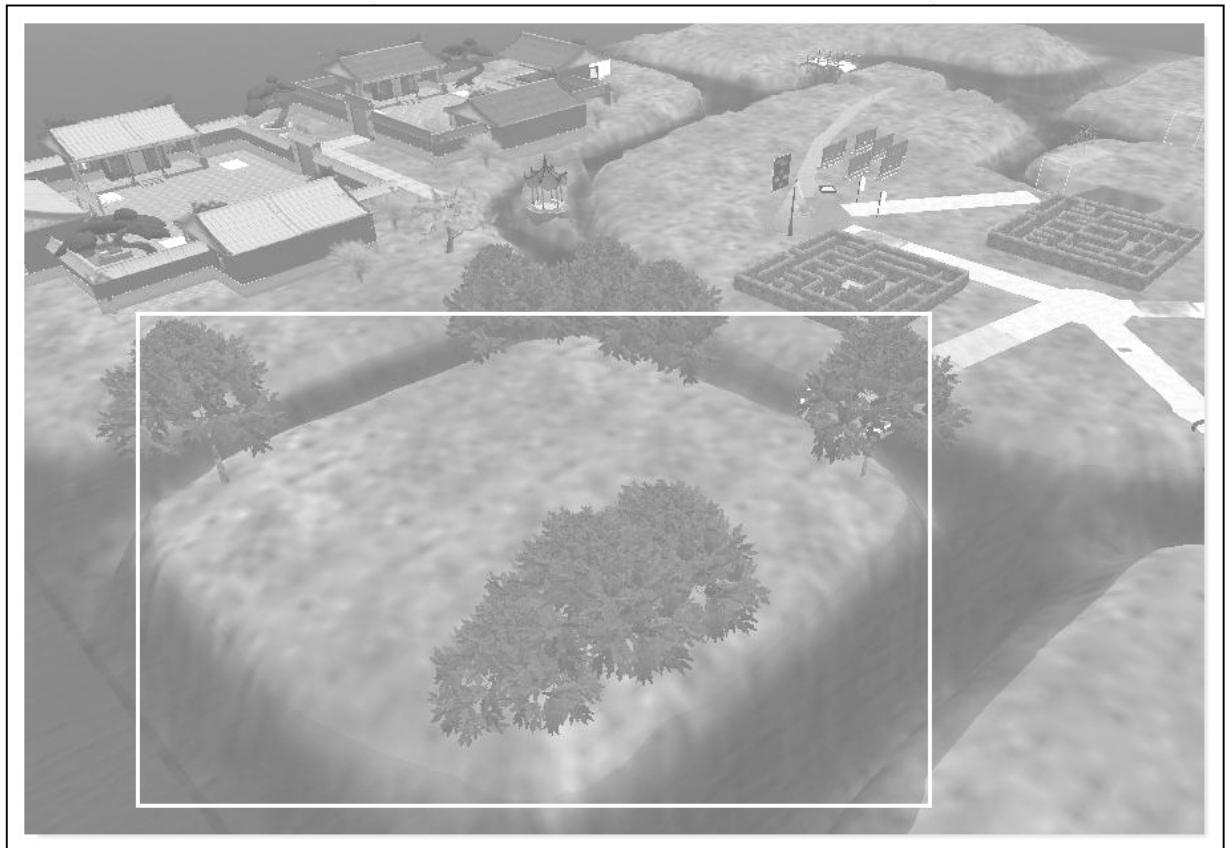
Figure 2 . The Island space used for the research project.

The researcher decided, with the time available for the study, that scaffolding members of the CoP to function in-world as well as enabling them to build their own objects would not be viable. Enabling the members to become object creators would have required some extra weeks to become familiar with the intricacies of the task. The researcher decided the participants to the study should have more freedom to concentrate on establishment of their presence rather than have the burden of building their own objects, The researcher hypothesized that establishment would occur at a faster rate and produce a more meaningful result by the end of the study

timeframe. In place of having them build and construct their own items the author explained to the members of the CoP they had the freedom to choose whatever objects they found in-world that would assist them in establishing their presence and where appropriate, he would fund the purchase of those objects using the in world Linden Dollar currency.

4.3   Implementation of the phase 1 process

Following the process the author organized three face to face group workshops with the members of the CoP. These workshops were designed to scaffold and best enable the CoP to effectively transition and establish itself in the environment in the time available. Wenger, White & Smith (2009)

The first workshop had an orientation objective: Instructing the CoP members on registering themselves in Second Life, Choosing an Avatar, basic user interface interaction as well as navigation functions such as walking, flying and teleporting**.**

- The first workshop outlined the following tasks
- Registering an account with Second Life
- Downloading and installing the Second Life Viewer (Graphical user interface)
- Second Life Viewer familiarization
- Creation of an Avatar
- Basic navigation exercises

The second workshop focused on communications which, after discussion on its functions, was practiced as a group, both through the text chat function and then the voice chat function. After these initial two orientation workshops the CoP members at a later stage, brought together face to face in a third workshop and given in world activities to help prepare them for the work of establishing their community. These tasks were pre-defined by the researcher with the objective to scaffold the CoP members to firstly interact with objects and secondly to better understand the affordances and potentiality of the technology through interactivity with objects and other avatars while experiencing information sharing. The activities consisted of a treasure hunt: being given an SLURL to teleport to and collect note-cards or screenshots from various objects to later share with other members of the CoP. Another task was to spend time changing their

Avatar appearance and purchasing new clothing, this proved to be a humorous teaming activity with all participants observed thoroughly engaged with the technology. Walker V.L. (2009) With the orientation workshops completed, the researcher validated that all CoP participants were comfortable with operating in-world and it was then time to go about the purpose of establishing their presence as a community.

4.4   Phase 2 implementation of the process

Implementation of phase 2 of the process saw a fourth workshop held entirely in-world and the CoP members were not together physically, the members met on the designated island in-world and discussed, using the voice chat facility, how best they could go about 'setting themselves up'. This discussion showed itself to be the first building block to the communities' establishment in the MUVE. Lave & Wenger (1991); Wenger (1998, 2005)

The conversation centered on implementing a structure of sorts, like a 'club house' as referred to by one participant. The members decided to spend some time in-world to find a suitable 'club-house' and meet back on the island after a specified time. Once the group reconvened each member had their own proposals for the 'clubhouse', proposals varied from a pyramid structure, a sky scraper, a house and an office block type building. The group agreed after further discussion and observance of examples of these structures that an office block building should be their first step as it was 'big enough', "had lots of floors' and would afford privacy as well as scope to further expand upon. Vygotsky, (1978)

4.5   Establishment, First steps.

The author, with agreement of the CoP obtained the selected office block building and 'rezzed' the structure on the island. The next meeting, again entirely in-world, the researcher observed the group self determining its professional portrayal. The group decided that each floor of the building should allow for a different facet of its functioning and determined through discussion, that the building would have five floors and each floor would not only represent their practice but possibly allow for their practice to be taught or carried out in world.
The CoP members designated the floors of the building to the following alignment:

- Ground Floor - Entrance and welcome area

- Second Floor - Coaching practice/role-play area later designated a Machinima studio.

- Third Floor - Café/relaxation area

- Fourth Floor - Knowledge sharing area

- Fifth Floor - Auditorium.

The CoP members then decided to furnish their building with appropriate items to make it comfortable and welcoming as well as professional looking. Items were purchased and installed in the building such as couches, lamps, tables, conference furniture, a teleporter for accessing different floors and café furniture including a virtual coffee machine.

4.6   Designation of building floors

A group discussion highlighted further the function of each floor: The Ground floor/Welcome area would greet any guests and inform visitors of the nature of the community also the group felt it important to impart that they were part of a research project by having a welcome notice.

Figure 3. Ground Floor
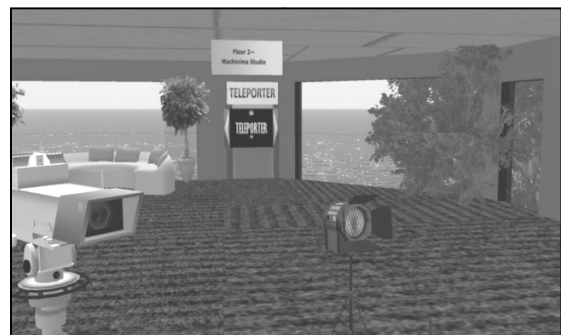
Figure 4. Second Floor

The second floor, originally cast as a practice area was then later decided through discussion to become a Machinima studio, whereby the coaches could role-play coaching scenarios and record them in-world to further share the practice of their community with reference to their experiential or tacit knowledge. The third floor was designated as a café which the group decided reflected their real life workplace and a typical scene where they would convene with other members of their community in an informal setting.

The fourth floor, the group decided would be their knowledge sharing area. It would be here that they would share artifacts of their community relating to what it was, how it practiced and

typical manifestations of its area of expertise. It was also decided by the group that the knowledge sharing floor should be a type of 'tour' topped off by examples of their practice in action by showing videos of coaching. The fifth floor would act as an auditorium where training and presentations to a wider audience could occur.

Figure 5. Third Floor Café

Figure 6. Fourth Floor Entrance

4.7 Artifact gathering

The researcher acted as architect for the wishes of the community, on what they wanted, the researcher built. The CoP members held another in-world meeting to determine what artifacts they wanted to bring together to share their practice. Having seen other examples of knowledge sharing and having experienced interactive media sharing objects in-world they decided that a blend of videos and text based materials would meet their needs.

The CoP members assigned themselves tasks to gather content for the fourth floor, and would reconvene at a later date. They determined they wanted to share information on their practice by splitting content into different categories, then arranging the categories of content into 'knowledge stations' which formed main displays on the fourth floor tour.

The content categories decided were the following:

- Coaching basics.
- Coaching language.
- Coaching ethics & credentials.
- Types of coaching.
- Coaching in practice.
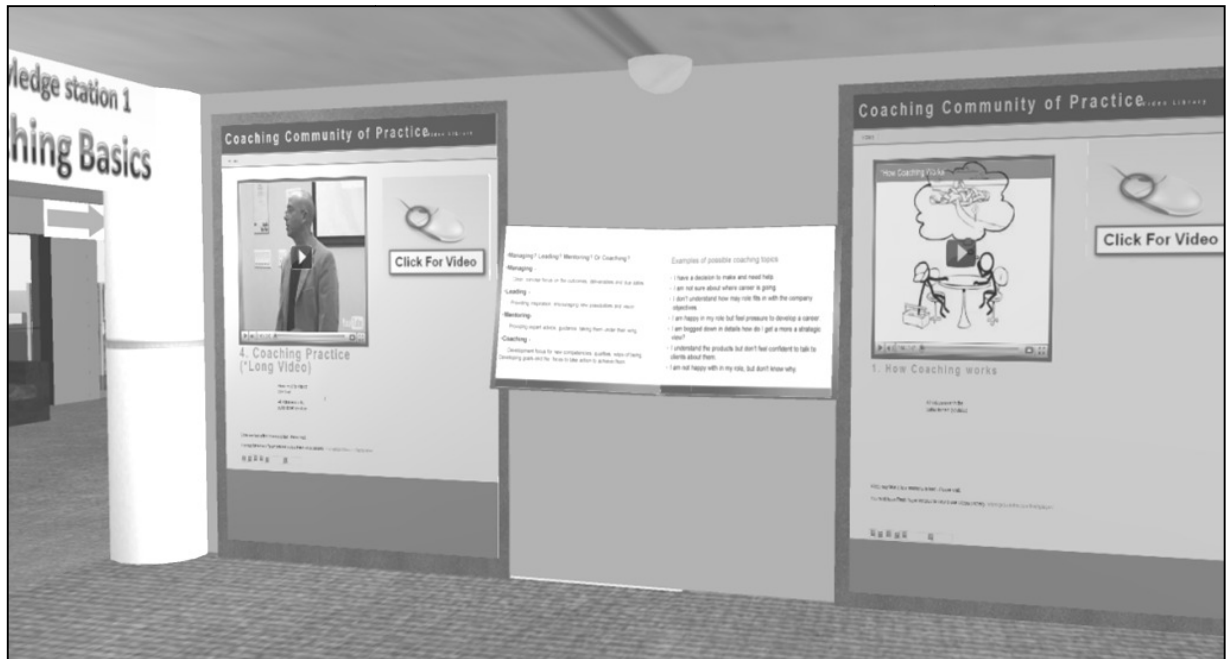
Figure 7.Artefacts: Example of a Knowledge Station

The community decided that the fourth floor should be designed to show visitors their artifacts in a way that the guests are introduced to the community on a phased basis and not overloaded with information. This agreement led to the community instructing a square shaped room was constructed, where all outward sides contribute information and the inner core of the square could show role-play coaching training videos.
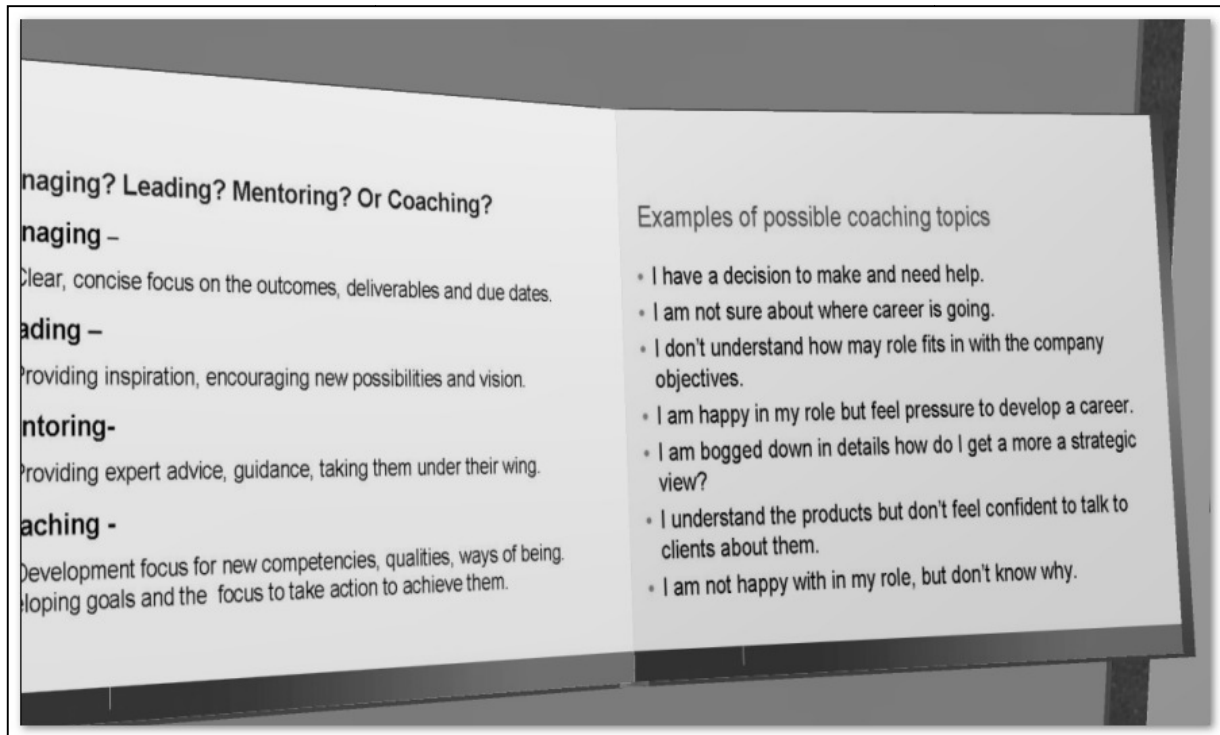
Figure 8. Artifact: an e-Book

Figure 9. Example of the Community Meeting Virtually in Second Life

At a sixth workshop, also held entirely in-world, content gathered by the community to become in-world artefacts was in the form of presentations, text documents and links to on-line videos on YouTube. Having experienced e-books, note cards and video objects linking out to the internet, the group indicated that reading matter in the form of e-books would be their presentation material, note-card givers would impart relevant text documentation while 'video walls' would contribute to the audio/visual information they wished to share. It was decided that each wall or facet of their practice would contain a combination of presentation/text and video content to best represent their professional practice while also allowing the visitor to take something away (in the form of note-cards). The objects allowing the delivery of the abovementioned information were either bought from a third or created by the researcher.

Figure 10. Artefacts: Knowledge Stations Sharing Language and Ethics of the Community.
A seventh workshop, determined the final design of the fourth floor. The researcher took instructions and constructed it according to the group wishes and took their content to integrate it to the various display objects. It was during this workshop the group decided that they were comfortable enough with using the technology to be able to undertake coaching role-plays in-world if there was some facility to make a recording.

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Figure 11. Artefacts: Notecard givers sharing credentialing and ethics information

The group decided that the best way to share what they do was not to rely on third party training videos which were their original idea, but to actually show what they do by performing a role-play in-world. The researcher informed the group that he could record the activity in second life if they so wished. The group decided they would work on basic role-play scripts and the next meeting in world would be dedicated to carrying out the role-plays they had written. The researcher used a simple screen recording software called FRAPS (www.fraps.com) to capture the role-plays of the group. Lave & Wenger, (1991); Wenger, (1998, 2005).

Figure 12. Artefacts: Example of an e-book.

4.8   Facets of the community's practice

The eighth and final meeting in world of the group was to review the construction of the fourth floor knowledge sharing areas and to record the coaching role-plays. The coaching role-plays were carried out on the second floor which was by then dubbed the Machinima Studio.

The CoP members had four role-plays in total, each role-play was scripted to impart a simple but yet effective example of how the community went about its practice. The first video was aimed at coaching the right way. The second video was aimed at coaching the wrong way. The third video was aimed at a typical '5 minute coaching session' which all members had experienced, and the fourth and final video was an interview with a coach, where one member of the CoP interviews another member to get insight in becoming a coach and what the practice entails.

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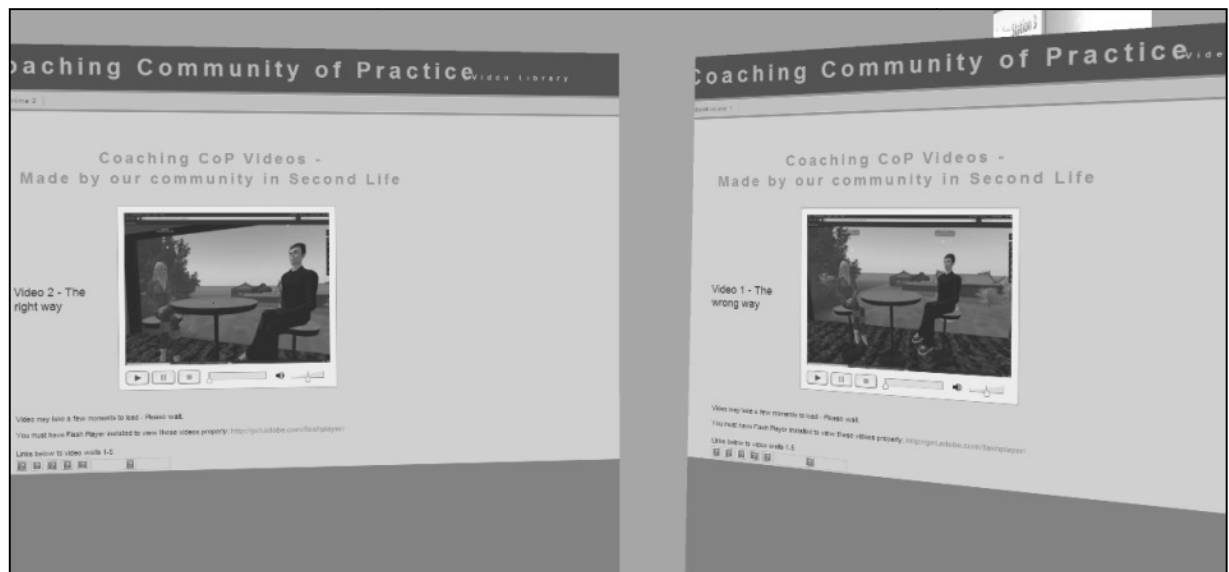
Figure 13. Artefacts: 'Machinima' videos imparting the community's tacit knowledge

The CoP determined that through all the knowledge stations and the final 'home made' videos that any potential visitor could gain a good understanding of the purpose of their community. The group also confirmed that the building, with each of its floors was fit for purpose, mentioning that they could potentially train or mentor new coaches in this environment.

Figure 14. Artefacts: Example of the community's in world role-play video

It was observed that the groups focus now seemed less on the 'how to use this software' and more on the 'what more can this software do' aspect. It appeared that the CoP members were fully comfortable using the Second life Client viewer and seemed to have moved into an advanced learning position. It was at this point the CoP members were unable to further meet together as a group for the purpose of the study as their work prevented further meetings, however individual members of the community reviewed the establishment of artifacts with the researcher to confirm they were established correctly and represented the message the community was trying to convey.

4.9   Summary:

The researcher, guided by the literature provided a two phase process with which to firstly scaffold the community of practice members on the usage of the technology and secondly to give the group objectives to reach. The group established themselves in the MUVE by implementing a building with multiple floors, each floor serving a different function of their practice. One of these floors was dedicated to sharing the community's practice, language, ethics and tacit knowledge through a series of knowledge stations which utilized video and textual material distributed via video walls, notecard givers and e-books.

The next chapter will describe the research methodology and data collection tools used during the study.

Chapter 5 - Methodology

5.1   Introduction.

The previous chapter described the implementation if the learning artifact with references to the literature. This chapter describes the research methodology and its implementation which is used to evaluate the overall study and help answer the research questions.

5.2   Research Design.

This study took the form of an Exploratory Case Study focusing on primarily gathering empirical data through observations, interviews and artifacts. The aim was to gain an understanding of the potential in using this type of technology to support and nurture CoPs and to then elicit the opinions and recommendations of the participants.

The following methodology strategies were considered when researching the most appropriate approach to answering the research question:

- The Survey
- The experiment
- The Exploratory Case Study

The survey is a strategy of empirical research and is concerned with obtaining an understanding of the overall view of that entity or phenomena being researched. It's also concerned with the understanding of a particular point in time and sometimes retrospectively (Denscombe, 2007). However in the case of this study, this strategy was deemed unsuitable due its lack of in depth inquiry into the unascertainable results (Denscombe, 2007). Also, given the small numbers of participants in the study, the results of a survey would be statistically incorrect.

The experiment is a strategy of empirical research that takes place in controlled environments where certain individual factors can be added or removed, to observe and measure their effect in minute detail (Denscombe, 2007). This strategy was deemed unsuitable as the purpose of the study was to understand how a community might become established in a virtual environment given the

affordances of the technology, the study would not be adding or removing elements as part of the study to understand the effects of doing so, therefore the strategy needed to have a more flexible approach to deal and cater for the unexpected.

5.3   The Case Study.

The Exploratory Case Study approach was chosen because case studies provide an in-depth examination of non random, typical, but extreme, opportunistic cases in authentic settings (Yin, 2006) and this study is primarily concerned with recording and understanding the descriptions from and perceptions of the participants (Stake, 1995). Case Studies are flexible in nature, and focus on relationships allowing the use of a variety of data collection tools Denscombe, (2007). Purposeful sampling is the most common strategy in qualitative research Hoepfl, (1997)

One type of purposeful sampling is the case study. Case studies can be single or multiple case designs (Yin, 2003). Multiple cases enhance the results of a case, increasing confidence in the strength of the theory. However, when no other cases are available for replication of the research, the research can be limited to single case designs Tellis, (1997)

Creswell, (1998) describes a case study as "an in-depth exploration of a bounded system (e.g. an activity, event, process or individuals) based on extensive data collection" (p. 439). According to Cohen et al (2007) the single case study can provide a "unique example of real people in real situations, enabling readers to understand ideas more clearly than simply by presenting them with abstract theories or principals." (p. 253)

Case studies have often been viewed as a useful tool for the preliminary, exploratory stage of a research project, as a basis for the development of the 'more structured' tools that are necessary in surveys and experiments. (Rowley, 2002)

A single case study design approach, as described by Yin (2003) was employed in this research study. The descriptive single case design is appropriate for this study as it explores a unique attempt to investigate the use of an MUVE as a vehicle for supporting and facilitating a community of practice. This approach complies with Yin's (2003) criteria of uniqueness for undertaking a case study design. To further outline the rationale for choosing a single case study is that with a shortage of literature in this particular area for research, the investigator believed he has access to a situation which previously was inaccessible to scientific observation in this context and domain rich environment, the case study was then worth conducting because the

descriptive information alone would be revelatory (Yin, 2003). From a practical perspective, the Case Study was also chosen due to the time restrictions of the participants.

5.4   Evidence collection tools.

Yin (2003) describes six sources of evidence most commonly used in case study research. These are: Documentation, Archival Records, Interviews, Direct Observations, Participant-observations and physical artifacts. No single source has an advantage over the other and Yin states there can be many sources. For the purpose of this study the researcher determined that the following sources of evidence would be gathered for the purpose of analysis: Participant –Observation, Direct Observation, Artifact(s) and Interviews which were semi structured.

Participant –Observation

Participant-observation makes the researcher into an active participant in the events being studied. This often occurs in studies of neighborhoods or groups. The technique provides some unusual opportunities for collecting data, but could face some major problems as well. The researcher could alter the course of events as part of the group. Tellis, (1997)

Purpose: As the author was acting as architect for the community this presented an opportunity to observe events from an active perspective. It would give the author a key position from which to study behaviours and make observances on emergent themes from discussions.

Direct Observation

Direct observation could be as simple as casual data collection activities, or formal protocols to measure and record behaviors. This technique is useful for providing additional information about the topic being studied. Tellis, (1997)

Purpose: This was selected as a data capture method as the author would not be in a participative observer at all times however would be accompanying the group at all times in the MUVE and when not participating in building would default to this method.

Artifact(s)

Physical artifacts can be tools, instruments, or some other physical evidence that may be collected during the study. The perspective of the researcher can be broadened as a result of the

discovery. Tellis, (1997)

Purpose: Due to the domain rich environment of a MUVE artifacts would be an objective of the CoPs establishment to support and enhance their practice, it is hoped that artefacts would represent the knowledge of the CoP and if created would become a data collection method.

Interviews – Semi Structured

This technique is used to collect qualitative data which allows a respondent the time and scope to talk about their opinions on a particular subject. The focus of the questions is decided by the researcher. The objective is to understand the respondent's point of view rather than make generalisations about behaviour. It uses open-ended questions and is flexible to allow for emergent themes. Yin, (2003)

Purpose: As the participants were leading their establishment in the MUVE they would undergo experiences which the author sought to understand. Emergent themes and perceptions are important to capture to determine if the process worked and to help answer the research question.

The following table outlines the assumed strengths and weaknesses in the evidence the researcher might be subject to. This is recommended by Yin (2003) the researcher decided it was important to include with this study and where possible make attempts to either nullify or limit exposures.

Evidence Type	Strengths	Weaknesses
Participant -Observation	Working directly with the group on implementing their requirements	May miss key events due to being involved in the building/implementation of objects
Direct Observation.	Real time records of actual events as they happened	Possible bias as only once source for records
Artifacts	Compound evidence of the community's establishment in MUVE	Availability and time may limit the artifact choice
Interviews	Targeted and insightful in relation to the actual study. Provides explainations to events	Possible bias due to poor questions. Innacuracies due to poor recall of events. Reflexivity: Interviewee says what the interviewer wants to hear.

Table 4. Strengths V's Weaknesses in evidence collection.

5.5 The Unit of Analysis.

The unit of analysis can be described as being the major entity that is being analyzed in a study Trochim, (2006). The Unit of Analysis is related to the initial research question(s) (Yin, 2003). Given the research question and sub questions, the following table outlines the units of analysis in relation to this study and the data collection methods used:

Research question/ sub questions	Unit of analysis	method of data collection
Given a professional community of practice (CoP) with no experience or presence in a virtual world, how might that community become established in the virtual world?	CoP behaviours and actions	Observation; Participant - Observation.Interviews
What approach might be taken to allow establishment of any community of practice in a multi user virtual environment?	MUVE Establishment process through facilitation workshops	Participant -Observation.
How might that community of practice represent itself in the MUVE?	Artifacts	Participant -Observation; Observation

Table 5. The unit of analysis and data collection methods.

5.6 Data capture methods

Given the evidence types and with the units of analysis, the researcher used the following methods to capture the evidence:

Participant –Observation & Direct Observation:

A research journal was maintained to record themes and main ideas of participant conversations and observations made by the researcher during the implementation of the process stages. Observations made as a participant would also be recorded, data from both of these sources were encoded into an excel spreadsheet database. This data would then be used in connection with the interview data to conclude emergent themes.

Artifacts created/built/implemented:

Screenshots would be used as evidence (see list of figures) and the author would make a written record of any unforeseen events during the implementation of artifact construction, written notes

would be included in the text data analysis.

Interviews:

Interviews with all participants: Audio recorded and semi-structured. Open ended questions to allow as much perception data as possible. Interviews held on different days in different locations. All interviews transcribed to text for coding and theming analysis.

All written and transcribed data is compiled into a case study database, in this case an Excel Spreadsheet. A preliminary analysis is completed to ensure integrity. This preliminary analysis is carried out by listening to the interview audio while reading the transcripts of the interviews and then reviewing the observation notes and memos for accuracy. The data is then compiled and passed through a process of coding and theming using the content analysis method which analyses written, verbal or visual communication messages (Cole 1988). A final analysis is then compiled and conclusions drawn which then feed into the discussion of the findings.
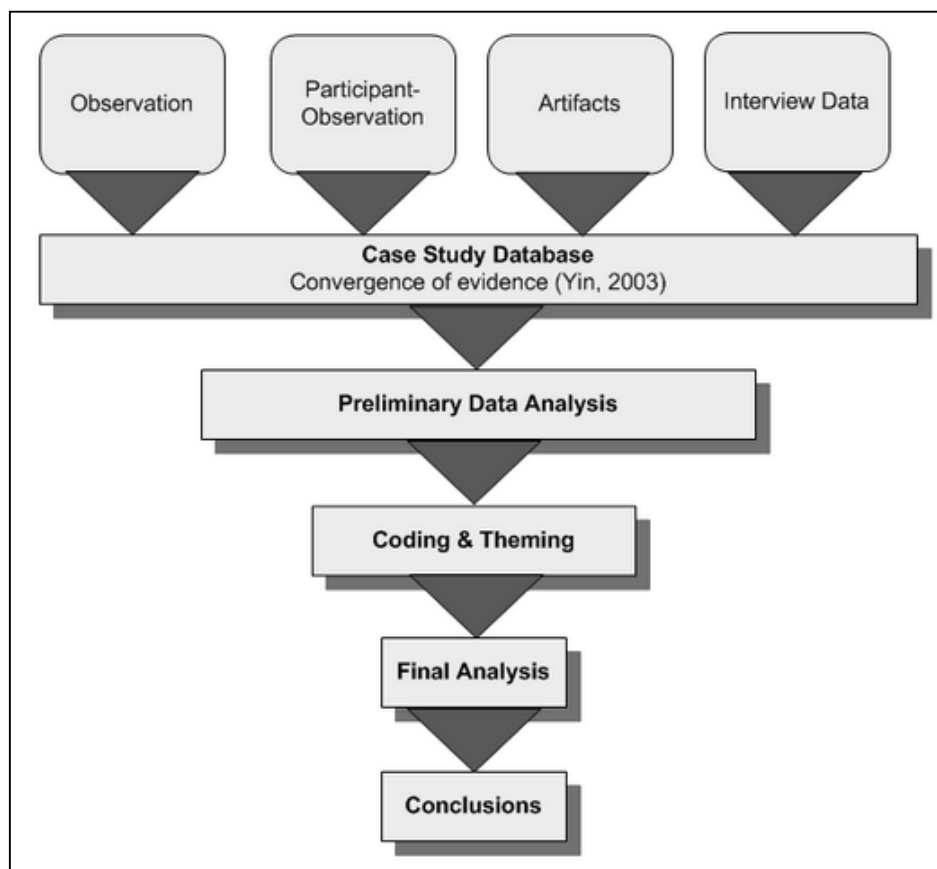
Figure 15. The data analysis process.

5.7   Participants.

The research study invited a traditional community of coaches working in a multi-national corporation. The invite indicated the research question and sub questions. Invites were sent to twelve members of the community of which six responded. Six members of the community began the study attending phase 1 of the implementation. Two participants subsequently left the study due to personal commitments which left four coaches completing the entire study.

The researcher chose the coaching profession for the study as its individuals typically carry out their practice face to face and their exposure to MUVEs in the course of their particular practice could be considered non-existent.

5.8   Time & Duration

The entire study took place over six weeks during November and December 2009. Each workshop was two hours duration. Total time spent in the virtual world with the community amounted to sixteen hours. When a participant could not make a workshop, it was re-scheduled to ensure all participants were present.

5.9   Protocol

Permission to conduct the study was sought and approved by the senior operations manager of the multi-national corporation. All participants in the study attended a presentation by the researcher at the beginning of the study outlining the roadmap of the study, including setting expectations on attendance and contributions to the study.

5.10   Ethical considerations.

Prior to the commencement of the study, each participant was given the ethics information sheet and asked to sign the informed consent form while advising them that they may withdraw consent at any time. All participants were assured that their anonymity was protected. For more information on the ethics documentation provided, please see appendices.

5.11   Researcher Bias

The researcher is aware that his closeness to the study and familiarity with the participants had the potential to undermine any conclusions made. However, the researcher will take all necessary precautions to minimise the effect of personal biases.

5.12   Researchers role

The researcher had three main functions in the study:
1. Instructor on usage of the technology (phase 1 scaffolding workshops)
2. Builder/implementer/architect of objects requested by the community
3. Observer and facilitator.

5.13   Conclusion

This chapter describes the research design and data collection tools used in the study to answer the research questions. The next chapter describes the analysis of the data collected during the study.

Chapter 6 - Analysis of the data

6.1 Introduction

The previous chapter outlined the research methodology used in conjunction with this study. In this chapter the data analysis procedure is discussed.

Stake (1995) describes analysis of data as a continual process that begins with first impressions and continues until the final aggregation of results. The analysis process and the results should be described in sufficient detail so that readers have a clear understanding of how the analysis was carried out and its strengths and limitations (U.S. GAO 1996).

6.2 Data analysis

The researcher used the following sources of evidence to gather data for the purpose of analysis:
- Participant –Observation.
- Direct Observation.
- Artifact(s).
- Interviews.

The researcher used an Excel spreadsheet to record memos on observations during the course of the research, screen captures were used to record memorable events and screen recording software to capture in-world video. Upon completion of the study each participant was interviewed using a semi-structured, in-depth interview process. The in-depth interview allows for facts of matter as well as opinions about events, it also allows in certain circumstances to allow the interviewee to propose his or her own insights into certain situations and may use those propositions as a further basis for inquiry. (Yin 2003)

The in-depth interview asked each participant nine questions in relation to the overall study and specifics within, also each participant was given space to elaborate on their answers in an attempt to illicit data that was not necessarily presenting itself by the question asked. Barriball, K., & While, A. (1994)

Where mentioning of a fact outside the scope of a question the researcher would note it and return to it in the interview to gather more data as recommended by Yin, the more the interviewee assists in this manner the more they could be considered more an informant rather than respondent. (Yin, 2003).

The following questions formed the basis for the in-depth interview:

- How might you go about establishing a physical, face to face community (to understand the traditional process they might take if establishing a community in the real world)?

- What was your prior understanding of virtual world technology before the research (to understand their knowledge before the research of the technology?)

- What were your First impressions of the technology and its affordances (From workshops) in relation to your community and its practices (To uncover was there a wow factor, what immediate impressions struck them, what instance of the technology captured them)

- What development ideas came to you while using the technology, not just limited to your community or this particular study? (To uncover their perceptions after some usage of the technology, what development ideas struck them, not limited to coaching).

- What hindrances, if any, of the technology did you encounter (To uncover difficulties and challenges to using the technology that possibly hindered development of the community in the MUVE)?

- What emerged from community group discussions on the way to establishing your community in the MUVE. (To uncover what the group discussed outside of the workshops, or when the researcher was not present)?

- Given more time, what additional artifacts could have been added to the establishment in the MUVE?

- In your opinion, what future might develop for the community in the MUVE and how could the technology better their community (Coaching of clients?, teaching of coaches? extended membership?)

- Any other observations you consider relevant to the project?

Below are sample answers of participant 1:

Figure 16. Excerpt of a transcribed interview – participant 1.

Figure 17. Excerpt of researcher observation logs.

6.3   Coding and theming of the data

All written and transcribed data was fed into the Excel database. The researcher then read through the data to understand emergent themes at a high level. The researcher then fed the data into a data mining software package called IBM® SPSS® Text Analytics which uses a special linguistics engine to cross reference words in text and group similar words together to create concepts from the data. The software then creates categories or codes through a linguistics engine and inbuilt template model that is designed for harvesting opinion type statements from the data. In total 609 concepts were found in the excel database, out of this a total of 30 codes were produced. The researcher noticed that some codes were very similar and proceeded to create a single code with the content from similar codes to narrow down the data. Upon completion of this task the researcher had a total of 8 codes where the following themes and 7 subthemes emerged from the data.

- Knowledge sharing with the subtheme: Artifacts
- Using the technology to coach
- Community
- Professionalism with the subthemes: Appearance, Client and Building.
- Technology Affordances with the subtheme: Technology issues
- Development and Learning
- Environment
- Experience

Concepts	Codes	Themes	Subthemes
609	30	8	7

Themes	Subthemes		
Knowledge sharing	Artifacts		
Using the technology to coach			
Community	Communication	Team work	
Professionalism	Professional Appearance	Professional client	Professional Building
Technology Affordances	Technology issues		
Development and learning			
Environment			
Experience			

Figure 18. Data coding results.

6.4 Description and Context of the Themes and Sub-themes.

Knowledge sharing with the subtheme: Artifacts

This theme encompasses statements in the data which reflect knowledge sharing as being of prime importance to this community of practice; their community meets frequently in the real world to share tips and advice on handling different coaching situations. It was seen from the data as being a structured community. The subtheme of Artifacts contained the most data under the knowledge sharing theme.. References were made to sharing of ideas, usage of items, reaching out to people, face to face meetings and showing people the functioning of their practice. Reference was made to the virtual environment and the building that held the communities artifacts. This theme communicates the importance of people and sharing knowledge within this community, it also shows how comfortable they were in using the technology in both artifact and building to help them share information about their practice. There is an interesting trend whereby the community talks of face to face meetings in-world just the same as in the non virtual world.

Using the Technology to Coach

This theme uncovered some interesting changes in mindset amongst the community. While none of the community had any experience with MUVEs before the study, this theme shows the community considering the technology for use in many different ways to promote their practice. Reference is made to different aspects of coaching such as sales coaching, employee coaching, training of coaches, business coaching and coaching scenarios. From the interviews the researcher received feedback that the technology could be used in the practice of coaching. The concepts of this theme show the participants had become comfortable with the potentiality of the technology to the extent they were considering to use it in the course of their work. One participant had mentioned at the beginning of the study that they would not consider personal one to one coaching outside of a physical face to face meeting due to the nature of confidentiality and the ethical considerations, however this data theme shows a trend departing from that position, if even only expressed by one participant. As a group, all of the documented data contained references to using the technology in some form to coach or train coaches.

Community with the subthemes: Communication and teamwork.

This theme has a strong undercurrent of collaboration to meet a goal. The main theme contained concepts relating to the group members themselves, reference to younger members helping older members with the technology is present in the data, group interactions, and conditioning are mentioned in the context of working towards a common goal. The communication subtheme references communication skills in-world. This is referring to the forms of communication amongst participants while in-world not being the same as in the real world, where audio/voice was used for communication, two participants when interviewed felt they missed the facial expressions when communicating with others in- world as they rely on them for visual cues in a conversation. The teamwork subtheme shows the participants approaching the study and their tasks with a collaborative mindset, with references made to setting up of meetings to practice the work and to work on the project.

Professionalism with the subthemes: Appearance, Client and Building.

This theme showed considerations for the communities' professional standing in the three subtheme areas. Professional appearance was the strongest subtheme. The researcher explored this area during an interview with the first participant who felt it was pertinent to explore further. The data shows that the majority of participants were concerned about their in-world appearance and wanted to show a professional demeanor as they would do in real-life.

It was observed by the researcher early in the study, after the participants had dressed their avatar and changed their avatar's appearance that each of them changed the appearance a number of times to reflect more traditional business attire and styling. The professional client subtheme reflects the consideration of the CoP potentially coaching client's in-world as references are made to a professional stance in registering of clients (in-world) and how to promote clients to share information and it further linked into the professional portrayal of the building used to house the community of practice as being of importance. Participants felt it important to have a professional atmosphere reflected in their in-world building. This links to the artifacts themselves and the building structure: the ground floor designed to welcome visitors and each subsequent floor designed to be comfortable but within real-world normality. Overall this theme

reflects the professional considerations of this community of practice and their overwhelming desire to carry this professional standard with them, be it in a virtual or real-world.

Technology Affordances with the subtheme: Technology issues

This theme reflects how the technology of a virtual world lent itself to the CoP in the context of this study where positive comments about the technology. The technology affordances theme shows that the participants were impressed with the navigable capabilities in the virtual world such as flying and instant teleporting to different locations. Other positive elements show favorable views to the quality of the objects, the internal help feature and the support systems of Second Life. Registration showed to be positive and easy as well as the overall general functionality within the virtual world. The technology issues subtheme showed clearly that this type of technology is systems performance dependant. Reference was made to the computers being used and laptop speed. This would seem to reflect a term known as 'lag' whereby the physical capabilities of the computer system are not optimal to fully represent the context rich features of a virtual world. Graphics chips and random access memory need to be relatively powerful and fast to represent the visual affordances of the virtual environment. The computer systems in use by the participants were of average performance quality aimed at standard business usage as opposed to high graphical performance which shows that performance of computer systems should be considered in these types of studies.

Development and Learning

This theme uncovers group considerations for potential use of the technology in a training aspect such as development of management and employees in a training context and where the technology could help overcome learning barriers and memory retention. This particular trend was observed by the researcher during the first three workshops when scaffolding the participants to use the technology their memories of what they had done in the previous workshops was very accurate, and that he had to spend little time revising previous workshop content. This would go so far as to indicate that the virtual world 3D visual environment could potentially go some way to help improve memory retention, although this would need to be researched further. It was also apparent from the discussions of the group that they understood

the further potential of their own experiences being put to the wider context in learning and development.

Environment

This theme reflects comments from the participants in relation to the environment of the virtual world. Specific references were made to the virtual face to face context and the intractability of the media rich interface and its similarities to a gaming interface without the gaming aspect. This also emerged in one of the interviews where a participant mentioned that it felt like a game and looked like a game but wasn't a game. Cross references could be drawn to the development and learning theme whereby the interface and environment are conducive to learning as they immerse a user just as a game would but without the competitive or narrative aspects of a game.

Experience

This theme emerged into two main strands: overall experience of the participants during the study and potential experiences of clients or visitors.

From the participant perspective, a feeling of satisfaction was evident from the comments as well as having had a new learning experience. In the interviews with all participants the researcher understood they all had overall a positive experience with working in-world to establish their community and thus believed their potential clients or visitors would have a similar experience.

6.5   Conclusion

This chapter described the analysis of the data collected during the study. In the next chapter the findings deriving from the data will be discussed in depth.

Chapter 7 - Findings of the Study

7.1   Introduction.

The previous chapter described the methods used to analyse the data. This chapter will describe the findings resulting from the analysis of the data.

7.2   Case findings

This was a single case study aimed at answering the main research question:

Given a traditional community of practice (CoP) with no experience or presence in a virtual world, how might that community become established in the virtual world?

The researcher deemed it important to describe the CoP that participated in this study to give the reader some context. They are individuals working as coaches for a multi-national corporation; all of them voluntarily became coaches as it was an area of interest to them personally. Coaches in this community not only coach people on their career's or how to go about handling tough work based situations, they also coach people on personal issues. Becoming a coach is a long and arduous path, one does not do a course and just start coaching, a specific training regiment is in place and a tough credentialing system exists in order to practice as a coach.
During their training the potential coach must undergo being coached themselves, understanding self personal limitations and anything upsetting from their past which might bias their thought processes must be explored. This process can be emotional and not all people last through this particular stage. After training, experiential learning is very much at the heart of becoming a coach; trainees coach each other in role-plays, learning how to listen and how to use effective questioning. The master coach in looks for maturity in the trainee before allowing a client to be taken. The coach performs a minimum of 200 hours of coaching clients to become fully qualified and only then is the trainee coach is in the position to get credentialed as an associate. Further accreditation takes place with further hours of coaching experience.

Each member of the community that took part in this study had been through the abovementioned rigors; it is safe to say that this community of practice was very much established and with strong roots in the real world. In line with Wenger's perspective on communities of practice, Wenger, (2006); this community has within itself knowledge sharing, specific language, ethics, credentialing and a hierarchy. When a traditional community this established in the real world is taken into a virtual world using technology they know nothing of and asked to establish themselves there in sixteen hours, this study described what happened.

The first three workshops were located in a classroom with participants present physically. They were designed to scaffold the participants on the usage of the technology interface; this was the greatest hurdle as all CoP participants were not familiar with MUVE technology and were mostly average computer users. Throughout these three workshops it was clear to the researcher that the participants entered the study, not as a community of practice, but as individuals learning something entirely new. This situation was catered for in the scaffolding; it made the easing into the technology much easier. Confidence was also observed as being important to the participants, taking the next and subsequent steps in getting used to using the technology was critical to their continued belief in what they were trying to accomplish. Proper construction of a scaffolded, step by step introduction to a new technology could be seen as key to full immersion in the technology at a later stage, as was observed in this study.

Participant Quote:

"We tried out some different scenarios on workshops and everything to get us able to move around. I would say that it was a very entertaining environment and an environment that at first I was probably a bit wary of but as I got used to it became very familiar and very comfortable."

Humor was noted as a large element of the entire study; it was observed that humor helped alleviate the stress of the technology learning curve and assisted with building confidence in the participants. The group maintained support to each other such as explaining how to do a task or carry out a function; Participants watched how others completed actions and then replicated these themselves while seeing the fun side of getting things wrong. This was observed as a classic example of Banduras theory at work.

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The third workshop was designed as a treasure hunt. Tasks were given to participants to visit certain locations in Second Life to gather objects. The objects they had to gather were note cards or screenshots of information on what was at a location and what could be done there and also to obtain new clothing items for their avatars. This proved a very useful exercise in getting the participants interacting with the technology and to plant the seed of virtual interaction in their minds so they could recall their experiences when it came time for them to determine their own objects and knowledge sharing options for their community, it was also noted by the author that the confidence levels of the participants had reached a point such that they were now entirely comfortable with navigation and communication within the MUVE, this proved the scaffolding process in phase 1 of the design worked.

The author made observations when it came to the participants' avatar personalization, the first creation of the avatar was a very basic and humorous affair and when participants were tasked with obtaining new clothing for their avatars they turned up in some lavish outfits.
By the end of the third workshop, a discussion began amongst the participants as to the suitability of their avatars appearance. The discussion began with the choice of clothing worn by one participant and the colour of their avatar hairstyle chosen, two other participants mentioned 'you couldn't coach a client looking like that, they wouldn't take you seriously'. Their colleague was somewhat taken aback and mentioned it was only a joke.
This was observed as a milestone and pivotal moment in this community's transition to the MUVE from the authors perspective: It was humor backed, new learning experiences for the individuals up until this point, then the community aspect of this group manifested itself; the participants reminded their colleague of the seriousness of their practice and that even though it was a virtual environment that they must portray a professional appearance, even in a digital representation of themselves. The loudly dressed colleague went about adorning more formal wear. This was a clear case of a community of practice enforcing its own standards. The author touched on this point in the interviews with the participants; three responded that they believed they should look professional, even in a virtual capacity with one participant indicating that in a virtual world the same social rules apply as in the real world.

Participant Quote:

"We're coming from certain conditioning and social background and so forth. And that's just how we've evolved. So, when we look at an image on the screen we're making a judgment about that particular person. So, I do think those things are taken in to the virtual environment as well. So, it wouldn't be probably any different to how we would relate in the real world."

Participant Quote:

"Eventually you realise that with the image we wanted to do you needed to dress according to the image that you wanted to give to your clients. As a coach you can't have pink hair and short skirts or whatever. You have to be in appropriate dress code because it is a matter of what the clients will think of you and with the avatar it is the same. The avatar is reflective of who you are and if you want to get the clients than the clients have to be shown that it is safe and serious and not just a bit of fun'.

Participant Quote:

"I probably took twenty years off my age, five inches on my height and choose some clothes that I would never normally be seen in. So, then when I got a bit more sensible; what it was I actually wanted to portray as myself being a coach I then revisited my outfit and then changed it to in the real world what would be a little bit more how I would see a coach to be represented as a person."

The phase 2 workshops were held entirely in-world, Participants logged on from different locations, either the office or at home. Initial time was spent getting everyone's audio chat working so all could be heard. The author had sent the objectives for the workshop earlier and reiterated them to the CoP. The objective was to begin establishing a presence of their community on the island space. A discussion took place and the participants concluded they needed a kind of 'club-house'. This could have partly been because of their observance of other projects on the university's island or because of other structures they had seen in other parts of the environment. All agreed this was appropriate for their community and they decided to split up and try and find a suitable building. Three came back with options, all participants then visited the location in Second Life to review the options. The group decided on a multi storey

building. This was after reviewing a pyramid and varieties of houses. The discussion around the choice of building was that it was 'big enough'; "had lots of floors' and would afford good privacy as well as scope to further expand upon. The author purchased the building and 'rezzed' or built it on the Island space. Once this was done participants entered the building and discussions around furnishing it began. This marked a second important milestone in the CoPs transition, they had now established a link to their practice in the MUVE, and the building was exclusively theirs.

It was observed that the groups' professional standing theme arose once again in a discussion on the sort of furnishing required within the building. It was deemed that couches and tables were needed, nice soft lighting and a conference table. These, the group discussed were typical of the type of environment they were used to and wanted to re-create. A hunt for furniture began and with limited budget of Linden Dollars, the author purchased the items requested. The workshop ended officially, however one participant stayed in world to help 'arrange' the furniture in the building. This workshop showed the existing strength of this community of practice and the strict professional ethos that carried through into the virtual world from the physical world through the personal avatar appearance, the building choice and to the furniture choices. As this was the first workshop where the participants were not physically co-located, it was noted how quickly the group began functioning as a community, gone was the naivety of coming to grips with new technology and replaced with a 'getting down to business' attitude. This attitude consisted throughout the remainder of the study, while still maintaining a humorous connection.

The fifth workshop objective was to consider objects that the community could use to help to support them in the environment. A discussion began within the group that focused on the building being designed in such a way that it could support coaching or possibly training a coach. The group decided that each floor of the building should represent or support some facet of coaching people or training coaches or even welcoming visitors, the floor designation is described in chapter 3 of this paper in detail, however to recap:

Ground Floor: Entrance and Welcome area

Second Floor, Coaching practice/role-play area, later designated a Machinima studio.

Third Floor – Café/relaxation area

Fourth Floor – Knowledge sharing area

Fifth Floor – Auditorium.

The discussion then veered towards the CoP discussing amongst them, what it was they do and how they do it. It was here that the conversation stalled a little and there seemed to be no moving beyond the point of how they could show this. The author had to prompt a little and asked the group what they had seen in the environment that impressed them, they discussed some objects they had remembered and it was noted the group were beginning to connect interactivity with their own practice. The workshop ended with each participant agreeing that for the next workshop, they would reflect on what the next steps would be and how they could use the technology to better support themselves. Each participant volunteered to gather information pertinent to the communities practice: What it did, how it did it, specifics to the profession and some other supporting information on the way the profession worked. In the interviews, two participants mentioned they had to do some reflection on what it was they did and how best to impart that using the technology.

Participant Quote:

"I suspect then that I started thinking about the makeup of being a coach and going into a building myself and trying to find out information so maybe something for a new coach, for somebody who is just starting an understanding of what coaching is"

Participant Quote:

"I also kind of thought just in thinking about how rooms look and what might facilitate a coaching type environment. I think it was interesting the interactions of the group and what they felt that they could create and what would represent them and what would be very good for a new coach."

It was noted the participants decided that a period of self reflection needed to happen. The interviews indicated they were very impressed and immersed in the technology, yet by this point they had not made a full connection on how to fully exploit the affordances of the technology to outline the scope of their practice, they needed time to consider the intangible or abstract facets of their practice and how they could bring them to life or portray them in the virtual world, the implementation process did not fully cater for this occurrence and perhaps more could be done in the scaffolding to help inspire the CoP.

The sixth workshop showed each member of the community had given thought to how they

could represent their practice using the environment. A short discussion determined that the fourth floor should be used to house information on the community's practice. Each participant had information they had gathered to build a story for a potential client, new coach or just a visitor. They wanted to show what coaching was about, the types of coaching, specifics to the profession such as language, ethical guidelines and credentialing. They also wished to show some tools coaches used. To do this they had gathered an array of media. Youtube videos had proved popular amongst them all to help explain certain facets of their practice, Documents and presentations in power point format made up others. One participant had seen e-books during one in world visit and mentioned these may be good to impart presentation material, another participant mentioned that note-cards should be used to give out information that could be taken away for later reading. The videos were all in the public domain and the author explained they could be shown in second life using specific scripting.

The group decided on a mixture of e-books, note cards and YouTube videos would suffice. The discussion then began around how they could show what they do, in practice. They talked about making a video of them role-play coaching to give a potential visitor or trainee coach an idea of the work a coach does, this video would be made in person, face to face, but another participant asked the author about recording what occurred in Second Life from the screen, with an affirmative response the group decided they would record scenarios of coaching in Second Life itself. The group was informed the group that this was called Machinima or the making of movies using technology alone; the group decided the second floor could be a dedicated studio to making training videos and dubbed it the Machinima Studio. It was decided by the group that the fourth floor would house the media relevant to their practice and that a tour of the media should be constructed with a video of themselves practicing coaching in a role-play scenario at the end of the tour.

The participants gave instructions to the author on the set up of the media and construction of the fourth floor to cater for the tour of their practice. Construction of media artifacts then got underway with the help of two participants directing what they wanted and where.

This ended the sixth workshop. The author found that a bridge had been crossed between making the intangible, tangible for this community. The media provided by them to make artifacts could be uncovered by any interested party given enough time; however the community artifact which

was to be created by the group was to construct a video, entirely in-world to help impart their tacit knowledge.

This showed two important things to the author:
1. The community recognized the need that learning in their particular practice comes through experiential immersion in the role. They themselves had learned through role-plays in real world training and saw fit that any potential coach or visitor would understand better how a coach works by viewing a role play that they constructed themselves.
2. This showed an acceptance by the participants of the affordances of a domain rich environment to support them in imparting their tacit knowledge. They now understood the learning opportunities that virtual world technology could give.

The Seventh workshop began with the participants having scripts for two of four videos they wished to record, these were: 1. The right way to coach, 2. The wrong way to coach and 3, The 5 minute coaching session. The participants explained that just doing one video would be no good to an outsider; they needed to have differentiation so an onlooker could see the differences in how they conducted themselves in a coaching session, they also wanted to show a typical short (5 minute) coaching session that they felt happened quite frequently in their line of work and finally they felt that a fourth video showing an interview with a coach would give a visitor an idea of the type of person who would make a suitable coach as well as impart some tips on how to go about it.

The participants were noted as being excited at the thought of making these videos as it was their own work and they felt that they could really get across what they do by making them.

A program was used called FRAPS to record the on screen proceedings, a number of takes needed to happen to ensure video and audio was being recorded correctly.

Two videos were recorded over the course of the workshop. The quality was reviewed by the participants and they indicated they were happy for the videos to be used. The group was informed that the next workshop would be the final as some participants had expressed they could no longer afford time to spend on the study. The group spent time organizing furniture and the artifacts on the fourth floor making adjustments and testing video feeds. The participants

indicated that they would like the videos to be the last stop on the knowledge sharing tour to be the 'cherry on the cake' so to speak. The construction was to be a square, where each wall contained one facet of the communities practice showing Video and other content, the inner part of the square was to contain the roleplay videos, the last stop on the knowledge sharing tour. This approach seemed to echo Polyani's words on tacit knowledge: "Tacit knowledge collects all those things that we know how to do but don't know how to explain, it is a type of knowledge that is not captured. It can be seen only in action. Polyani, (1958)

The eighth and final workshop of the study recorded the final two videos, the 5 minute coaching session and an interview with a coach, the videos were uploaded and time was spent reviewing and checking the building. It was noted there seemed to be an air of disappointment the study had come to an end. The participants were proud of their work and were impressed that in such a short time that they could manage to establish such a presence in the virtual environment. A discussion took place between two participants on the possibility of holding an actual coaching session in the environment; however both came to the conclusion that more work would need to be done to ensure security and confidentiality. All participants discussed how the environment could be very well used to train employees, especially in simulations.

This ended the study from the perspective of establishing a community of practice in a multi user virtual environment. Eight workshops were held; participants were trained on the usage of the technology and given a series of objectives for each workshop. They established a community building and furnished it for use, they assigned different functions to each floor of the building and they shared information on how their community functions through the use of virtual artifacts. The attempted to impart their tacit intangible knowledge through a series of Machinima videos created in the environment using their virtual selves as actors.

7.3   Conclusions

This chapter described in detail the findings from the data. In the next chapter the study conclusions will be discussed answering the research question and suggestions for further study are made.

Chapter 8 - Discussion and Conclusions

This previous chapter provided an in-depth review of the findings from the data. This chapter will answer the research question, discuss the limitations of the study and make recommendations for further research.

8.1   Answering the Research Question

Given a traditional community of practice (CoP) with no experience or presence in a virtual world, how might that community become established in the virtual world?

This study shows that members of a traditional community of practice with no knowledge of a virtual world can successfully become established in a MUVE if given the right supports. The study shows that proper preparation and basic instruction to MUVE technology plays a large part in a successful community transition to and establishment in a virtual world. The immersive domain rich context of virtual worlds showed it is an incubator for ideas and provides communities of practice opportunity for sharing of knowledge, both tangible and intangible.

Sub question:

What approach might be taken to allow establishment of any community of practice in a Multi-User Virtual Environment?

The author, guided by the literature formulated an eight stage process which facilitated the community of practice in its establishment of presence in the MUVE and further facilitated the creation of artifacts. It was found that the first phase of this process is important to a successful establishment of presence as the CoP participants are more immersed in the technology and less concerned about how to operate it. Discussion and democratic decision making are also important to aid establishment.

How might that community of practice represent itself in the MUVE ?

This study shows that adherence to social, real world norms were prevalent with this instance. It was observed from selection of avatar appearance and choice of building to its furniture. The community was seen to govern itself in the virtual world as in the real world, and a professional outward appearance was expected in line with the communities' ethos.

This community represented itself using documented artifacts such as presentations and videos shared using virtual world technologies such as e-books, video streaming and note-cards. The community attempted to capture and share its tacit knowledge through Machinima by scripting, and acting in role-plays within the virtual environment.

8.2   Unexpected Findings.

The author did not foresee the community functioning in the MUVE as it would in the real world in relation to its professionalism and ethos. Observations on how the community policed itself and considered its portrayal in the virtual world, just as important as it would in the real world, was unexpected. There was no expectation that the community would also consider using the technology to coach their clients, this was stated as a potential result of further use by a number of participants. The self reflection of the community was unexpected, before establishing themselves in the environment had them question the community reason for being and the facets of its practice, this shows that a transition to virtual community can bring clarification and motive to a community by helping them to re-consider what is priority to them.

The innovative use of Machinima by creating in-world videos of the CoP roleplaying coaching scenarios was perhaps the most interesting artifact created, the other artefacts represented hard knowledge already existent but brought into the virtual environment, the role-play videos show how this community considered the potentiality of the technology and exploited it to show their tacit, unwritten knowledge, it also shows how tacit knowledge is of importance to this community as they actively sought a way to share it for the benefit of others, this stands with Ardichvili's perspective: knowledge exchange is motivated mostly by moral obligation and community interest considerations, not by narrow self-interest. Ardichvili et al, (2003) and further ties in with Lave & Wenger's view on CoP: Communities develop themselves and their

practice through activities such as sharing of experiences and stories. Lave and Wenger. (1991).

8.3   Limitations of the Research

There were some limitations to this research study.

1. The number of participants was four people.
2. The participants did not have to build or program any objects themselves.
3. The participants did not have to fund any objects themselves.
4. There was no opportunity to have the artifacts reviewed by non participants.

8.4   Recommendations for further research.

The author recognizes that this study had certain limitations, specifically as it was a single case study, opportunity to research different types of communities of practice transitioning and establishing in a Multi User Virtual Environments should be seized upon to understand further how the technology can facilitate and support these groups. Another potential area for research is the personalization of an avatar and the social consideration thought processes behind it, also further study of the social interactions that occur in a MUVE amongst communities of practice where visual cues to conversation are not present would add to the literature.

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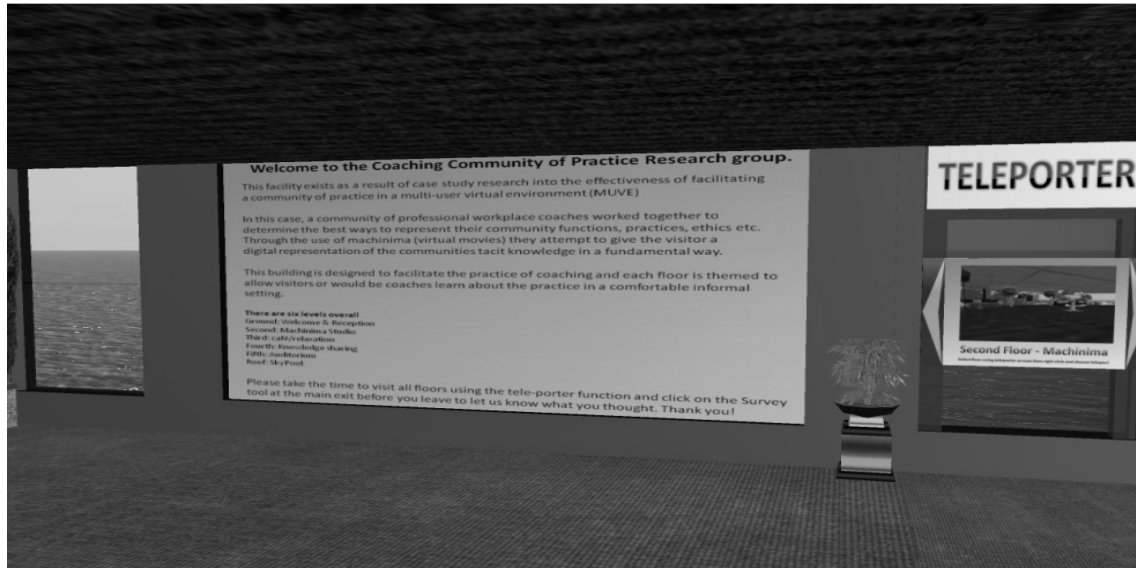
Appendix A – Views of the Artifacts

Figure 19. First floor welcome area.

Figure 20. Second Floor Meeting/Machinima Studio

Figure 21. Third floor café

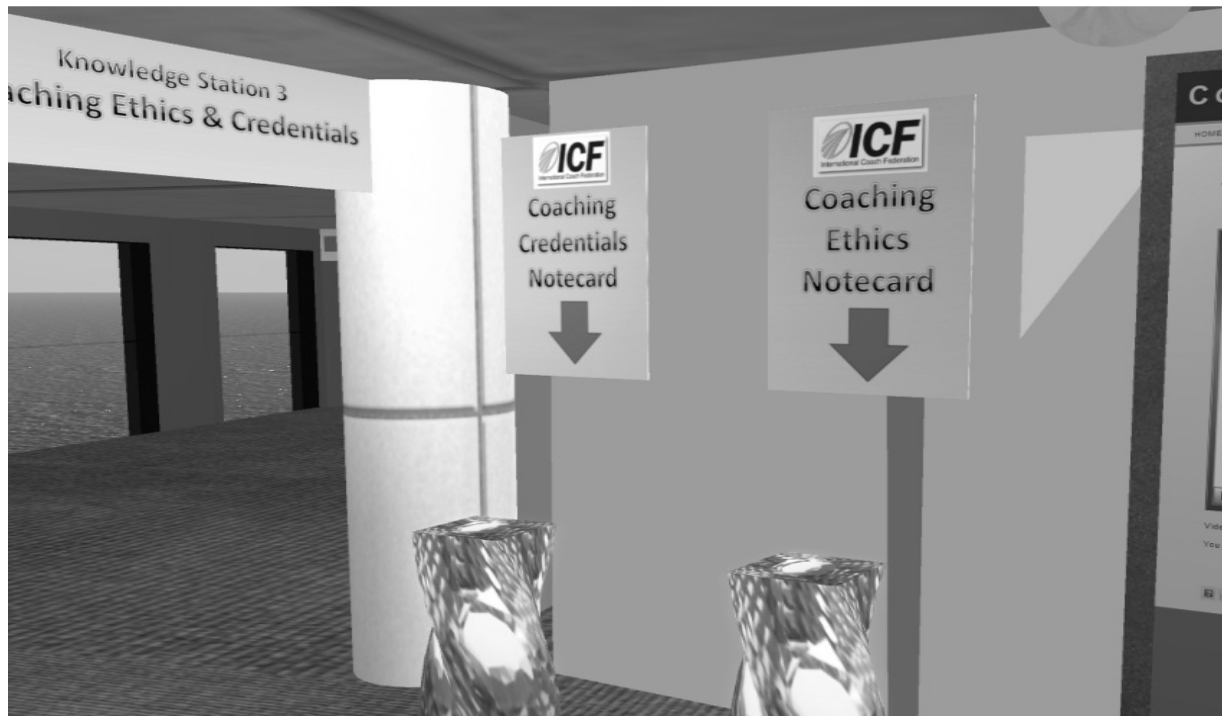**Figure 22. Further Example of 4th floor knowledge sharing stations.**

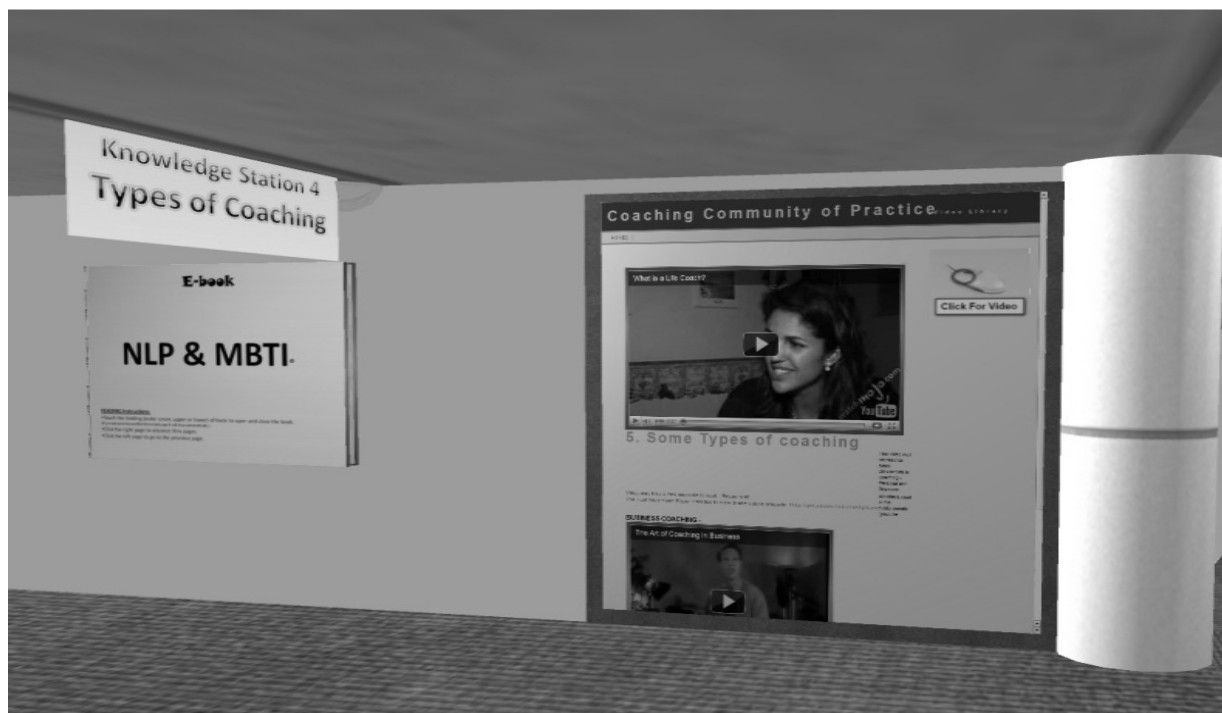**Figure 23. Notecard givers sharing credentialing and ethics information.**

Figure 24. Video wall and eBook examples.

Figure 25. Tacit knowledge sharing: Machinima videos made by the community

Figure 26. 'The Wrong Way'; tacit knowledge video made by the community.

Figure 27. Fifth Floor Auditorium.

Figure 28. Example of a Teleporter in the CoP building.

Appendix B – SPSS® Data mining.

Figure 29. SPSS® Concepts results

Figure 30. SPSS® Codes/Categories Results

Figure 31. SPSS® Narrowing of Codes/categories

Figure 32. SPSS® Percentage and number of documents where the concepts in the categories appeared

Appendix C. Research ethical approval and participant forms.

Project Title: An exploration into the effectiveness of facilitating a workplace community of practice in a Multi-user virtual environment (MUVE).

Name of Lead Researcher: ....Paul Cronin...

TCD E-mail: ……croninp1@tcd.ie……………........……………. **Contact Tel No.:** …xxxxxxxx...........……

Course Name and Code (if applicable): …MSC Technology & Learning – CS008...…………………………………………

Estimated start date: Nov 1st 2009...……………… **Estimated end date** Dec 21st 2009......……………

Office Use Only
SCSS Ref No.: ………………………..............…………Date Received:

I confirm that I will (where relevant):

- Familiarize myself with the Data Protection Act and guidelines http://www.tcd.ie/info_compliance/dp/legislation.php;
- Tell participants that any recordings, e.g. audio/video/photographs, will not be identifiable unless prior written permission has been given. I will obtain permission for specific reuse (in papers, talks, etc.)
- Provide participants with an information sheet (or web-page for web-based experiments) that describes the main procedures (a copy of the information sheet must be included with this application)
- Obtain informed consent for participation (a copy of the informed consent form must be included with this application)
- Should the research be observational, ask participants for their consent to be observed
- Tell participants that their participation is voluntary
- Tell participants that they may withdraw at any time and for any reason without penalty
- Give participants the option of omitting questions they do not wish to answer if a questionnaire is used
- Tell participants that their data will be treated with full confidentiality and that, if published, it will not be identified as theirs
- On request, debrief participants at the end of their participation (i.e. give them a brief explanation of the study)
- Verify that participants are 18 years or older and competent to supply consent.
- If the study involves participants viewing video displays then I will verify that they understand that if they or anyone in their family has a history of epilepsy then the participant is proceeding at their own risk
- Declare any potential conflict of interest to participants.
- Inform participants that in the extremely unlikely event that illicit activity is reported to me during the study I will be obliged to report it to appropriate authorities.

Signed: ....Paul Cronin.. **Date:** ....October 22nd 2009...............
         Lead Researcher/student in case of project work

Part B

Please answer the following questions.		Yes/No
Has this research application or any application of a similar nature connected to this research project been refused ethical approval by another review committee of the College (or at the institutions of any collaborators)?		No
Will your project involve photographing participants or electronic audio or video recordings?		Yes Audio Recordings only for transcription purposes
Will your project deliberately involve misleading participants in any way?		No
Is there a risk of participants experiencing either physical or psychological distress or discomfort? If yes, give details on a separate sheet and state what you will tell them to do if they should experience any such problems (e.g. who they can contact for help).		No
Does your study involve any of the following?	Children (under 18 years of age)	No
	People with intellectual or communication difficulties	No
	Patients	No

Details of the Research Project Proposal must be submitted as a separate document to include the following information:

1. Title of project
2. Purpose of project including academic rationale
3. Brief description of methods and measurements to be used
4. Participants - recruitment methods, number, age, gender, exclusion/inclusion criteria, including statistical justification for numbers of participants
5. Debriefing arrangements
6. A clear concise statement of the ethical considerations raised by the project and how you intend to deal with them
7. Cite any relevant legislation relevant to the project with the method of compliance e.g. Data Protection Act etc.

Part C

I confirm that the materials I have submitted provided an complete and accurate account of the research I propose to conduct in this context, including my assessment of the ethical ramifications.

Signed: ....   Date:
....
          Lead Researcher/student in case of project work

There is an obligation on the lead researcher to bring to the attention of the SCSS Research Ethics Committee any issues with ethical implications not clearly covered above.

If external ethical approval has been received, please complete below.

External ethical approval has been received and no further ethical approval is required from the School's Research Ethical Committee. I have attached a copy of the external ethical approval for the School's Research Unit.

Signed: ....Paul Cronin..   Date: .....23ʳᵈOctober 2009....................................
       Lead Researcher/student in case of project work

Completed application forms together with supporting documentation should be submitted in hardcopy to the School's Research Unit, Room F37, O'Reilly Institute, and an electronic copy e-mailed to <u>research-unit@scss.tcd.ie</u> Please use TCD e-mail addresses only.

Research proposed

An exploration into the effectiveness of facilitating a workplace community of practice in a Multi-user virtual environment, (MUVE).

o **Purpose of project including academic rationale**
The purpose of this research project is to understand how a community of practice might function in a virtual environment and furthermore how that community of practice might extend its reach to people interested in becoming full members of that community of practice.

o **Methods and measurements**
The virtual environment will use the facilities of Second Life (www.secondlife.com) in a dedicated controlled access area provided by Trinity College Dublin. Participants of an existing community of practice will use the virtual environment to share knowledge and also to create and publish artefacts specific to that community of practice. Measurements will take the form of surveys of participant's usage of the virtual environment and their perceptions of it as a vehicle for communicating with members of their community. Interviews with participants will also take place to delve further into their perceptions of usage of the virtual environment. Technical measurements from second life will be recorded such as chatlogs and screenshots of work in progress.

o **The participants:**
Participants will be made up of two groups: Existing members of a community of practice in a workplace environment and a second group of potential new members to that community of practice. Recruitment will be voluntary. It is expected a minimum of four people will partake in each group making a minimum total of eight people of mixed gender and age groups from 25 to 55 years of age. All participants are adults working in a modern corporate workplace and will be briefed fully on the nature of the research and allowed to opt out at any stage without penalty.

- **Debriefing arrangements**

   One on One interviews will be staged with participants upon completion of the activities in the virtual environment. These interviews will be audio recorded for the purposes of transcription. All participants will remain anonymous, except to the researcher.

- **Ethical Considerations**

   Data privacy with Audio Recordings: Should a participant object to being audio recorded during the one to one interviews, the researcher will rely on hand written notes. Participants will be asked to sign an agreement before embarking on the research. This agreement outlines the nature of the research and what participants will be expected to participate in and how their data will be handled. (Agreement is attached to this document)

- **Data Protection:**

   Any personal data will be anonymous. The participants of the research will be known in person only to the researcher. All digital data recorded will be stored on a secure hard drive which will be password protected. All survey responses will be via on on-line survey tool (www.freeonlinesurveys.com) and access to the surveys will be password controlled and responses only viewable to the researcher. The researcher will endeavour to adhere to the data protection act 1988 & 2003 amendments to that act which are governed under the laws and statutes of the Republic of Ireland.

Participant information & consent form

The purpose of this research project is to explore how a community of practice might function and grow in a virtual environment. It will involve participants using a virtual environment in the form of an avatar (digital representation of oneself in a virtual environment).

This research project will record data relevant to the project only and in all cases participants will remain anonymous as will their organisation. Any data collected will be used in relation to the writing of a dissertation on the topic of the research and the researcher will endeavour to adhere to the provisions laid out in the Data protection act 1989 & 2003 amendments governed under the laws and statutes of the Republic of Ireland.

Participants will be asked to complete questionnaires/surveys and statistical data from the virtual world on participants will be recorded in the form if screenshots and chat logs. Audio recordings of one to one interviews with the participants and the researcher will also take place for the purposes of transcription only. Participants will be identified in the research dissertation as Participant 1, Participant 2 and so on.

Participants should understand that participation in this research project will be recorded for the purposes of writing a dissertation on the topic. Interviews may be audio recorded for the purposes of transcription and that at all times personal identity & the participant's organisation will remain anonymous and known only to the researcher. Participants should understand that any data collected during the course of this research project and which may be entered into the dissertation of the researcher will be held in the libraries of Trinity College, Dublin, Ireland for up to and exceeding seven years and will be publicly available for review.

Participant Consent

I confirm that I have received the information letter detailing aspects of this research project, including how my data will be collected, stored and how I can contact the researcher. I also understand that I can opt out of the research project at any time without penalty.

I understand that:
• I will not be identified personally in the final results of this study.
• The researcher will not reuse my data for any other purpose.
• My participation in this research is voluntary.
• I am able to opt-out at any time during this study without penalty.
• It is not required for me to complete all questions of the questionnaire(s).
• I am able to contact the researcher for a copy of the findings of the research after the study has been completed.
• If I or anyone in my family has epilepsy I proceed at my own risk.
• I will declare any conflict of interest with this research.
• I understand if any illicit activity is reported during this study the researcher is obliged to report it to appropriate authorities.

Name of Participant: _____

I am over 18 years of age and competent to give consent (please circle):   Yes   /   No

Participant's signature: _____

Researcher's signature: _____

Researcher's contact details:
Paul Cronin. croninpa@ie.ibm.com; croninp1@tcd.ie   Tel +35387-7799-419.

Date:_____

(This consent form will be filed with all matters relating to this project and details will not be passed on to any third party.)

External ethical approval: Employer Approval

Paul Cronin will engage in a research study within his workplace with Adult employees and will apply the attached ethical guidelines during the study. I hereby approve the research study to occur on the condition that the organization name and participants to the study remain anonymous.

Signed_____
Manager of operations, xxxxxxx

Date_____

Contact Telephone Number_____