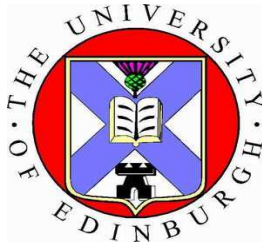


**Usability Engineering and Social Presence for  
Interaction, Collaboration and Learning in Second Life  
for the Provision of Real-World Financial Services**

**Laurene McCafferty**



**Ph.D. Thesis**

**2009**

## **Declaration of Originality**

**25<sup>th</sup> September 2009**

This thesis is submitted for the Degree of Doctor of Philosophy. I declare that it has been composed by myself and that the work described is my own research.

Laurene McCafferty

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## **Abstract**

Virtual environments offer an exciting platform for social science research. The persistent nature of online virtual worlds such as Second Life however has increased the potential for both companies and institutions looking to establish a virtual presence and researchers looking to measure the evolving forms of human behaviour displayed when interacting within them. Since the use of the Internet has become widespread, commercial enterprises are particularly interested in exploring the opportunities that virtual environments may hold for them as the stereotype of what constitutes a ‘typical’ computer user gradually becomes broken down within contemporary society. Second Life and virtual worlds alike deviate from what might be categorized as a game, serving more as extensions of reality than escapes from it. Virtual worlds have been said to be dichotomous in that they may act as play spaces as well as extensions of the real world. Much existing research on computer-mediated communication and online behaviour has focused upon the differences between computer-mediated and face-to-face communication, and has provided in-depth reports on online communities. A growing body of research, however, focuses a more integrative view of computer mediated communication, looking at how online time fits with and complements other aspects of an individual’s everyday life.

This work uses the virtual environment of Second Life to integrate the virtual and the real for real-world financial benefits and analyses the ways in which they intersect.

The research presented here provides evidence for the thesis that the persistent online virtual world of Second Life can act as a valid and effective user interface metaphor for the financial services sector. The theory of social presence when applied to human-computer interaction provided the basis of this work. A practical metric is developed by which a bank could effectively create an optimum virtual environment to provide a new and innovative service for its customers by measuring levels of perceived social presence in interaction, collaboration and learning scenarios. Financial institutions and companies alike can use these results and turn them into practical tools to create a virtual environment for customers or staff to interact within that can project them to the forefront of technological innovation and add to a reputation as an ever developing and forward thinking company.

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## List of Abbreviations

CASA	– Computers as Social Actors
CVE	– Collaborative Virtual Environment
FA	– Financial Agent / Advisor
HCI	– Human Computer Interaction
MMORPG	– Massively Multiplayer Online Role-Playing Game
MOG	– Multiplayer Online Game
MUD	– Multi-User Dimension / Domain / Dialogue / Dungeon
SVE	– Shared Virtual Environment
VoIP	– Voice over Internet Protocol
VW	– Virtual World

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# Chapter One

## Introduction

The thesis expounded in this work is that the persistent online virtual world of Second Life can act as a valid and effective user interface metaphor for the financial services sector. The research involved both objective analysis of usability and subjective analysis of social presence and user motivations within Second Life. Three milestones were identified for the project, each corresponding to a usability experiment. This project involves three large-scale experiments – The Interaction Experiment, The Collaboration Experiment and The Learning Experiment. Each experiment in the project involved the analysis of different sociological aspects within Second Life.

The motivation for this research is to make a contribution to knowledge in the field of online virtual environments, and gain insights into how best to realise their practical application. The foundations of the research are theories of social presence when applied to human-computer interaction as well as the five-factor model of user motivations in shared virtual environments (Yee, 2006). The research is based on a series of practical experiments conducted to explore the usability design issues of carrying out financial based tasks within a specially created virtual bank branch in Second Life. The research presented here details the development of a valid and reliable metric for the assessment of attitudes towards interaction, collaboration and learning within Second Life. Since this metric has specific practical relevance to the financial services sector, it would enable financial institutions to create an optimum virtual environment for their customers to interact within.

The research described here begins in Chapter 2 with an examination of the theoretical foundations for these studies with a review of the relevant literature on virtual environments and Human-Computer Interaction (HCI). Theories of social presence are also discussed, taking into account the wide discrepancies that exist within this area to arrive at a definition for the development of the metric presented in this research. Studies conducted within virtual environments are also examined however the research within this area is still in its infancy. A lack of controlled experiments in this field also makes the research presented here a novel contribution, with the majority of existing studies being more of an observational nature.

Three empirical investigations of Second Life for the provision of real world financial services, their design and possible practical applications are then presented together with a discussion of the results of a qualitative analysis of a new Shared Virtual Environment (SVE) Social Presence Perception Scale questionnaire, proposed here. Chapter 3 discusses the Interaction Experiment, comparing the impact of the appearance of three different financial agent avatars, differing in levels of anthropomorphism, within the virtual bank branch in Second Life. In the experiments, participants were asked to carry out both real-world and 'in-world' financial enquiries, completing usability questionnaires for each financial agent avatar and task context. Participants also completed the SVE Social Presence Perception Scale questionnaire for each financial agent avatar and task context to assess and compare the effect that each of the three financial agent avatars had upon customers' perceived level of social presence. The findings of this experiment show that customers prefer interacting with humanoid avatars when utilising the virtual world of Second Life to carry out tasks relating to both real-world as well as 'in-world' Second Life financial



enquiries. These findings show that the level of anthropomorphism affects people's social judgements of their interaction partners as well as the levels of usability and perceived social presence experienced. They also provide the foundations for the study and define the details for the experiment design discussed in Chapter 4.

Chapter 4 discusses the Collaboration Experiment comparing the impact of collaborating through two different mediums within the virtual bank branch in Second Life on customers' attitudes towards carrying out financial tasks. The financial agent avatars used within this experiment were humanoid in appearance as a result of the findings from the Interaction Experiment. The virtual bank branch was also altered as a result of previous participant feedback to display a more realistic theme and to include the case bank's logo. Customers compared two communication mediums (text messaging and voice - VoIP) within the virtual bank branch in Second Life. Each participant encountered two communication mediums as well as two genders of financial agent avatar. In each encounter participants collaborated with their partner, another customer of the case bank logged into Second Life, to alter the appearance of a financial agent avatar and then choose the features of a credit card for an organisation "to which they both belonged". After each set of tasks participants completed a Usability questionnaire as well as the SVE Social Presence Perception Scale questionnaire. The findings from this experiment show that customers prefer communicating using voice (VoIP) rather than instant text messaging when collaborating within the virtual world of Second Life to carry out financial tasks. The communication medium affects people's social judgements of their collaboration partner (and financial agent) as well as the levels of perceived usability and social presence experienced.

Chapter 5 discusses the final experiment in the study, The Learning Experiment, comparing two information display methods (basic text display and video stream) within the virtual bank branch in Second Life. In this between-subjects design, half of the participants viewed information through basic text presentation and the other half viewed the information through video stream (voice over and images). Each participant took part in the experiment individually to carry out one set of tasks within the virtual bank branch, during which they would also be interacting with the humanoid financial agent avatar. The set of tasks consisted of two stages in which participants will view both a 'history' and a 'present' presentation of information relating to the case bank. After each of the presentations the financial agent asked the participant three basic questions based on the information they had just viewed and their responses were recorded in order to test information recall levels within each condition. After the task set participants completed a Usability questionnaire as well as the SVE Social Presence Perception Scale questionnaire. The results from this experiment showed that customers prefer viewing financial based information through video stream rather than text display within the virtual world of Second Life. The information delivery method affects people's attitudes towards interacting within the virtual bank branch as well as the usability, perceived social presence experience and overall experience.

Chapter 6 details the main findings and the contributions that this research provides as well as making suggestions for further work.

## Chapter Two

# **The Sociology of Virtual Worlds and the Theory of Social Presence**

## ***2.1 Introduction***

Chapter 1 provided a brief insight into the motivations for this research and outlined the Interaction, Collaboration and Learning Experiments contained within the study. This chapter will explain in more detail the technology under investigation (virtual worlds and in particular, Second Life), the associated sociological issues and theories involved in this study, and the methodology used to examine them for real-world financial purposes.

## ***2.2 A history of virtual worlds***

Online video gaming has expanded steadily since the mid-1990s. Whilst earlier games were designed to be played by a single player or more than one player in the same location, today's games in many instances have online options for players to join each other and play either cooperatively or competitively over the Internet. One of the most recent examples of this can be seen in Sony's Play Station Network. The current generation of video game systems; XBox 360, PlayStation 3, and both the Nintendo Wii and the Nintendo DS portable, all connect to the Internet, and games designed for mobile phones or Internet-connected pocket computers are proliferating. Researchers are exploring the methods needed to create an entirely new generation of games, called pervasive LARPs (live-action role-playing games), that have players act in the real world while simultaneously interacting over the Internet via wireless mobile connections. The term 'virtual world' is a relatively vague and inclusive term.

Differing from what may be typically classed as a 'game' however, a virtual world may be defined as a computer-based simulated environment intended for its users to inhabit and interact via avatars. This habitation is usually represented in the form of two or three-dimensional graphical representations of humanoids (or other graphical or text-based avatars). The majority, but not all, virtual worlds allow for multiple users. The computer-simulated environment in many cases appears similar to the real-world with real world characteristics such as gravity, locomotion, topography, real-time actions and communication. Communication has, until recently, been in the form of text, but now real-time voice communication using VoIP is available.

One perception of virtual worlds requires an online persistent world, active and available twenty-four hours a day, seven days a week, to be classed as a true virtual world. Whilst this may be possible for smaller virtual worlds, especially those that are not actually online, no massively multi-player game can technically run consistently every day. The majority of online games include downtime for maintenance that is not included as time passing in the virtual world. While interaction with other participants is done in real-time, time consistency is not always maintained in online virtual worlds. For example, Everquest time passes more quickly than real-time despite using the same time calendar and time units to present game time.

The earliest virtual worlds were not games but generic virtual reality simulators. The first virtual worlds presented on the Internet were 'communities' and chat rooms, some of which evolved into MUDs (Multiple user Dimensions, Domain, Dialogue Dungeons because of their suggested genealogy from the role-playing game Dungeons and Dragons in the late 1970s and early 1980s). Some early prototypes

were Worlds Away and The Palace however credit for the first online virtual world usually goes to Habitat, developed in 1987 for the Commodore 64 computer. In 1996, the city of Helsinki, in conjunction with the Helsinki Telephone Company launched what was called the first online virtual 3D depiction, intending to map the whole city. The Virtual Helsinki Project, later named Helsinki Arena 2000 mirrors the concept of more recent tools such as Google Maps and more recently Street View launched in 2009. The first virtual world concentrating on children's education was launched as Whyville.net<sup>1</sup> in 1999. Site design included many features that are now common to other virtual worlds, including user-customisable avatars, an "in-world" economy and "bubble chat".

It has been argued that Second Life and other virtual environments like World of Warcraft, Active Worlds and There can have their early origins traced back to MUDs. MUDs are multi-user real-time virtual worlds described entirely in text, although in some MUDs players are represented by graphical icons. They generally involve some of the characteristics of role-playing games, 'hack and slash', interactive fiction and online chat. Players can read descriptions of rooms, objects, other players, non-player characters and actions performed in the virtual world. Players interact with one another, as well as the world itself, by typing commands that resemble a natural language. Using the example of the virtual world LambdaMoo, a person playing a character named LM would type the command "say" before engaging in text chat and this would appear on all players screens as "LM says". Any actions that this player typed after the command "emote" will appear after their name just as they type them, for example "LM walks away" or "LM cries loudly". Characters can also "whisper"

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<sup>1</sup> <http://www.whyville.net/smmk/nice>

to one another and only the specific character that the message is intended for will be able to see the words. This kind of function has been developed and can be seen in Second Life with private instant messaging options through text and more recently voice by clicking on a button. A wide range of MUDs currently exist, appealing to different individual motivations and as a result some distinct sub-groups can be seen to have formed. For instance there are hack and slash, player versus player, role-playing and talker MUDs. It has previously been suggested that the majority of MUD players are middle class males in their early twenties and late teens (Turkle, 1995). With the emergence of new virtual worlds appealing to a wider range of user motivations within the past ten years however, it could be said that there has been a broadening in the demographic of virtual world users in terms of both age and gender.

Graphical virtual worlds were originally called graphical MUDs with one of the most prevalent being Everquest<sup>2</sup>. By 2000 however, the term MMORPG (massively multiplayer online role-playing game) had become widely used in reference to these virtual environments. The term MMOG is also used and will be used throughout this study. The increase in computing power and Internet connectivity during the late nineties could be said to be responsible for this change in terminology. Graphical MUDs are MUDs that use computer graphics to represent parts of the virtual world and its inhabitants. They require users to download a special client and the game's artwork. They range from simply enhancing the user interface to simulating 3D worlds with visual spatial relationships and customised avatar appearances.

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<sup>2</sup>Everqueststation.station.sony.com./

Having discussed the earlier forms of online environments, it may be unclear as to what actually constitutes a virtual world. Further confusion may arise from the various names to which online virtual environments are referred, including CVE's (Collaborative Virtual Environments), virtual worlds, MMORPGs (massively multiplayer online role-playing games), MUDs (multi-user domain / dialogue / dungeon). The Term SVE (shared virtual environment) is incorporated into the metric developed in this research since it is appropriate when referring to an online environment such as Second Life where there are not set goals or objectives, where the term 'collaborative' perhaps may infer that there was a particular requirement of the user. Six key characteristics have been identified however to suggest the features that all virtual worlds have in common (Terranova, 2004):

1. Shared Space: The world allows many users to participate at once.
2. Graphical User Interface: The world depicts space visually, ranging in style from 2D "cartoon" imagery to more immersive 3D environments.
3. Immediacy: Interaction takes place in real time.
4. Interactivity: The world allows users to alter, develop, build or submit customized content.
5. Persistence: The world's existence continues regardless of whether individual users are logged in.
6. Socialization / Community: The world allows and encourages the formation of in-world social groups like guilds, clubs, neighbourhoods etc.

These six characteristics differentiate virtual worlds from related but separate online spaces including MUDs (which contain all of the characteristics except from the



Graphical User Interface) and chat rooms (which contain all the characteristics except from Interactivity and the Graphical User Interface). The inclusion of all of the six features within an online environment can arguably increase the immersive experience for users, as seen in Second Life.

### **2.3 Second Life**

Since the turn of the 21<sup>st</sup> Century, a number of social networking sites have evolved, offering a new generation of interactive tools through which Web users can communicate on a global scale. Such sites include MySpace, Facebook, Bebo and YouTube<sup>3</sup>. The popularity of these sites has resulted in a continual stream of media scrutiny, assessing both the positive and negative implications of such tools. They could perhaps also be credited with playing a role in reducing the element of ‘social stigma’ traditionally attached to online communities. The persistent virtual world of Second Life<sup>4</sup> can be seen to take the premise of the aforementioned social networking sites to a three-dimensional presentation. Media representations have been prompted by a number of organisations and businesses that have entered this virtual world, including Harvard University, Stanford University, Adidas and Sony BMG. However, despite this wide-scale interest, there remains an array of sociological issues associated with virtual networking which merit study. Issues include parallels and differences between online and real world behaviour, relationship formation, community, gender, sexuality, in-world economies and avatar creation.

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<sup>3</sup> [www.myspace.com](http://www.myspace.com), [www.facebook.com](http://www.facebook.com), [www.bebo.com](http://www.bebo.com), [www.youtube.com](http://www.youtube.com)

<sup>4</sup> [www.secondlife.com](http://www.secondlife.com)

Second Life (SL) is an Internet-based virtual world, launched in 2003 by Linden Labs in San Francisco. It is only recently, however, that Second Life has come to international attention through a number of media representations in late 2006 and early 2007. Users, more commonly referred to as ‘residents’, are able to interact with one another through animated avatars, providing an advanced level of a social network service combined with the general aspects of a metaverse. Residents can explore, meet other residents, participate in individual and group activities and create and trade items and services from one another in a 3D virtual world. At present, a total of some seven million resident accounts have been created with trading in the region of some \$1.5 million per day. Second Life has its own virtual currency, the Linden Dollar (L\$), and is exchangeable for US dollars in a marketplace consisting of residents, Linden Lab and real-life companies.

A number of these Internet-based virtual worlds exist and continue to grow in popularity, of which the most prolific include Active Worlds<sup>5</sup>, There<sup>6</sup> and World of Warcraft<sup>7</sup>. These virtual environments are often referred to as Massively Multiplayer Online Games (MMOGs or MOGs) and provide a persistent 3D environment in which users can interact. What sets Second Life apart from a number of the other virtual worlds, however, is that there are no set goals or objectives which users are required to achieve (e.g. to move on to another level) as is often the case in environments such as World of Warcraft. Instead, the focus in Second Life appears to be predominantly on interaction, as well as in-world creation, which can be seen in the creation of virtual property in particular.

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<sup>5</sup> [www.activeworlds.com](http://www.activeworlds.com)

<sup>6</sup> [www.there.com](http://www.there.com)

<sup>7</sup> [www.worldofwarcraft.com](http://www.worldofwarcraft.com)

There is much debate surrounding the potential longevity of Second Life, as well as the number of other virtual worlds that are prominent at present. This may be due to the fact they are still very much in a stage of infancy and perhaps not yet fully integrated into contemporary society. Such views, however, may be seen to have been expressed in the introductory stages of mechanisms such as on-line banking and indeed telephone banking, with a number of experts in the field indicating that virtual worlds will too become increasingly integrated and indeed accepted beyond a stereotypical 'tech-savvy' user group (Turkle, 2005).

## ***2.4 The Avatar***

When carrying out research in virtual worlds with participants that are not regular users of virtual worlds, it is important not to simply presume that certain terminology is widely understood and accepted. Throughout the experimental process, participants were given an explanation of what an avatar was within the research context, and particularly Second Life. The term could be said to be gradually entering into mainstream media, for example through reports on the upcoming James Cameron film 'Avatar' (Empire, 2009). The following section outlines the origins of the term avatar and how it came to be used within the context of virtual environments.

An avatar is a computer user's representation of himself / herself or alter ego, whether in the form of a three-dimensional model as used in computer games, a two-dimensional (picture) as used on Internet Forums, or a text construct found on early systems such as MUDs. It is an "object" representing the embodiment of the user. The

word avatar from the Sanskrit word for ‘stepping down’ or ‘moving on’ is usually translated in English as ‘incarnation’ (Linden, Lab, 2009).

As used for a computer representation of a user, the term dates at least as far back as 1985, when it was used as the name for the player character in the Ultima series of computer games (De Maria, 2007). The Ultima games started out in 1981, but it was in Ultima IV in 1985, that the term "Avatar" was introduced. To become the "Avatar" was the goal of Ultima IV. The later games assumed that you were the Avatar and "Avatar" was the player's visual on-screen in-game persona. The on-screen representation could be customized in appearance. Later, the term avatar was used by the designers of the pen and paper role-playing game Shadowrun (1989), as well as in the online role-playing game Habitat (1987).

The use of the term avatar to mean online virtual bodies was popularised by science fiction novel Snow Crash (Stephenson, 1992). In Snow Crash, the term avatar was used to describe the virtual simulation of the human form in the Metaverse, a fictional virtual-reality application on the Internet. Social status within the Metaverse was often based on the quality of a user's avatar, as a highly detailed avatar showed that the user was a skilled hacker and programmer while the less talented would buy off-the-shelf models in the same manner a beginner would today. This idea is also reflected within Second Life where regular users can identify new or less experienced users (“newbies”) by the default appearance of their avatar or lack of customization. The importance of the appearance of the avatar in an environment such as Second Life can be seen when regular users may not be as willing to interact with users that have more basic avatar designs since the assumption may be that they are not very familiar with

the Second Life “community” and therefore an interaction with them may be less appealing.

Avatars within the gaming industry are essentially the player's physical representation in the game world. In most games, the player's representation is fixed, however increasingly games offer a basic character model, or template, and then allow customization of the physical features as the player sees fit. For example some avatars in the game Grand Theft Auto: San Andreas can be dressed in a wide range of clothing, given tattoos and haircuts and body build can be altered. Avatars in non-gaming online worlds are used as two-dimensional or three-dimensional human or fantastic representations of a person's self. Such representations can explore the virtual environment they are in using their avatar, add to it, or conduct conversations with other users, and can be customized by the user.

In non-gaming universes, the criteria avatars have to fulfil in order to become useful can depend to a great extent on the age of potential users. Research suggests that younger users of virtual communities put great emphasis on the fun and entertainment aspects of avatars and their practical functionalities, such as ‘whispering’ (Wood et al., 2005). They are also interested in the simple ease of use of avatars, and their ability to retain the user’s anonymity. Meanwhile, older users pay great importance to an avatar’s ability to reflect their own appearance, identity and personality. Many older users also want to be able to use an avatar’s expressive functionalities (such as showing emotions), and are prepared to learn new ways of navigation to do it. Social scientists at Stanford's Virtual Human Interaction Lab examine the implications,

possibilities and transformed social interaction that occur when people interact via avatars (Bailenson, J, 2009).

Some researchers have suggested that customizable avatars in non-gaming worlds tend to be biased towards lighter skin colours and against darker skin colours, especially in those of the male gender (Nakamura, 2002). These observations are less true of Second Life, where avatars range from lifelike humans to more fanciful robots, animals, and mythical creatures, with avatars created by players. The main Second Life grid is open only to adults, and participation is driven by social, artistic and commercial motivations. The avatar customization is one of the most important entertainment aspects in non gaming virtual worlds, such as Second Life, IMVU<sup>8</sup> and There.com. Many virtual worlds are providing users with tools to customize their representations, allowing them to change shapes, hair, skins and also gender. Moreover there is a growing secondary industry devoted to the creations of products and items for the avatars. Some companies have also launched social networks and other websites for avatars such as Koinup<sup>9</sup>, Myrl<sup>10</sup> and Avatars United<sup>11</sup>.

Many events and activities in online virtual worlds revolve specifically around avatars, in the form of customization classes, clothing sales and costume contests. Whether avatars mirror the users' offline physical appearance or not their customization engages users in the process of online identity formation and they must

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<sup>8</sup> <http://www.imvu.com/>

<sup>9</sup> <http://www.koinup.com/>

<sup>10</sup> <http://www.myrl.com/>

<sup>11</sup> <http://www.avatarsunited.com/>

decide how closely they want their virtual 'self' to resemble their offline self. In general, in virtual worlds, it could be said that there exists a general expectation that avatars will reflect a users' real-life appearance in some form. Virtual worlds have received negative attention within the media surrounding the issue of users creating avatars that in no way resemble their offline selves. In more sensationalist reports, this concept has also been extended to gender where a user will create an avatar of the opposite gender and interact with other users through the instant messaging functions. Such reports contribute to some of the social stigma attached to online environments in general due to this heightened sense of anonymity that the Internet on the whole, provides. In the majority of cases however, virtual environments such as Second Life may be thought to provide a platform that can also allow for self expression through the creation of avatar designs. The need for an avatar to resemble a user's offline appearance can stem from the fact that some users may interact within virtual worlds to initiate friendships or even romantic relationships which may at some point extend to the offline world. As a result of the expectation to in some way reflect real-world appearance, there could be said to be a constant tension within virtual worlds to on the one hand meet any underlying standards of attractiveness that exist but at the same time portraying an accurate representation of offline bodies. There is a certain level of recognition that avatars are likely to be highly idealized, though significant variation from offline appearances may be viewed as deceptive particularly in terms of gender, as mentioned. From this point of view, the principal in MMORPGs where real world elements are minimal is reversed within social virtual worlds. In saying this however, within Second Life there are default avatars that are not even human in appearance. Avatars referred to as "fuzzys" can be in the form of an animal. From this viewpoint, the ideas expressed above might seem redundant. Certain users may view Second Life

as being entirely a mode of escapism, whereas others may focus more on friendship formation. Perceptions of avatars can be entirely subjective and the context of interactions also has to be taken into account. The research contained within this book will assess customer attitudes towards avatars of varying appearances to determine the preferable avatar design within a financial task context.

## ***2.5 Internet and Society***

Commercial enterprises are particularly interested in exploring the opportunities that these virtual environments may hold for them as the stereotype of what constitutes a ‘typical’ computer user gradually becomes broken down within contemporary society. Use of the Internet has become widespread, particularly in homes. It was estimated that between 2000 and 2006 there was a 36.1% increase in Internet usage within the British population (ITU, 2006). This is a total of approximately 62% of the British population (37.6 million users); with overall usage continuing to increase at a steady rate. The Internet has moved from being an early tool for expert use to being embedded in the routine of everyday life, which has been referred to as the “second age” of the Internet. Instead of viewing the Internet as simply a research tool, it has been suggested that the focus should be placed upon the social world in which it is embedded (Wellman & Haythornthwaite, 2002).

It has been debated whether or not the Internet serves to draw people away from their everyday lives or if instead it provides a platform for connectivity and opportunity. From a sociological viewpoint it is necessary to examine if the Internet is supporting new forms of human relationships or if it is reproducing existing patterns of behaviour. The Internet’s relevance to domestic relations, community, alienation,



activities and the workplace will be explored in this project, assessing whether the Internet has had a positive or negative effect upon these areas. A recurring argument for critics of online virtual environments and indeed the Internet as a whole, is that the Internet is in a sense acting to isolate individuals, keeping them indoors, which leads to fewer in-person (as well as fewer telephone) interactions with friends, family and their community. Online communities have also been criticised as being pseudo-communities that have only the appearance of true social bonding (McClellan, 1994). It could therefore be argued that in general the strength of relationships have diminished as this more recent form of communication has flourished. The counter argument would in turn present the idea that the Internet has in fact enhanced connectivity to an unprecedented level, allowing for more interaction than ever before on an increasingly global scale.

Much existing research on computer-mediated communication and online behaviour has focused upon the differences between computer-mediated and face-to-face communication, and has provided in-depth reports on online communities. Whilst there has undoubtedly been important research produced from this perspective the concentration on computer-mediated versus face-to-face, online versus offline, and virtual versus real, has perpetuated a dichotomized view of human behaviour. These forms of either / or dichotomies may serve to pit one form of computer-mediated communication against another - for instance, synchronous versus asynchronous communication (e.g. chat versus email) or the sphere of use, for example computer use at work versus home or indeed computer and Internet users versus non-users. A growing body of research, however, focuses a more integrative view of computer mediated communication, looking at how online time fits with and complements other

aspects of an individual's everyday life. This project will utilise the virtual environment of Second Life to integrate the virtual and the real for real-world financial benefits and will analyse the ways in which they intersect.

## ***2.6 The Social Life of Virtual Worlds***

The research presented here takes into account that Second Life and virtual worlds alike deviate from what might be categorized as a game, serving more as extensions of reality than escapes from it. Virtual worlds have been said to be dichotomous in that they may act as play spaces as well as extensions of the real world (Castronova, 2003). As multiplayer platforms become increasingly powerful and lifelike, they will inevitably be used for more than storytelling and entertainment. In the future, virtual world platforms will be adopted for commerce, education, professional, military and vocational training, medical consultation and psychotherapy, and even for social and economic experimentation to test how social norms develop (Balkin, 2005). These aspects make it necessary to look at some of the current categorizations of human behaviour within virtual environments to provide a basis for the experiments provided in this body of work.

Multiplayer Online Game (MOG) players have been classified into four primary psychological groups: Socialisers, Explorers, Achievers and Killers (Bartle, 2003). These classifications were then expanded into a thirty-question test that helps players determine which category they are associated with<sup>12</sup>. With over 200,000 test responses as of 2006, this is perhaps the largest ongoing survey of multiplayer game players.

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<sup>12</sup> <http://www.guildcafe.com/bartle.php>

A recent study looked at the demographics, motivations, and derived experiences of users of massively multi-user online graphical environments through online survey data that was compiled from 30,000 users of MOGs over a three-year period (Yee, 2006). In that study a group of 40 statements were devised in order to create an empirical framework for articulating these motivations for MOG usage. These covered a broad range of motivations which were based on both open-ended responses, and the theoretical framework of 'Player Types' (Bartle, 2003) derived from previous experience in the field of MUDs (multi-user dungeons). The MUD is an early form of multiplayer online games that typically runs on a bulletin board system or Internet server. In an MUD, the game is usually text driven, where players read descriptions of rooms, objects, events, and other characters in a virtual world. The statements used included: "I like to feel powerful in the game" and "I like to be immersed in a fantasy world". They were presented using a 5-point Likert-type scale and then analysed using an exploratory factor analysis to arrive at a representation of the associations among the 40 statements. Findings suggest that MOGs appeal to a broad age range, i.e. 11-68 year olds, with a mean age of 26.6 years. Furthermore, the appeal is strong - with users across all ages spending on average 22 hours per week online. Male players were significantly more likely to be motivated by the achievement and manipulation factors, while female players were significantly more likely to be motivated by the relationship factor. The data further indicated that users derived meaningful relationships and significant emotional experiences, as well as real-life leadership skills, from these virtual environments. The research concluded that MOGs are not simply a pastime for teenagers, but a valuable research venue and platform where millions of users interact and collaborate using real-time 3D avatars on a daily basis.

The exploratory factor analysis allowed for the production of a five factor model of user motivations; Achievement, Relationship, Immersion, Escapism, and Manipulation. This model illustrates the diverse appeal of these online environments and provides the point of departure for the research to be undertaken in this project.

Research at the Daedalus Project<sup>13</sup> has involved the analysis of data from 35,000 MOG players over recent years, focusing on psychological and sociological aspects of these games. Recent findings included that players spend a considerable amount of time (often a third of their total time investment) doing things that are directly related to, but outside of, the game itself. This investment of time suggests a sense of emotional attachment amongst users to creating and building upon their in-game environment and subsequent experience.

Other researchers have found that the enjoyment of a game is directly related to the social organization of a game, ranging from brief encounters between players to highly organized play in structured groups (Nardi and Harris, 2006).

Second Life therefore offers a unique opportunity for further research, because unlike the majority of current MOGs there is no obvious goal or objective within it. Instead, the emphasis is on interaction and communication, as well as the continual creation of the environment itself. In sociological terms, this therefore offers scope for the analysis of differing forms of human behaviour and motivation from an alternative perspective based upon the five-factor model of user motivations (Yee, 2006).

It has been suggested that in order to provide an insight into the way in which people interact within virtual worlds, a combination of research methods must be employed

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<sup>13</sup> <http://www.nickyee.com/daedalus/>

(Schroeder, 1996). Participant observation studies are necessary in order to analyse existing multi-user virtual environments and the interactions within these populations. It is also necessary, however, to view the interactions between users within an experimental environment in order to allow for variations in the conditions in which participants interact, the technologies they use and the tasks they perform. It has been further suggested that social interaction in virtual worlds must be placed within the wider context of studies of other technologies and communication networks and the impact these have had upon our lives. The research reported here will therefore seek to draw upon both qualitative and quantitative research methods to ensure a thorough analysis of user perceptions and motivations within the virtual environment of Second Life.

## **2.7 Virtual Worlds In Education**

*'Within the context of "social gaming", players are engaged in complex interactions that go far beyond simple competition and cooperation and begin to function as autonomous societies with economies, rules and social mores of their own. Not only are players in these worlds constantly learning simply by their participation but the potential for accelerated and more specific learning opportunities are vast.'* (De Maria, 2007).

It has been suggested that we hold a fundamentally physical sense of reality that contradicts the philosophical perspective that our reality is mediated by our sensory systems (Nesson and Nesson, 2008). Regular users of virtual environments however may become more comfortable with an alternative reality and interaction through an avatar. Advocates of the use of virtual worlds in learning however, stress that instead of attempting to minimize or overlook the differences between the two 'realities' they

should be incorporated into methods of teaching. Mirroring real world activities in a virtual world in many instances can be ineffective. It is thought that constructing an effective educational environment within Second Life or other virtual worlds requires careful attention to the balance between taking advantage of widely understood real world classroom and educational practice and breaking from traditional educational expectations and practices when they do not work effectively in the virtual space. Many modes of interaction are less fluid in the virtual world than they are in the real world making direct translations of a real world educational experience less effective. Instead, new forms of learning are recommended to take advantage of the features that virtual worlds can offer. With students becoming increasingly comfortable with this kind of learning as well as electronic communications and online interactions in general, for many avatar-to-avatar activity can feel as real as face-to-face contact. This mirrors the ideas expressed in the CASA paradigm (Reeves & Nass, 1996). For those who are less familiar with the use of technology however, learning how to navigate an avatar within a virtual world may not be as intuitive and more interaction within the virtual environment may be necessary for them to feel comfortable and to minimise any barriers to subsequent learning.

Educators are continually looking for new and innovative ways to reach and appeal to students on an increased level. Whilst more traditional forms of education could be said to remain relatively one-dimensional, less traditional methods are changing rapidly. With the growing popularity of virtual environments such as Second Life, learners can now be engaged in ways that are more difficult or indeed impossible in the real world. As the technology behind these virtual environments evolves, so too can the possibilities for teaching, learning and research within them. Virtual worlds

have been identified as one of the various emerging technologies that will have an impact upon higher education (NMC & ELI, 2007). This speculation focuses on mainstream acceptance, though there are a number of institutions already involved. As a result of the growing number of educational institutions and interested educators entering Second Life, Linden Lab has set up blog<sup>14</sup> exclusively dealing with the developments within this field within the virtual environment. The growing use of online social networking sites is again reflected in the fact that updates of this blog can be followed on Twitter<sup>15</sup>. There are also a number of blogs<sup>16</sup> dedicated to the discussion of research and ideas surrounding education within Second Life in an attempt to create a platform where people can learn from both the positive actions as well as less effective methods used by others in teaching and research.

With virtual environments being in a stage of infancy however, institutions may lack knowledge as to how to use Second Life as a tool for education. The issue may then be whether or not an institution can gain the support and be given the tools to explore the potential for education within them. Whilst such progression may be unfamiliar territory for these institutions it is important to take into account the sociological and technological changes in society and the impact that this has had on the new generation of student (Oblinger, 2003; Oblinger & Oblinger, 2005). Students within modern culture may be said to be becoming increasingly non-traditional in their approaches to education as well as their expectations from it. Students have become

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<sup>14</sup><https://blogs.secondlife.com/community/learninginworld>

<sup>15</sup><http://twitter.com/>

<sup>16</sup><https://lists.secondlife.com/cgi-bin/mailman/listinfo/educators>, <http://www.sl-educationblog.org/>

increasingly comfortable using online methods of communication with it becoming an everyday part of their lives.

Virtual worlds constitute a growing space for collaborative play, learning, work and e-commerce. The main objection to using Second Life or any other virtual world in education may be that at this relatively early stage of development, virtual worlds are no more than ‘glorified chat rooms’ that in many instances require robust hardware and fast internet connections. The gaming element of a virtual world can be thought by some to distract users from focusing on the subject matter itself and the debate as to what is ‘real’ and what is not comes to the forefront. As the line between the virtual and the real continues to blur however, so too does the line between formal and informal learning. It has been proposed that in computer technology, ‘playgrounds’ often are where real innovation emerges (Rheingold, 2000). This is perhaps why a growing number of educational organisations have begun to use Second Life for teaching and learning purposes. Harvard, Edinburgh, Princeton, St Andrews, Michigan and Queensland Universities are amongst the growing number of institutions that now have a presence within Second Life. The three-dimensional (3D) graphical setting of virtual worlds along with the use of avatars to represent users may be thought to provide a sense of presence that helps the user to feel more involved in the environment than they perhaps might in more traditional forms of online learning. Second only to the general concept of Web 2.0, virtual worlds are the source of more articles in PubMed<sup>17</sup> than any other emerging social technology. Of the many virtual worlds, Second Life is the one with the strongest presence in health care communities, from patient groups and medical education to research and professional meetings.

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<sup>17</sup> <http://www.ncbi.nlm.nih.gov/pubmed/>



Second Life can enable health systems to create either public or secure private spaces for functions from patient education, outreach, staff training, remote meetings, or more. As with any social technology, understanding the context and norms of the online space are essential to making institutional engagement a success. The Learning Experiment therefore aims to assess levels of usability and perceived social presence within the virtual bank branch in Second Life to determine the most effective environment for education within a financial context.

Since Second Life is a very flexible environment, it is a tool that can be used for many different purposes. In that respect, it appears that each institution is using this tool in a way that reflects its own perceived need. For privacy reasons, Linden Lab does not release information regarding its clients. It is therefore not always clear what the most recent developments within any of the educational institutions is at any given time and this difficulty is further added to by the fact that in some instances it is one individual or department that constitutes the institutions presence (Kelton, 2007). Some available examples of educational uses within Second Life, other than those mentioned above, include those by the New Media Consortium (NMC) who are introducing programming for higher education and the University of Illinois at Chicago School of Public Health who are recruiting public health workers to participate in emergency preparedness training where the costs, time and difficulty associated with traditional emergency training exercises would be too vast (Sechser, 2009). These two examples provide a stark contrast in terms of usage which illustrates the way in which Second Life can be used to adapt to the needs of the particular institution. With any new information technology product or service, and in this case both, there are always various obstacles to large-scale adoption. In the case of Second

Life, some of these obstacles are technical. Linden Lab's servers have on a number of occasions experienced difficulties whether it they are the result of high levels of usage at one time or otherwise. Whilst Second Life has had a number of technical problems and there does seem to be a certain degree of trial and abandonment amongst users, much of that may be the result of exponential growth and predictable human curiosity.

One of the main benefits of virtual worlds in education is that they allow users to carry out tasks that could be difficult in the real world due to constraints and restrictions, such as cost, scheduling or location. Users can share the same experiences in real-time and interact with one another which can result in a shared sense of presence that two-dimensional (2-D) websites do not provide and has not previously been possible in distance education. This sense of being in the same place at the same time can also naturally lead to peer-learning. The use of an avatar can in many instances increase the sense of social presence experienced by users, more so if users feel that their avatar is an accurate representation of themselves in some way. One of the most important aspects in the educational experience could therefore be said to be a students' emotional attachment to their avatar. Spending an increasing amount of time within the virtual environment navigating through their avatar as well as customizing its appearance might increase levels of perceived social presence and subsequently what a student gains from their experience. Seemingly contradictory however, is that interacting within a virtual world through an avatar can also provide a feeling of anonymity which can also be beneficial within an educational context, sometimes referred to as the Online Disinhibition Effect (Suler, 2004). This could encourage users to interact more freely in learning tasks than they perhaps would in a real world setting. In collaborative exercises within a virtual environment, spatial cues

also enhance communication and with the introduction of VoIP in virtual worlds, interactions can be more emotive which again may lead to an increased level of perceived social presence.

Another powerful aspect of 3D graphical environment like Second Life is the ability to recreate the signals that trigger social norms displayed in the real world by creating a space that has a similar layout and features as a real world setting. Such behaviour can be seen in the behaviour of participants in both The Interaction and Collaboration experiments where in many instances participant's adhered to social norms when interacting with both the financial agent as well as their collaboration partners. For example in the majority of interactions, participants waited for their cue to speak during conversations and displayed spatial awareness in terms of where they positioned their avatars in relation to the financial agent, which is more characteristic of real-world interactions. Participants also displayed courtesy in The Interaction Experiment even when they were interacting with an unanimated avatar suggesting that real world behaviours can carry over into interactions within the virtual world. When a virtual environment is created to look like a real world setting, even if a user is new to the environment, it is likely that they will know a lot about what they see around them and about how they are expected to interact. Much of the instruction on how to use the space may be thought to be implicit in the knowledge that we bring from the outside. This idea can be again be illustrated by looking at differences in participant attitudes in The Interaction and The Collaboration Experiments.

In The Interaction Experiment, the virtual bank branch was designed in a very futuristic way which did not reflect the appearance of a real-world bank branch, more

in keeping with some of the surreal themes displayed throughout Second Life. This prompted some negative attitudes from participants with many suggesting they would prefer the branch to be more realistic and practical. The following experiment, The Collaboration Experiment therefore incorporated a more realistic design as well as including the case bank's logo which subsequently prompted significantly more positive attitudes from participants concerning its design. These observations would suggest that even when interacting within a virtual environment, a real world appearance may be preferable. It has to be taken into account however, that in this instance participants were bank customers and were using the virtual bank branch to carry out financial tasks. Many of the comments surrounding this preference therefore related to the fact that they were dealing with finances and as a result wanted a more professional environment and this therefore would perhaps not be a preference when using the virtual environment for other purposes such as education. Despite these preferences however, experience of corporate and some non-educational ventures in Second Life demonstrate that this incorporation of real-world expectations is both an advantage and a danger (Nesson and Nesson, 2008).

Taking into account both the positive and negative implication and media representations surrounding Second Life, when looking at the official statistics<sup>18</sup> for the first quarter of 2009, strong growth was reported in user hours and overall activity. There was an increase of 42% in user hours from the same quarter in 2008 to 124 million hours as well as an increase of 33% in peak concurrent users from the previous year to 88,2000. Such statistics are perhaps more telling than looking at overall numbers of residents since the numbers provided in these statistics represent

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<sup>18</sup><https://blogs.secondlife.com/community/features/blog/2009/04/16/the-second-life-economy--first-quarter-2009-in-detail>

individual avatars and it is not uncommon for users to have more than one. With an increase in user hours, usage of Second Life appears to be growing at a steady rate and with users investing more time in creating the environment it will perhaps offer an increasingly exciting prospect for educational institutes to become a part of and adapt it to cater to their needs.

## **2.8 Social Presence**

*'We have learned to take things at interface value'*

(Turkle, 1995)

It could be said that we are moving toward a culture of simulation in which people are becoming increasingly comfortable with substituting representations of reality for the real. What is deemed 'real' and what is thought to be artificial may become less easy to distinguish. The idea that humans respond socially to agents and computers has been the topic of a considerable amount of recent research attention (Allbeck & Badler, 2002; Swinth & Blascovich, 2002; Reeves & Nass, 1996). A number of researchers argue that humans' social responses to computers and agents are just like their responses to other real people (Nass & Moon, 2002; Nowak & Biocca, 2001). Others however have found that this is not always the case (Bailenson et al., 2001; Blascovich et al., 2002). Attempts have also been made to reconcile the two apparently contradictory sets of findings by investigating factors that are believed to moderate people's perceptions of and social responses to computerized-agents and human embodied by avatars (Swinth & Blascovich, 2002).

A number of communication researchers frequently use measurements of social presence to compare face-to-face and mediated interactions (Short et al., 1976; Walther, 1992). On analysis of the findings in this project, from a sociological viewpoint it will be imperative to provide such comparisons, but for the purposes of the proposed Interaction, Collaboration and Learning Experiments, the focus will be predominantly on comparing mediated interactions within Second Life to one another.

Social presence, as a concept, was first asserted by communications researchers to describe the extent to which telecommunications media differ in their ability to convey the salience of others in a mediated interpersonal interaction and the consequent salience of their interpersonal relationship (Short, Williams & Christy, 1976). From this perspective, telecommunications media differ in their ability to transmit social information and social cues, and social presence reflects the degree to which a medium is perceived as conveying the presence of others.

Virtual environment / computer science researchers, however, have adopted a somewhat different view of social presence. For the purposes of the research reported here, social presence will be defined as the extent to which other beings, both living and synthetic, exist in a virtual world and appear to react to the user (Heeter, 1992). Social presence helps enhance a user's sense of personal presence within a virtual environment, because if other people are in the virtual world, there is more evidence that the world exists and if they respond and react to the user, this results in the user feeling as though they actually exist within this world.

Other definitions of social presence describe it as the feeling that another intelligent being is present; or the degree to which a person feels socially engaged and immersed in a mediated situation; or the degree to which a person is perceived as a 'real person' in mediated communication (Biocca, 1997; McIsaac & Gunawardena, 1996; Gunawardena, 1995). Social presence has also been described as being experienced when a person does not acknowledge that technology is creating their perception that they are communicating with one or more other people or entities (Lombard, 2002).

The lack of consensus on an explicit definition of what actually constitutes social presence may appear problematic in terms of advancing upon previous research in this area. However, the majority of these definitions appear to reflect three primary themes:

#### **Co-situation**

1. A user's sense that there are other social entities co-situated within some interpersonal environment (whether those entities are other human beings or something else).

#### **Realism**

2. The extent to which others appear to be real (that is, a user's sense that they are interacting with a person instead of an agent or some other social entity).

#### **Responsiveness**

3. The extent to which social entities are engaged and responsive to one another.

These dominant themes are instrumental in the development of a reliable and valid metric for the analysis of perceived levels of social presence when interacting within the virtual branch in Second Life. These themes relating to social presence will be utilised in the Interaction, Collaboration and Learning Experiments and will be fundamental to the design of the Shared Virtual Environment Social Presence Perception Scale developed here.

## ***2.9 Research Methodology for Usability Engineering***

Usability engineering attempts to address one of the biggest problems that designers of user interfaces encounter by means of a practical solution, namely ensuring that the system and / or service they develop meets the users' wants and needs. It uses the basic principles of quality measurement to assist in the product development process ensuring as far as possible that the product is suitable for the purposes it was designed for (Faulkner, 2000). Usability engineering borrows most of its techniques for experiment design, stringent measurement systems and data analysis from experimental psychology. In turn usability experiments usually follow a standard format along the lines of, observing the interaction between the user and the product in a carefully planned scenario, within which the controlled manipulation of variables are measured. This will then go some way to answering specific questions posed about the effectiveness, efficiency and satisfaction with which the specified users can achieve the specified goals set in that particular environment (ISO, 1998). The main components of this experiment-based approach are as follows; obtaining a group of participants (usually a target market segment), a product (the design(s) of which to be assessed in the experiment), a set of tasks to be completed (to allow the user to interact with the product), participant criteria to measure the effectiveness of the



product (participants demographics or technographics or behaviour), usability metrics (used to measure the usability of the user interface against a specific criterion).

Usability analysis of virtual environments is a new development within the field. Virtual environment developers might be said to have previously focused mainly on producing the most innovative or “impressive” product with less attention given to how users will actually benefit (Gabbard, 2002). With an ever increasing variety of applications available within virtual environments such as Second Life, it is of increasing importance therefore to conduct usability analyses to ensure the continued effective progression of these environments, as shown in the experiments in this study. The Interaction and Collaboration Experiments in Chapters 3 and 4 consecutively, are within-subjects repeated-measures designs. This allows comparisons to be made for each participant’s experience with all the different versions of the design without the need for a control group. The order of exposure to each design is counterbalanced among the cohort to ensure the results are not biased (Preece, Rogers & Sharp, 2002). The Learning Experiment in Chapter 5 however utilises a between-subjects design which meant that half of the participants experienced one version of the design with the other half experiencing another version. Participants were randomly assigned to one of the designs, again ensuring the results were not biased. The experiment methodology was altered in the third experiment to avoid participant fatigue.

This series of experiments investigate the usability of an existing user interface for a new product therefore it was essential that the environment created enables the interaction between user and the service to be systematically assessed and measured.

The interactions involved in the experiments consisted of the user using the new service as a means of achieving a specified number of objectives by carrying out specified tasks. The Interaction Experiment involved two simple banking enquiries relating to both real-life and Second Life finances (payment enquiry and balance enquiry). The Collaboration Experiment involved collaborating with a partner (and financial agent) to customise the appearance of a financial advisor avatar and choose the features of a credit card through both instant text messaging and voice. Finally, The Learning Experiment involved interacting within the virtual bank branch to view banking information and answer questions (posed by the financial agent avatar) relating to it through VoIP. Participants were selected from the case banks customer database that has been TPS<sup>19</sup> verified. Participants were balanced for gender and age (two age groups: 18-34 and 35 and over). Since this study was conducted over a three year period, as much as possible, participants were involved in all three of the assessments.

Participants completed a demographic questionnaire to establish specific characteristics that would in turn be used to measure the effectiveness of the new service. This is the first step in such experiments and is the most common way to distinguish consumer groups (i.e. based on variables such as age, gender and occupation). Demographic data have been shown to correlate with consumers' preferences, requirements and usage levels of products. This information allows demographic segmentation to occur and in turn allows the company to target a market more successfully.

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<sup>19</sup> TPS – Telephone Preference Service, is a 'central opt-out register' on which individuals can record their preference not to receive unsolicited sales and marketing telephone calls to their home or mobile telephone numbers. It is a legal requirement that all organisations do not make such calls to numbers registered on the TPS unless they have consent to do so. Therefore individuals not on this register are able to receive calls for marketing purposes.

## **2.10 Summary**

This chapter has detailed the technology under investigation throughout this body of work, namely Second Life, and the methodology used to examine its effectiveness in the provision of real world financial services. It has provided a background of the use of the Internet within society, Avatars and the sociological issues related to virtual worlds on the whole. The theory of social presence, arguably of great importance when both designing a virtual environment as well as testing user attitudes towards it is also discussed. The results of the experiments presented in this work came together to provide a measurement of attitudes towards learning within Second Life, which is currently one of the most exciting aspects of virtual environments continually portrayed in the media. An overview of learning in virtual environments is provided in this chapter. Finally, it also underlined the importance of testing the usability of such a technology in an increasingly emergent field.

## Chapter 3

## ***The Interaction Experiment: The Effect of Avatar Appearance on Usability and Perceived Social Presence when making Financial Enquiries in Second Life***

### ***3.1 Introduction***

This chapter discusses the results of an empirical evaluation assessing the use of three avatars, differing in appearance and levels of interaction with customers, in financial enquiry scenarios. The aim of the experiment was to assess the attitudes of the Bank's customers towards interacting with the three different financial agent avatars within a specially created virtual bank branch in Second Life to carry out a tasks relating to both real-world and 'in-world' Second Life financial enquiries. Customer's perceived level of 'social presence' was analysed along with the 'immersion' and 'escapism' factors derived from a five-factor model of user motivations in shared virtual environments (Yee, 2006). An objective analysis of usability engineering issues is also provided. The theory of social presence when applied to human-computer interaction provided the basis of this analysis. The Interaction Experiment provides a platform for the development of a reliable and valid metric for the assessment of attitudes towards interaction, collaboration and learning within Second Life. This metric will have specific practical relevance to the financial services sector.

The collaborative virtual environment of Second Life is employed as the basis of this experiment, and provided the arena in which participants interacted with 'in-world' avatars to gain specific financial information. The Interaction Experiment aimed to test previous research that identified a correlation between user motivations and behaviour within virtual environments (Yee, 2006). Attitudes towards social presence

within Second Life were assessed in order to determine how effective this virtual environment is for carrying out real-world tasks as well as how engaging they found the environment and their interactions within it to be. Different avatars were used in order to test this theory as well as previous research that suggests that the level of anthropomorphism (the extent to which an avatar resembles a human being) affects people's social judgements of their interaction partners (Nowak, 2001). Although research into attitudes towards avatar appearances exists, there has not yet been any controlled experiments conducted that look at levels of usability and perceived social presence experienced as a result of interacting with customizable avatars within Second Life, particularly within a financial based scenario. This research could be particularly important for businesses or institutions looking to set up a presence in Second Life. Since Second Life offers a wide range of choices in terms of avatar type and appearance, the metrics used within this first experiment could help to determine the most effective avatar type and appearance to increase customers' usability, perceived social presence and overall enjoyment of interaction.

Only two of the five factors of user motivation ('immersion' and escapism') were incorporated within the SVE Social Presence Perception Scale metric presented in this chapter as they were of particular relevance to the interaction experiment context. The remaining three factors will be incorporated in the metric throughout the study according to relevance to the experimental scenario. The items used within the SVE Social Presence Perception Scale were based on items that have previously been tested for internal consistency, displaying Cronbach's coefficient alpha values above the acceptable standards of 0.70 and above. (Yee, 2006; McCroskey & Young, 1981;

Short et al., 1976). These statements can therefore be interpreted as measuring the same phenomenon (Bowers & Courtright, 1984).

### ***3.2 Second Life Bank Branch and Avatar Designs Used in the Research***

The virtual bank branch has been created within Second Life with careful consideration to establish a financial environment that, whilst reflecting the surreal theme of Second Life, also incorporates an element of professionalism in order to promote a sense of trust within participants when utilising it for handling their finances. The design aspects of the branch were brought together through collaboration with engineers. Utilizing the construction methods implemented in the Second Life client itself, the branch was constructed from various primitives (building blocks), each of which possesses a number of features that regulates its appearance in the 3D world. Complicated objects can be constructed with these primitives. Other features central to the branch involved utilising Linden Scripting Language, which is a scripting language that allows users to assign interaction properties to objects in the world, such as code-activated doors and animated billboards. In order to allow for two participants to take part in The Interaction Experiment at any given time, two levels were incorporated into the branch design (Figure 3.1), of which participants were assigned a specific level at the beginning of the experiment and instructed to 'fly' their avatar to the designated level to carry out their tasks. By means of further increasing security, participants were issued with a security access code during each exposure to the virtual branch, and only after entering this code were they granted access. Two separate codes security access codes were set for level 1 and 2 of the branch in order to further increase security. Once granted access, participants were

instructed to enter the virtual bank branch (Figures 3.2 and 3.3) where they were greeted by the financial agent avatar and led through the interaction.

The financial agent avatars themselves varied, with each participant encountering an avatar in the form of an unanimated stack of coins (Figure3.4), an animated avatar again in the form of a stack of coins (Figure 3.5), and a humanoid financial agent avatar (Figure3.6) once each in both of the enquiry scenarios (real-life and Second Life). The animated coin-stack possessed human-like features (eyes and a mouth) thus allowing for three levels of comparison in terms of the effect of anthropomorphism on participants perceptions of the avatars and their resulting experience.

The humanoid financial agent avatar was created to reflect a more 'traditional' style, since the focus of Second Life is not predominantly on avatar appearance but on the environment and creation within the environment itself. Unlike the coin stack avatars that required objects to be built and customized to give the appearance of a coin stack, the humanoid avatar was created using the existing options available in Second Life's 'edit appearance' feature. Although the customization of avatars appears to have emerged as a particularly important feature within Second Life, the majority of users and indeed users new to the environment will be more likely to maintain a basic avatar in their initial stages of entering the world. The basic humanoid financial agent avatar was therefore included as it reflects this idea. It was also necessary to test the theory that predicts that people are more influenced by virtual humans to the extent that they exhibit behavioural realism and / or are believed to be avatars, that is, on-line digital representations of actual others (Blascovich, 2002). Further to this, one study that looked at the influence of avatar androgyny, anthropomorphism and



credibility in online interactions found that androgynous avatars are perceived as less trustworthy than ones that are clearly male or female (Nowak and Rauh, 2007). The humanoid financial agent avatar was therefore created to clearly represent a professional female figure, which lacked the ambiguity of the coin stack avatars, and the more surreal and inanimate elements associated with them.



**Figure 3.1: Second Life Avatar Flying Towards ‘Landing Area’ of the Virtual Bank Branch (Level 1)**



**Figure 3.2: Interior of Level 1 of the Virtual Bank Branch**



**Figure 3.3: Birdseye View of Interior of Level 1 of the Virtual Bank Branch**



**Figure 3.4: Unanimated Coin Stack Financial Agent Avatar**



**Figure 3.5: Animated Coin Stack Financial Agent Avatar**



**Figure 3.6: Humanoid Financial Agent Avatar**

### ***3.3 Experiment Design and Procedure***

Two weeks prior to the experiment, participants took part in an induction session in which they are introduced to Second Life. In this induction session they were introduced to the steps necessary to create their own avatar and were guided through the basic premise of Second Life, performing a number of the basic functions that would be necessary for their participation in the following Interaction Experiment. Participants carried out a number of simple tasks using one of the basic default avatars previously created for this research. Participants were then given the ‘Second Life Journal’ and asked to follow a number of basic steps to install and become accustomed to Second Life at home before returning to complete the experiment. The

induction session lasted approximately thirty minutes and was necessary in order to ensure, as much as possible, that all participants would be at approximately the same level in terms of competency when they returned for the experiment.

A 'diary keeping' method of data collection was employed, based on participants using a Second Life Journal to keep notes in order to allow for a more in-depth sociological analysis of participant motivations and attitudes towards their usage of Second Life. It also allowed for further investigation into various elements from the five-factor model of user motivations. The Second Life Journal required participants to record brief accounts and observations on assigned tasks / activities they were engaged in within Second Life. It served the purpose of allowing for the recording of various behaviours and attitudes towards Second Life and interactions within it without researcher intrusion. Since basic assignments were also included within the logbook, it also served to familiarise participants with Second Life and a number of its functions prior to the experiment (see Appendix 1 for the fully formatted Second Life Journal). The Second Life Journal further provided contact details, by which participants could call for technical support<sup>20</sup>.

When participants returned for the main experiment, their Second Life Journal was collected to allow for an analysis of their usage of Second Life at home. Whether or not participants had experienced difficulty installing or using Second Life at home was also of interest and they were instructed to note any comments concerning such difficulties. Following collection of their Second Life Journal, participants were asked to complete a questionnaire that looked at opinions regarding Second Life to that date

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<sup>20</sup> [SLSupport@ccir.ed.ac.uk](mailto:SLSupport@ccir.ed.ac.uk) - email address set up to provide technical support for participants. Participants were also contacted via this email address prior to their return for the experiment to achieve a uniform standard of practice within Second Life upon return.

and technology on the whole. This was done in order to gain background information on participants' general attitudes towards the media and technology and to determine whether this had an effect on their subsequent attitudes towards their experience of Second Life.

A cohort of 48 customers of the case was recruited for the experiment. Participants were recruited from a database of customer of the Bank who had given prior consent to taking part in studies. Participants were given an honorarium of £50 (£20 for the Induction session / £30 for the experiment) as a thank you for taking part. The participants were balanced for gender and age as much as possible (male and female; and two age groups: ages 18-34 and 35 and over, see Table 3.1). Gender biases and preferences will be investigated as well as the attitudes and preferences of different age groups. These age groups were based on findings that show 18-34 year olds make up the main demographic within the gaming industry and are likely to be more technologically driven (Jupiter Communications, 1999).

<b>Participants</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
<b>Age 18 – 34</b>	13	12	25
<b>Age 35 and over</b>	12	11	23
<b>Total</b>	25	23	48

**Table 3.1: Participants by Gender and by Age Group**

The procedure consisted of a set of clear stages. Once participants had completed the short initial questionnaire, they were told that they would be using Second Life to carry out financial enquiries, some of which would relate to real-world bank accounts and others that would relate to only to Second Life virtual bank accounts. Participants were seated in front of a desktop monitor screen and asked to log in to Second Life using the avatar name and password they had created at home as part of their assigned

tasks contained within the Second Life Journal. Participants were given a different persona to use for each of the scenarios in an attempt for them to perceive each interaction as a separate entity as well as to mark a clear difference between the real world and Second Life banking scenarios. They were also given a security access code that would be necessary for them to gain entry to the virtual bank branch. Once the first task was completed, the financial agent avatar asked (through typed text) if there was anything else they could help with and at this point the participant proceeded on to the second part of the enquiry. When the set of tasks within the context in question (real-life or Second Life) was completed, the financial agent thanked the participant for using the virtual bank branch and the participant was instructed to exit the virtual branch in the same way that they entered (again entering the security code) and remain on the 'landing area', as previously discussed.

Participant's attention was drawn to the task context to set the scene clearly before they carried out their enquiry. After each scenario participants were asked to complete a usability questionnaire relating to the scenario and a questionnaire to assess the perceived level of social presence experienced during the interaction. The usability questionnaire items were 7-point Likert attitudinal statements presented randomly via a laptop (see Appendix 2 for usability questionnaire). The items used within the usability questionnaire were based on items that have been developed within the CCIR and have previously been tested for internal consistency, displaying Cronbach's coefficient alpha values above the acceptable standards of 0.70 and above. These statements can therefore be interpreted as measuring the same phenomenon (Bowers & Courtright, 1984). The social presence questionnaire items were 7-point Likert scale statements also presented randomly via laptop (see Appendix 3 for SVE Social

Presence Perception Scale). In all questionnaires, statements were balanced for polarity (equal number of positively and negatively worded statements). After participants had experienced all six scenarios they were asked open-ended questions (Appendix 4) on their opinions regarding the interactions with each of the agents and their overall interaction within Second Life itself.

For this experiment there were two manipulated variables: - financial agent type (three designs – a humanoid avatar (**H**), an animated avatar (**A**) and an unanimated avatar (**U**)) and task context (two contexts – real-life tasks or Second Life tasks).

**H** = Humanoid avatar

**A** = Animated avatar

**U** = Unanimated avatar

**r** = Real-life task

**s** = Second Life task

Numbers **1**, **2** and **3** shown in the full factorial design in Table 3.2 correspond to the details on the task sheets handed to the participants. Details were varied on the task sheets to ensure they differed for each exposure, since three sets of real-life tasks and three sets of Second Life tasks were carried out by each participant, making twelve possible orders necessary.

<b>Order 1</b>	<b>H (s1, r1)</b>	<b>A (s2, r2)</b>	<b>U (s3, r3)</b>
<b>Order 2</b>	<b>H (r3, s3)</b>	<b>U (r1, s1)</b>	<b>A (r2, s2)</b>
<b>Order 3</b>	<b>A (s2, r2)</b>	<b>H (s3, r3)</b>	<b>U (s1, r1)</b>

<b>Order 4</b>	<b>A (r3, s3)</b>	<b>U (r2, s2)</b>	<b>H (r1, s1)</b>
<b>Order 5</b>	<b>U (s2, r2)</b>	<b>A (s1, r1)</b>	<b>H (s3, r3)</b>
<b>Order 6</b>	<b>U (r1, s1)</b>	<b>H (r3, s3)</b>	<b>A (r2, s2)</b>
<b>Order 7</b>	<b>H (r1, s1)</b>	<b>A (r2, s2)</b>	<b>U (r3, s3)</b>
<b>Order 8</b>	<b>H (s3, r3)</b>	<b>U (s1, r1)</b>	<b>A (s2, r2)</b>
<b>Order 9</b>	<b>A (r2, s2)</b>	<b>H (r3, s3)</b>	<b>U (r1, s1)</b>
<b>Order 10</b>	<b>A (s3, r3)</b>	<b>U (s2, r2)</b>	<b>H (s1, r1)</b>
<b>Order 11</b>	<b>U (r2, s2)</b>	<b>A (r1, s1)</b>	<b>H (r3, s3)</b>
<b>Order 12</b>	<b>U (s1, r1)</b>	<b>H (s3, r3)</b>	<b>A (s2, r2)</b>

**Table 3.2: Full Factorial Design**

The bundles of tasks themselves involved participants using typed text to communicate with the financial agent avatars to firstly find out if a specified sum had been taken out of their bank account and secondly to check the new balance of their bank account. In the real-life task context, participants were given task sheets which contained a persona, for example David White / Diane White, as well as a security number for access to the specific level of the branch. This task sheet contained scenarios to set the scene, giving them dates and places of specific purchases relating to real-world bank accounts. In the Second Life task context, task sheets did not contain personas, since the financial enquiries related entirely to ‘in-world’ Second Life bank accounts, and the existing name of the avatar was therefore suffice. The tasks in this context contained ‘in-world’ scenarios, detailing dates and Second Life purchases as well as places relating to a Second Life bank account (see Appendix 5 for examples of the task bundles in both contexts).



In total, there were three versions of the financial agent avatar (Humanoid, Animated and Unanimated) and two financial task contexts (real-life and Second Life). Participants therefore interacted with each avatar twice, each time carrying out a different set of financial tasks. Participants therefore experienced a total of six interactions within the virtual bank branch in Second Life. Each of the financial agent avatars were controlled by confederates who interacted with each participant during each interaction by following a uniform script tailored to each task and also taking into account participant gender.

This experiment was designed to employ financial agent avatars within a virtual bank branch Second Life with varying levels of anthropomorphism (the extent to which an avatar resembles a human being). This was done in order to assess whether levels of social presence and usability were impacted by the avatars appearance within a financial context. The independent variables were the six different treatments (three financial agent avatars and two financial enquiry contexts) as well as participant gender and age group. The experiment employed a repeated measures within-subject design and the order of the presentation of the three financial agent avatars was balanced across participants.

Each of the financial agent avatars were situated within with virtual bank branch in Second Life, which contained two floors to allow two participants take part in the experiment at any given time (participants did not interact with one another in this experiment), see Figure 3.1.

The financial agent avatars were controlled by hidden researchers situated in a separate area of the research centre. Participants were all instructed to ‘teleport’<sup>21</sup> to the designated area within Second Life with an aim to achieving as uniform an experience as possible for each of the participants. Participants were instructed as to which level of the branch they were to approach (Level 1 or Level 2) and enter the virtual branch using the security code provided. Once inside the branch, participants approached the financial agent avatar to carry out their first set of tasks. Once these were completed, participants were instructed to exit the virtual bank branch, again using the security code provided, and situate their avatar on the ‘landing area’ (see Figure 3.1) found outside each of the two levels of the branch. The confederate controlling the avatars followed a basic script to ensure, as far as possible, uniform interactions (see Appendix 6 for Confederate Script outline). After each interaction participants completed a usability questionnaire regarding their attitude towards the scenario and the financial advisor avatar as well as a SVE Social Presence Perception questionnaire, to assess how immersed and socially present they felt during the interaction. At the end of the session participants took part in an exit interview to gain a more qualitative insight into their attitudes towards their interactions with each of the avatars within the virtual bank branch as their overall experience of utilising Second Life for financial purposes.

The experiment was developed to examine the following hypotheses:

<b>H<sub>0A</sub>:</b>	<b>There will be no significant differences between the usability for each of the financial agent avatars.</b>
<b>H<sub>1A</sub>:</b>	<b>There will be significant differences between the usability for each of</b>

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<sup>21</sup> ‘Teleporting’ is one method of navigating an avatar within Second Life which can be done through entering a destination into the ‘Map’ section in Second Life and selecting the ‘Teleport’ option.

	<b>the financial agent avatars</b>
<b>H<sub>0B</sub>:</b>	<b>There will be no significant differences between the overall usability for the two financial enquiry contexts.</b>
<b>H<sub>1B</sub>:</b>	<b>There will be significant differences between the overall usability for the two financial enquiry contexts.</b>
<b>H<sub>0C</sub>:</b>	<b>There will be no significant differences between the perceived levels of social presence experienced during interactions with each of the financial agent avatars.</b>
<b>H<sub>1C</sub>:</b>	<b>There will be significant differences between the perceived levels of social presence experienced during interactions with each of the financial agent avatars.</b>
<b>H<sub>0D</sub>:</b>	<b>There will be no significant differences between the overall perceived levels of social presence experienced for the two financial enquiry contexts.</b>
<b>H<sub>1D</sub>:</b>	<b>There will be significant differences between the overall perceived levels of social presence experienced for the two financial enquiry contexts.</b>
<b>H<sub>0E</sub>:</b>	<b>There will be no preference for the appearance of the financial agent avatars.</b>
<b>H<sub>1E</sub>:</b>	<b>There will be a preference for the appearance of the financial agent avatars.</b>

**Table 3.3: The Alternative and Null Hypotheses**

### **3.3.1 Usability Questionnaire Design**

An established usability questionnaire provided the basis to assess the contributions to usability made by a set of key attributes. It uses a 7-point scale on which participants indicate the extent to which they agree or disagree with statements that relate to each key usability attribute. The usability questionnaire employed in this experiment consists of 26 statements that will allow for an overall measurement of the usability for each of the designs; in turn this measurement will act as a predictor of customer behaviour (See Appendix 2 for the fully formatted usability questionnaire, for a summary see Table 3.4). For this period of research in the thesis, the usability questionnaire is adapted to apply specifically to the task. Within this experiment, the Interaction Experiment, the focus is on the interaction with the financial agent avatars (financial advisors).

<b>Usability Questionnaire Statements</b>	
<b>Cognitive</b>	I thought that interacting with the financial advisor was confusing.
	I had to concentrate hard when interacting with the financial advisor.
	I got flustered when interacting with the financial advisor.
	I felt under stress whilst interacting with the financial advisor.
<b>Fluency</b>	I thought interacting within the virtual world was complicated.
	I felt frustrated when interacting with the financial advisor.
	I felt in control when interacting within the virtual world.
	I thought the financial advisor was competent in supplying the necessary information.
	I felt that interacting with the financial advisor took too long.
<b>Transparency</b>	I found it difficult to interact within the virtual world.
	I thought the financial advisor communicated clearly.
	I understood the information the financial advisor gave me during the interaction.
<b>Quality</b>	I would be happy to interact with the financial advisor again.
	The virtual world was suited to the financial task.
	I think the information supplied during the interaction was reliable.
	The financial advisor helped me feel engaged within the virtual world.
	I thought that the interaction with the financial advisor was efficient.
	I found the interaction with the financial advisor satisfying.
<b>Engagement</b>	I thought that the financial advisor was friendly.
	I didn't like using text to communicate with the financial advisor.
	I would be happy to use the virtual world again.
	I enjoyed interacting with the financial advisor.
	I thought the financial advisor was polite.
	I felt intimidated by the financial advisor.
	I would prefer to interact with a real person.
The appearance of the financial advisor distracted me from carrying out my task.	

**Table 3.4: Usability Questionnaire Summary**

The questionnaire design follows standard practice by using an equal number of positively and negatively worded statements presented in a randomised order. This technique removes the possibility of participants consistently agreeing with statements, a phenomenon of response bias called acquiescence bias (Hogg & Vaughan, 1998). The Likert scale is the most common choice of response scale in usability measurement mainly because it consistently shows statistical validity and reliability is concise (Hogg & Vaughan, 1998) and directly reflects the participants'

attitudes. This type of scale also allows for simple analyses of the results. Mean scores for each attribute can be calculated and scores below the neutral point (4) reflect negative, disapproving attitudes and scores above the neutral point reflect positive, supportive attitudes.

### **3.3.2 SVE Social Presence Perception Scale Design**

The Shared Virtual Environment (SVE) Social Presence Perception Scale for this research consists of twenty-nine 7-point Likert scale statements in which participants' rate the extent to which they agree or disagree with each statement. The SVE Social Presence Perception Scale seeks to look at customers' perceived levels of Immersion, Escapism, Social Presence and Credibility during their interactions with each of the three financial agent avatars within the virtual branch in Second Life. Whilst the areas of Social Presence and Credibility are categories within their own right within the SVE Social Presence Perception Scale, Immersion and Escapism are sub-categories derived from previous work describing a five-factor model of user motivations (Yee, 2006) where online survey data were collected from 30,000 MOG users over a three-year period to explore users demographics, motivations and derived experiences. An exploratory factor analysis revealed a five-factor model of user motivations:

1. Achievement
2. Relationship
3. Immersion
4. Escapism
5. Manipulation

Throughout the course of this project, elements from all five factors of user motivation will be incorporated within the SVE Social Presence Perception Scale to create a reliable and valid metric for the assessment of attitudes towards interaction, collaboration and learning within Second Life. For this first experiment in the study however, (The Interaction Experiment), only the Immersion and Escapism elements are relevant for analysis.

## **Immersion**

The five-factor model of user motivations (Yee, 2006) provides an empirical framework for measuring and categorizing individual differences in the motivations of users of MOGs. The first group of statements draw specifically on ‘Immersion’ items. Users who score high on the Immersion factor enjoy being in a fantasy world as well as assuming alternative ‘in-world’ identities. They are attracted to the fictional aspects and story telling elements of these worlds and enjoy creating avatars with histories that extend and bear a relation to aspects of the real world. The items from this empirical framework were adapted to have specific relevance to measuring attitudes towards carrying out financially based tasks within the virtual bank branch in Second Life.

The six statements in this group are:

- I felt as though I was actually part of the virtual world.
- I disliked the feeling of interacting in the virtual world.
- I enjoyed the role playing aspect of carrying out the financial task.
- I enjoyed the role playing aspect of interacting with the financial advisor.

- I felt that my avatar had its own life story.
- I felt that my avatar had its own personality.

## **Escapism**

The second group of statements are specifically aimed at assessing levels of escapism experienced by participants during their interactions with each of the financial agent avatars within Second Life. These statements were based upon items taken from the 'Escapism' items and adapted with specific relevance to the financially based interactions within Second Life. This factor measures to what extent a user is involved in the virtual world as a means to temporarily avoid, forget about and escape from real-life stress and problems.

The three statements in this group are:

- I disliked the escapism element of the virtual world.
- Interacting within the virtual world let me forget some of the real-life problems I may have.
- Interacting within the virtual world let me relieve stress from my daily life.

## **Social Presence**

For the purposes of the research proposed within this project, social presence is defined as the extent to which other beings, both living and synthetic, exist in a virtual world and appear to react to the user (Heeter, 1992). Social presence helps enhance a

user's sense of personal presence within a virtual environment, because if other people are in the virtual world, there is more evidence that the world exists and if they respond and react to the user, this results in the user feeling as though they actually exist within this world.

The lack of consensus on an explicit definition of what actually constitutes social presence may appear problematic in terms of advancing upon previous research in this area. However, as defined previously, the majority of these definitions appear to reflect three primary themes of co-situation, realism and responsiveness.

The statements contained within the Social Presence section of the SVE Social Presence Perception Scale were therefore built upon these three fundamental themes. Since the theory of Social Presence provides the basis for this project, the number of statements contained within this group reflects this.

The seventeen statements in this group are:

- I felt that other people were with me within the virtual world.
- I felt that other avatars were present within the virtual world.
- I felt all alone within the virtual world.
- I felt like I was interacting with a real person.
- I felt like I was interacting with an automated machine.
- I felt that the financial advisor was being controlled by another human being.
- I thought the financial advisor's appearance was unrealistic.
- I thought the financial advisor's behaviour was realistic.



- I thought the virtual branch was realistic.
- I thought the financial advisor was visually unappealing.
- I thought the financial task was unrealistic.
- I thought the interaction with the financial advisor was impersonal.
- I felt uneasy interacting with the financial advisor.
- I feel that the financial advisor was responsive towards me.
- I felt like I was interacting with an object rather than a person.
- I felt present within the virtual world.
- I felt personally involved in the financial task.

## **Credibility**

Recent research in the field of avatar design has focused upon the influence of avatar androgyny, anthropomorphism and credibility in online interactions (Nowak and Rauh, 2007). Within this project, credibility is of particular importance since the objective is to assess attitudes towards the use of Second Life as a user interface metaphor for the provision of real-world financial services, that is, employing the virtual for real world results. Various studies have been conducted concerning the credibility of online health information for instance. Beyond this, there have also been studies conducted in the field of avatar credibility. From such studies, it has been suggested that anthropomorphic avatars will be rated as more credible than less anthropomorphic avatars. It was also concluded that more androgynous avatars are perceived as less anthropomorphic than less androgynous avatars. This research was conducted however using a series of static 3D avatars. The research proposed in this

project therefore moves beyond previous studies, as it will be conducted within a 3D online persistent world in which avatar creation is considered an integral feature.

Statements for the credibility section within the SVE Social Presence Perception Scale were built upon the ‘competence’ and ‘character’ dimensions. These dimensions were used in previous research measuring avatar static credibility, and are derived from a published credibility scale (McCroskey, 1971; McCroskey and Young, 1981). Table 3.5 provides a breakdown of these two dimensions;

<b>Dimension</b>	<b>Adjectives</b>
Competence	Intelligent / Unintelligent
	Informed / Uninformed
Character	Reliable / Unreliable

**Table 3.5: Credibility Dimensions**

The three statements in this group are:

- I thought the financial advisor was intelligent.
- I thought the financial advisor was informed.
- I thought that the information that the financial advisor gave me was unreliable.

Table 3.6 provides a summary of the SVE Social Presence Perception Scale (See Appendix 3 for fully formatted questionnaire).

<b>SVE Social Presence Perception Scale</b>	
<b>Main Concepts</b>	<b>Questionnaire Statements</b>
<b>Immersion</b>	I felt as though I was actually part of the virtual world.
	I disliked the feeling of interacting in the virtual world.
	I enjoyed the role playing aspect of carrying out my financial task.
	I enjoyed the role playing aspect of interacting with the financial advisor.
	I felt that my avatar had its own life story.
	I felt that my avatar had its own personality.
<b>Escapism</b>	I disliked the escapism element of the virtual world.
	Interacting within the virtual world lets me forget some of the real-life problems I may have.
	Interacting within the virtual world lets me relieve stress from my daily life.
<b>Social Presence</b>	I felt that other people were with me within the virtual world.
	I felt that other avatars were present within the virtual world.
	I felt all alone within the virtual world.
	I felt like I was interacting with a real person.
	I felt like I was interacting with an automated machine.
	I felt that the financial advisor was being controlled by another human being.
	I thought the financial advisor's appearance was unrealistic.
	I thought the financial advisor's behaviour was realistic.
	I thought the virtual bank branch was realistic.
	I thought the financial advisor was visually unappealing.
	I thought the financial task was unrealistic.
	I thought this interaction with the financial advisor was impersonal.
	I felt uneasy interacting with the financial advisor.
	I feel that the financial advisor was responsive towards me.
	I felt like I was interacting with an object rather than a person.
	I felt present within the virtual world.
I felt personally involved in the financial task.	
<b>Credibility</b>	I thought that the financial advisor was intelligent.
	I thought that the financial advisor was informed.
	I thought that the information that the financial advisor gave me was unreliable.

**Table 3.6: SVE Social Presence Perception Scale Summary**

Table 3.7 presents a summary of the experimental design.

<b>Second Life: The Interaction Experiment – Design Details</b>	
<i>Experiment purpose:</i>	<b>Experimental exploration of usability and customer attitude towards the use of Second Life as a User Interface Metaphor for the Provision of Real-World Financial Services</b>
<i>Experiment hypotheses:</i>	<p><b>H<sub>0A</sub></b>: There will be no significant differences between the usability for each of the financial agent avatars</p> <p><b>H<sub>1A</sub></b>: There will be significant differences between the usability for each of the financial agent avatars</p> <p><b>H<sub>0B</sub></b>: There will be no significant differences between the overall usability for the two financial enquiry contexts</p> <p><b>H<sub>1B</sub></b>: There will be significant differences between the overall usability for the two financial enquiry contexts</p> <p><b>H<sub>0C</sub></b>: There will be no significant differences between the perceived levels of social presence experienced during interactions with each of the financial agent avatars</p> <p><b>H<sub>1C</sub></b>: There will be significant differences between the perceived levels of social presence experienced during interactions with each of the financial agent avatars</p> <p><b>H<sub>0D</sub></b>: There will be no significant differences between the overall perceived levels of social presence experienced for the two financial enquiry contexts</p> <p><b>H<sub>1D</sub></b>: There will be significant differences between the overall perceived levels of social presence experienced for the two financial enquiry contexts</p> <p><b>H<sub>0E</sub></b>: There will be no preference for the appearance of the financial agent avatars</p> <p><b>H<sub>1E</sub></b>: There will be a preference for the appearance of the financial agent avatars</p>
<i>Experiment design:</i>	<b>Participants experience 3 versions of the avatar (humanoid, animated object and unanimated object), performing two tasks, in a 6 cell, repeated measures, within-subjects design, and balanced exposure.</b>
<i>Dependent variables:</i>	<p><b>Perceived usability and attitude towards avatar / environment</b></p> <p><b>Perceived level of social presence and immersion / escapism</b></p>
<i>Other data:</i>	<p><b>Second Life Journal data</b></p> <p><b>Baseline Analysis data</b></p> <p><b>Exit questionnaire data</b></p> <p><b>Demographic data</b></p>
<i>Independent variables:</i>	<p><b>Experiment – 12 treatments (6 orders of avatars, 2 account enquiry scenarios)</b></p> <p><b>Participant – Gender (2 genders, balanced), age group (2 groups, balanced)</b></p>
<i>Confounding variables:</i>	<p><b>Researcher bias (randomised)</b></p> <p><b>Experiment Room (randomised)</b></p> <p><b>Tasks (matched task sheets)</b></p>
<i>Cohort:</i>	<p><b>N = 48</b></p> <p><b>6 conditions x 2 genders x 2 age groups x 2 service orders = 48</b></p>

<i>Honorarium</i>	<i>Personal cheque for £20 x 1 after induction session £30 x 1 after experiment session = £50</i>
<i>Duration:</i>	<i>1 hour induction + 1 hour experiment = 2 hours</i>

**Table 3.7: The Interaction Experiment Summary**

### **3.4 Results**

#### **3.4.1 Usability Questionnaire Results**

#### **3.4.2 Mean Usability Scores**

Overall, within the Second Life financial task context participants rated the humanoid financial agent avatar as having the highest usability, followed by the animated financial agent avatar and the lowest usability levels were reported during interactions with the unanimated financial agent avatar, as shown in Table 3.8. Table 3.9 shows the overall within-subjects effects amongst the three avatars in terms of usability in the Second Life task context, as well as providing a breakdown by age, gender and version.

<b>Financial Agent Avatar</b>	<b>Mean Usability Score</b>
Humanoid (H)	5.22
Animated (A)	4.98
Unanimated (U)	4.78

**Table 3.8: Mean Usability Scores (Second Life Tasks)**

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Avatar Second Life	Sphericity Assumed	10.360	2	5.180	337.063	.000	.991
	Greenhouse-Geisser	10.360	1.035	10.012	337.063	.000	.991
	Huynh-Feldt	10.360	2.000	5.180	337.063	.000	.991
	Lower-bound	10.360	1.000	10.360	337.063	.000	.991
Avatar Second Life*age	Sphericity Assumed	.497	2	.248	16.159	.004	.843
	Greenhouse-Geisser	.497	1.035	.480	16.159	.026	.843
	Huynh-Feldt	.497	2.000	.248	16.159	.004	.843
	Lower-bound	.497	1.000	.497	16.159	.028	.843
Avatar Second Life*gender	Sphericity Assumed	.696	2	.348	22.636	.002	.883
	Greenhouse-Geisser	.696	1.035	.672	22.636	.016	.883
	Huynh-Feldt	.696	2.000	.348	22.636	.002	.883
	Lower-bound	.696	1.000	.696	22.636	.018	.883
Avatar Second Life*version	Sphericity Assumed	3.840	22	.175	11.358	.003	.977
	Greenhouse-Geisser	3.840	11.838	.175	11.358	.032	.977
	Huynh-Feldt	3.840	22.000	.175	11.358	.003	.977
	Lower-bound	3.840	11.000	.349	11.358	.035	.977

**Table 3.9: Test of Within-Subjects Effects for Usability (Second Life Tasks)**

Table 3.10 shows that differences between the usability scores for each of the avatars within the Second Life task context to be highly significant.

Avatar (SL Task)		Mean Difference	Std.Error	Sig. (a)
Humanoid (H)	Animated (A)	.416*	.005	.000
Humanoid (H)	Unanimated (U)	.659*	.030	.001
Animated (A)	Unanimated (A)	.244*	.032	.014

Based on estimated marginal means

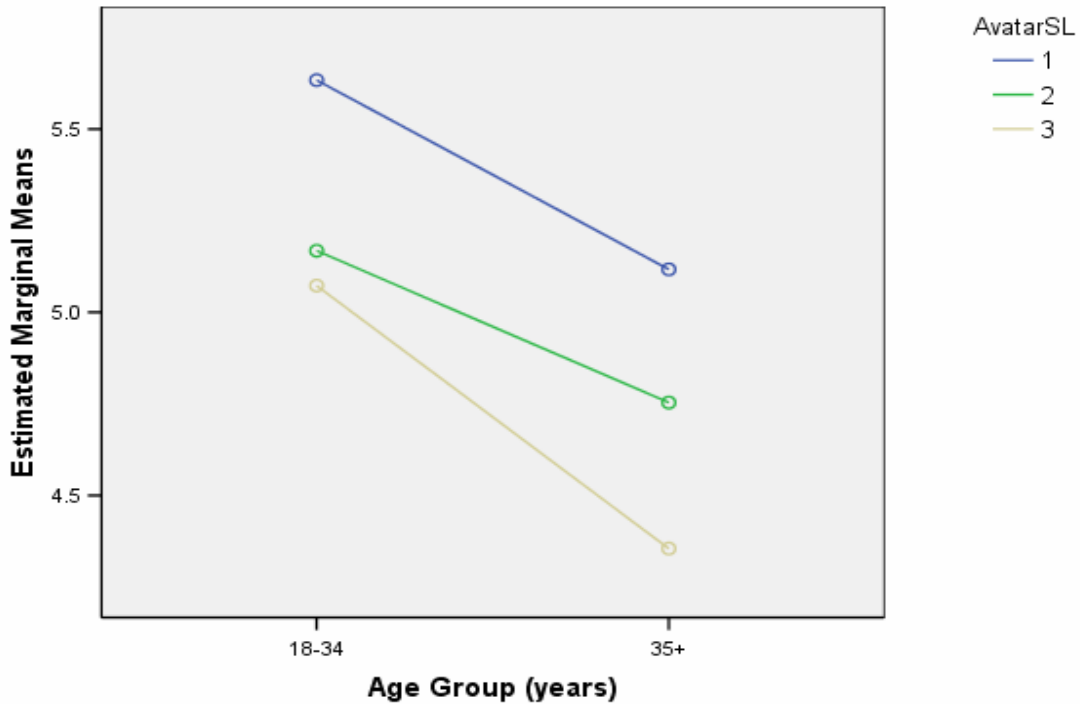
\*. The mean difference is significant at the 0.05 level.

a. Adjustment for multiple comparisons: Bonferroni.

**Table 3.10: Pairwise Comparisons (ANOVA) for Avatar Usability (Second Life Tasks)**

Within the Second Life financial task interactions, there was a significant within-subject effect for age on the mean usability score ( $p=0.026$ ).

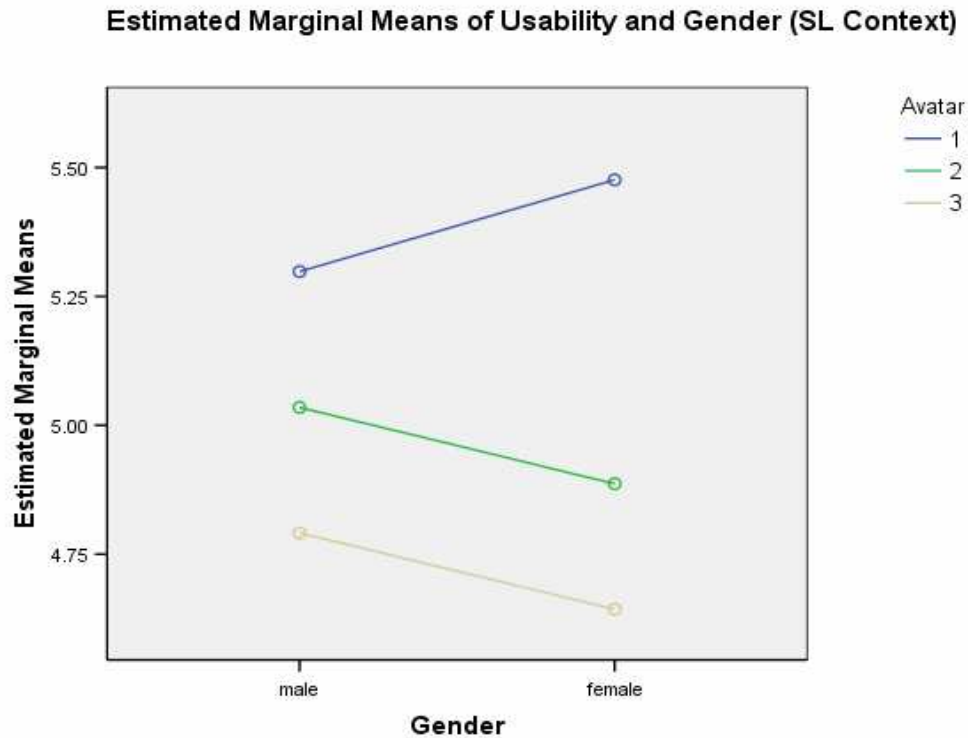
**Estimated Marginal Means of Usability and Age (SL Context)**



**Figure 3.7: Estimated Marginal Means for Usability and Age: Second Life Task (1 = Humanoid, 2= Animated, 3= Unanimated)**

Figure 3.7 above shows that participants in the 18-34 age group reported higher levels of usability than those in the 35+ age group when carrying out the Second Life financial tasks with each of the three financial agent avatars. Both age groups reported the highest levels of usability during interactions with the humanoid financial agent avatar (1) and the lowest levels with the unanimated financial agent avatar (3).

There was also a statistically significant within-subject effect for gender on the mean usability score within the Second Life task context ( $p=0.016$ ), which can be seen in figure 3.8.



**Figure 3.8: Estimated Marginal Means for Usability and Gender: Second Life Task (1 = Humanoid, 2= Animated, 3= Unanimated)**

Figure 3.8 above shows that males reported higher levels of overall usability than did females during Second Life financial task interactions with both the animated (2) and unanimated (3) financial agent avatars. Conversely, females reported higher levels of overall usability than did males when carrying out Second Life financial tasks with the humanoid (1) financial agent avatar.

Further analysis showed a statistically significant within-subject effect for version order on levels of usability ( $p=0.032$ ) indicating that the order to which participants were exposed to the financial agent avatars when carrying out Second Life financial tasks affected their overall levels of usability.



Within the real-life financial task context, participants similarly rated the humanoid financial agent avatar as having the highest usability, followed by the animated financial agent avatar and the lowest levels with the unanimated financial agent avatar, shown in Table 3.11. Table 3.12 shows the overall within-subjects effects amongst the three avatars in terms of usability in the real-life task context, as well as providing a breakdown by age, gender and version.

<b>Financial Agent Avatar</b>	<b>Mean Usability Score</b>
Humanoid (H)	5.34
Animated (A)	4.99
Unanimated (U)	4.74

**Table 3.11: Mean Usability Scores (Real-life Tasks)**

<b>Source</b>		<b>Type III Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>	<b>Partial Eta Squared</b>
Avatar Real-life	Sphericity Assumed	9.239	2	4.620	166.800	.000	.982
	Greenhouse-Geisser	9.239	1.034	8.934	166.800	.001	.982
	Huynh-Feldt	9.239	2.000	4.620	166.800	.000	.982
	Lower-bound	9.239	1.000	9.239	166.800	.001	.982
Avatar Real-life*age	Sphericity Assumed	1.138	2	.569	20.547	.002	.873
	Greenhouse-Geisser	1.138	1.034	1.101	20.547	.019	.873
	Huynh-Feldt	1.138	2.000	.569	20.547	.002	.873
	Lower-bound	1.138	1.000	1.138	20.547	.020	.873
Avatar Real-life*gender	Sphericity Assumed	.343	2	.172	6.193	.035	.674
	Greenhouse-Geisser	.343	1.034	.332	6.193	.086	.674
	Huynh-Feldt	.343	2.000	.172	6.193	.035	.674
	Lower-bound	.343	1.000	.343	6.193	.089	.674
Avatar Real-life*version	Sphericity Assumed	6.842	22	.311	11.230	.003	.976
	Greenhouse-Geisser	6.842	11.376	.601	11.230	.033	.976
	Huynh-Feldt	6.842	22.000	.311	11.230	.003	.976
	Lower-bound	6.842	11.000	.622	11.230	.035	.976

**Table 3.12: Test of Within-Subjects Effects for Usability (Real-life Tasks)**

Table 3.13 shows the differences between the usability scores for each of the avatars within the real-life task context is highly significant.

Avatar (RL Task)		Mean Difference	Std.Error	Sig. (a)
Humanoid (H)	Animated (A)	.371*	.012	.000
Humanoid (H)	Unanimated (U)	.624*	.036	.001
Animated (A)	Unanimated (A)	.254*	.046	.036

Based on estimated marginal means

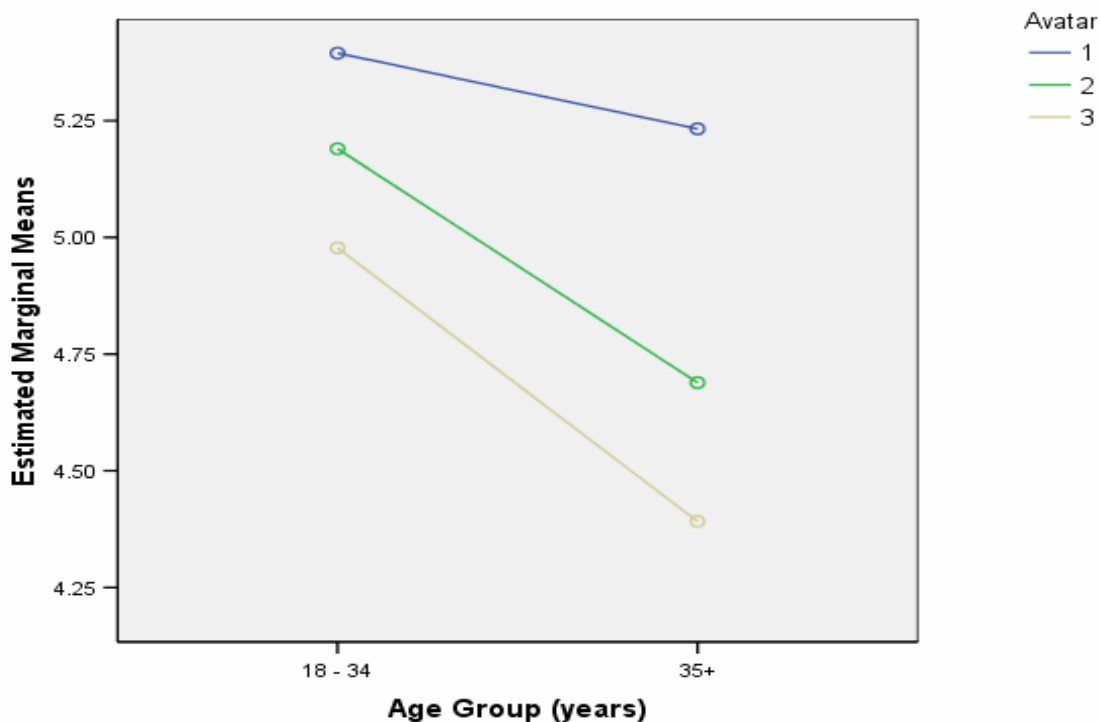
\*. The mean difference is significant at the 0.05 level.

a. Adjustment for multiple comparisons: Bonferroni.

**Table 3.13: Pairwise Comparisons for Avatar Usability: Real-life Tasks**

Within the real-life financial task interactions, there was a significant within-subject effect for age on the mean usability score ( $p=0.03$ ).

**Estimated Marginal Means of Usability and Age (RL context)**



**Figure 3.9: Estimated Marginal Means for Usability and Age: Real-life Task (1 = Humanoid, 2= Animated, 3= Unanimated)**

Figure 3.9 above shows that the 18-34 age group reported higher levels of usability than the 35+ age group when carrying out real-life financial tasks with each of the

three financial agent avatars. Both age groups reported the highest levels of usability during interactions with the humanoid financial agent avatar (1) and the lowest levels with the unanimated financial agent avatar (3).

There was also a statistically significant effect for version order on levels of usability within the real-life financial task context ( $p=0.003$ ), which again shows that the order which participants were exposed to the financial agent avatars affected their attitudes towards usability.

Charts 1, 2 and 3 compare the usability scores for all three versions of the financial agent avatar (humanoid, animated and unanimated) during the Second Life financial tasks on a pairwise basis. It can be seen that significant differences occur in usability attributes such as “Enjoyment of interaction” between the humanoid and animated financial agent avatars (Chart 1) and the animated and unanimated financial agent avatars (Chart 3), but the most significant differences can be seen between the humanoid and the unanimated financial agent avatars (Chart 2).

Charts 4, 5 and 6 compare the mean usability scores for all three versions of the financial agent avatar during the real-life financial tasks, also on a pairwise basis. Significant differences in usability attributes can also be seen to occur between the humanoid and animated financial agent avatars in the real-life task context (Chart 4) and the animated and unanimated financial agent avatars (Chart 6), but the most significant differences within this task context can be seen between the humanoid and unanimated financial agent avatars (Chart 5).

When comparing usability levels for each set of financial agent avatars experienced in each context, more significant differences amongst the usability attributes can be seen to occur between the humanoid and animated financial agent avatars when carrying out the real-life financial tasks (Chart 4) than when carrying out the Second Life financial tasks (Chart 1). More significant differences can also be seen to occur amongst the usability attributes between the humanoid and unanimated financial agent avatars when carrying out the real-life financial tasks (Chart 5) than when carrying out the Second Life financial tasks (Chart 2). Whilst this would suggest a significant effect for the financial task context on the overall participant experience and the subsequent mean usability levels, further analysis within this report will show that the overall effect of task context on usability is not statistically significant.

Chart 1: Usability Scores for Humanoid Avatar Vs Animated Avatar (SL Context)

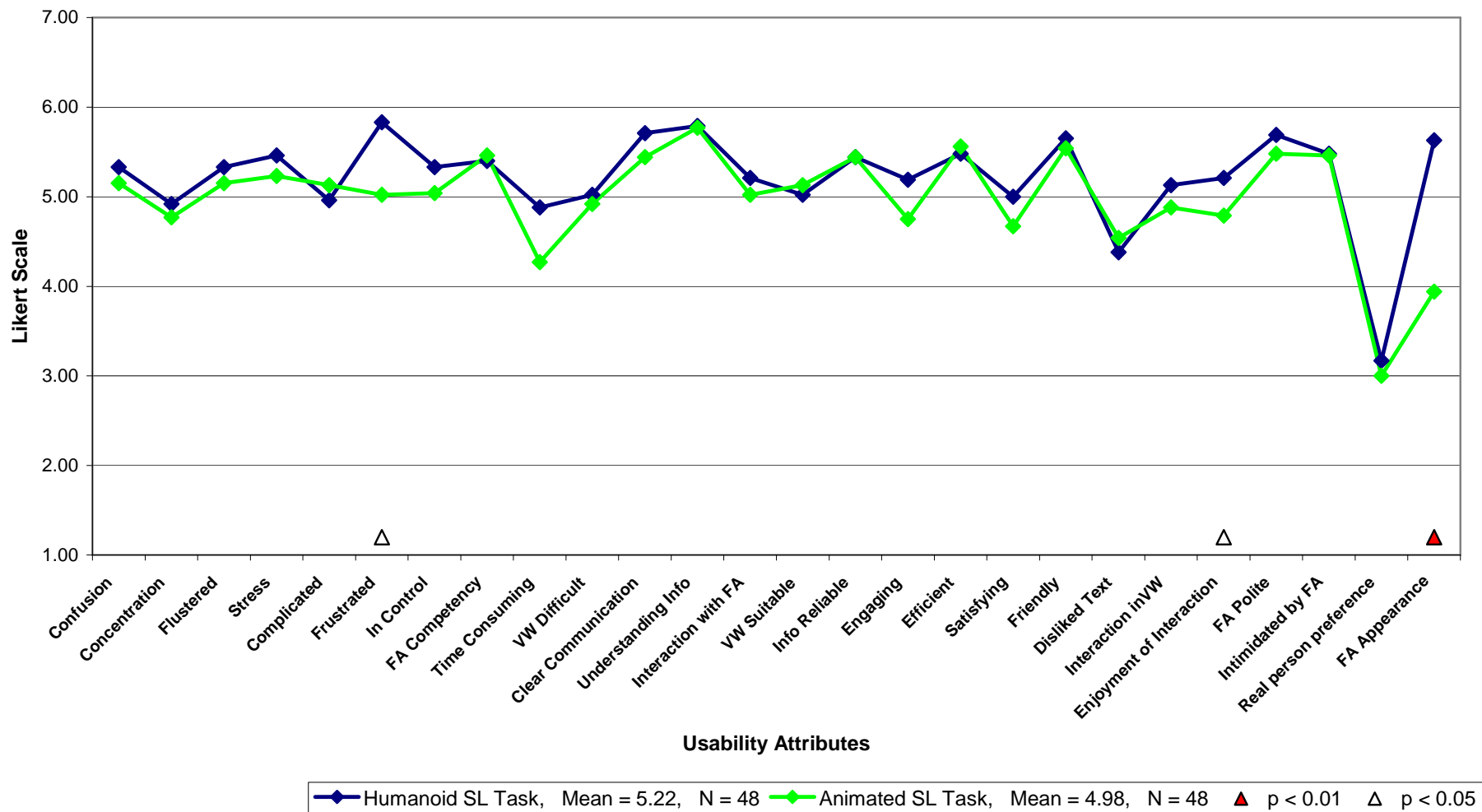


Chart 2: Usability Scores for Humanoid Avatar Vs Unanimated Avatar (SL Context)

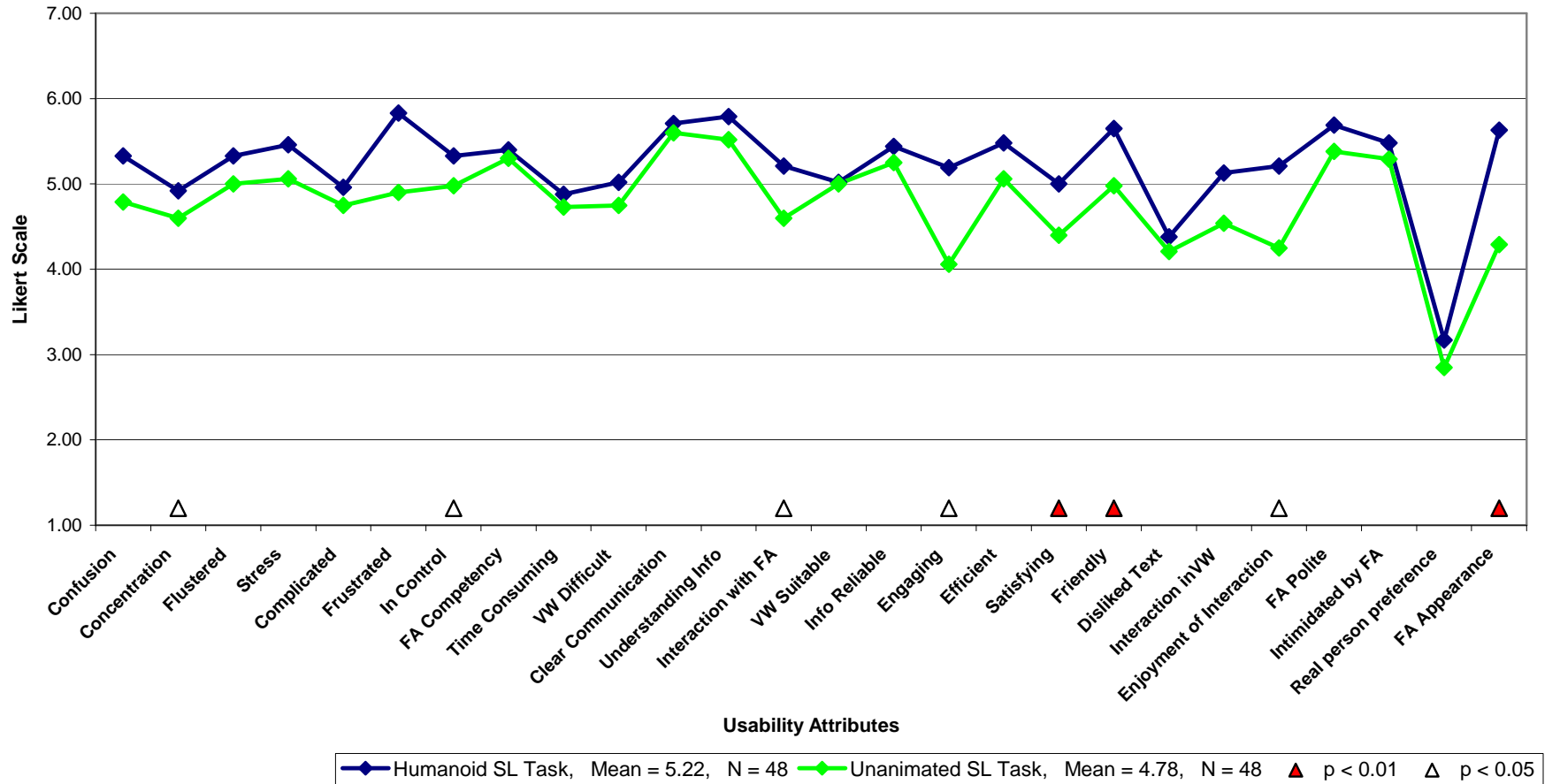


Chart 3: Usability Scores for Animated Avatar Vs Unanimated Avatar (SL Context)

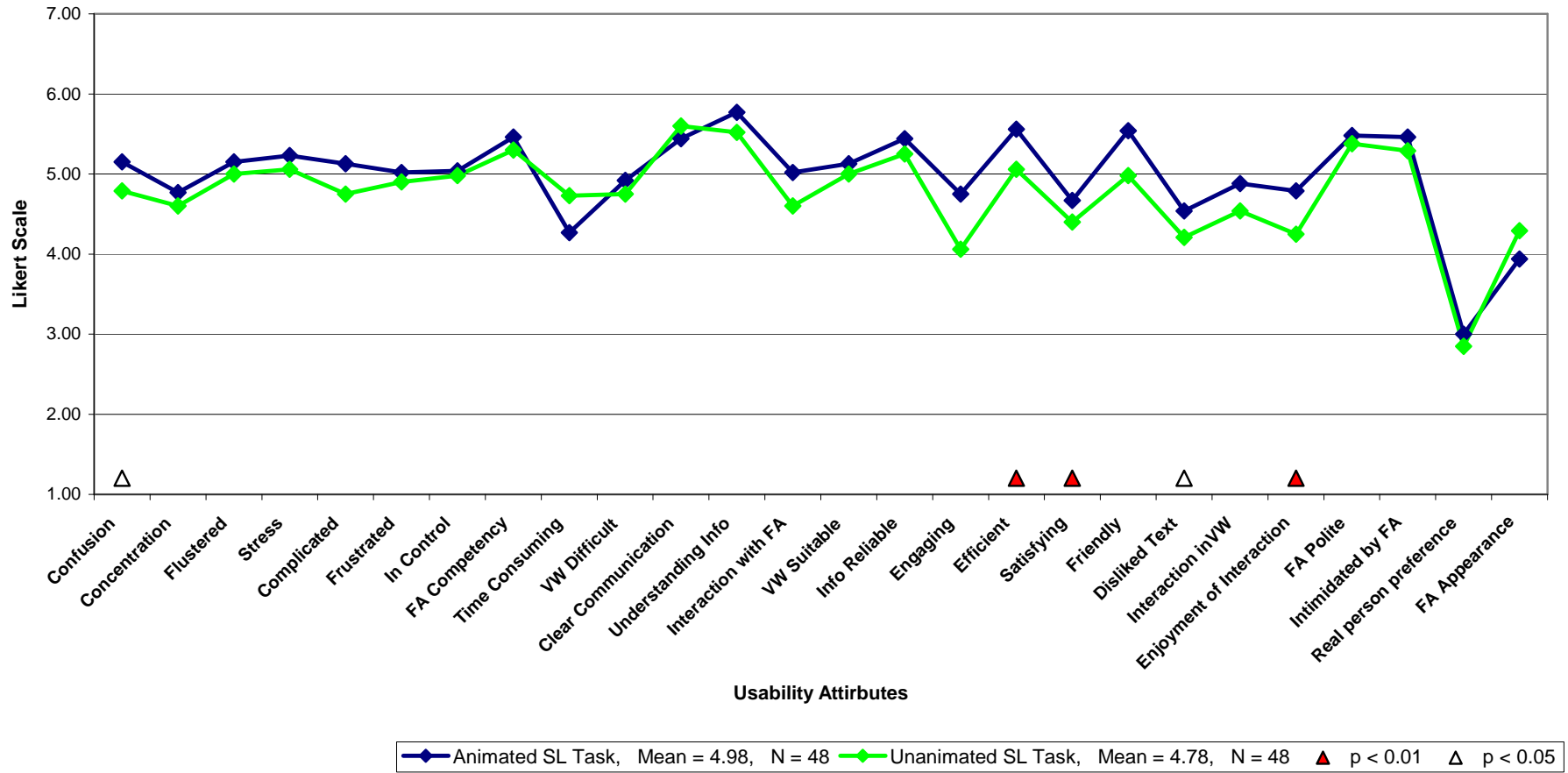


Chart 4: Usability Scores for Humanoid Avatar Vs Animated Avatar (RL Context)

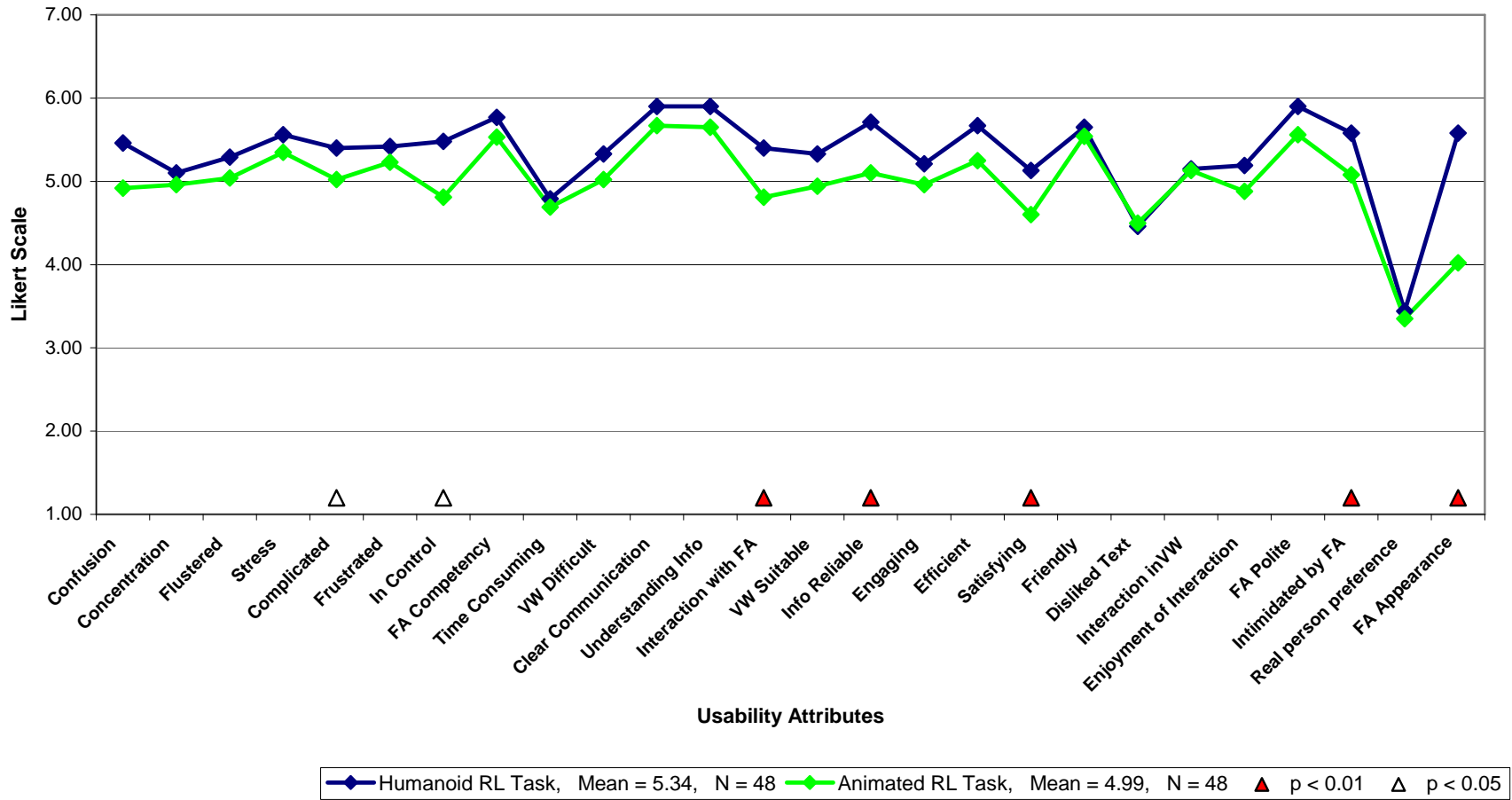






Chart 5: Usability Scores for Humanoid Avatar Vs Unanimated Avatar (RL Context)

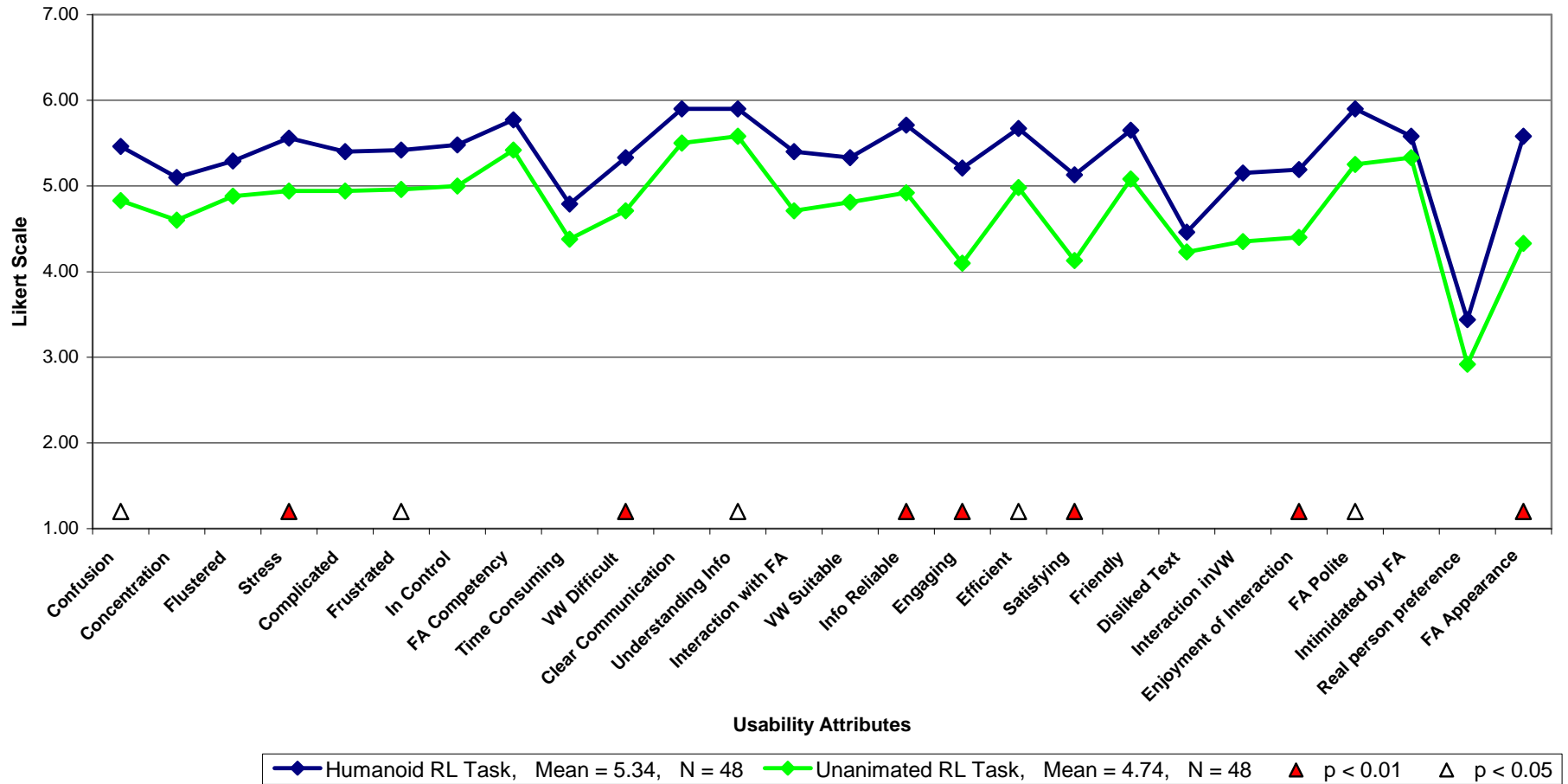
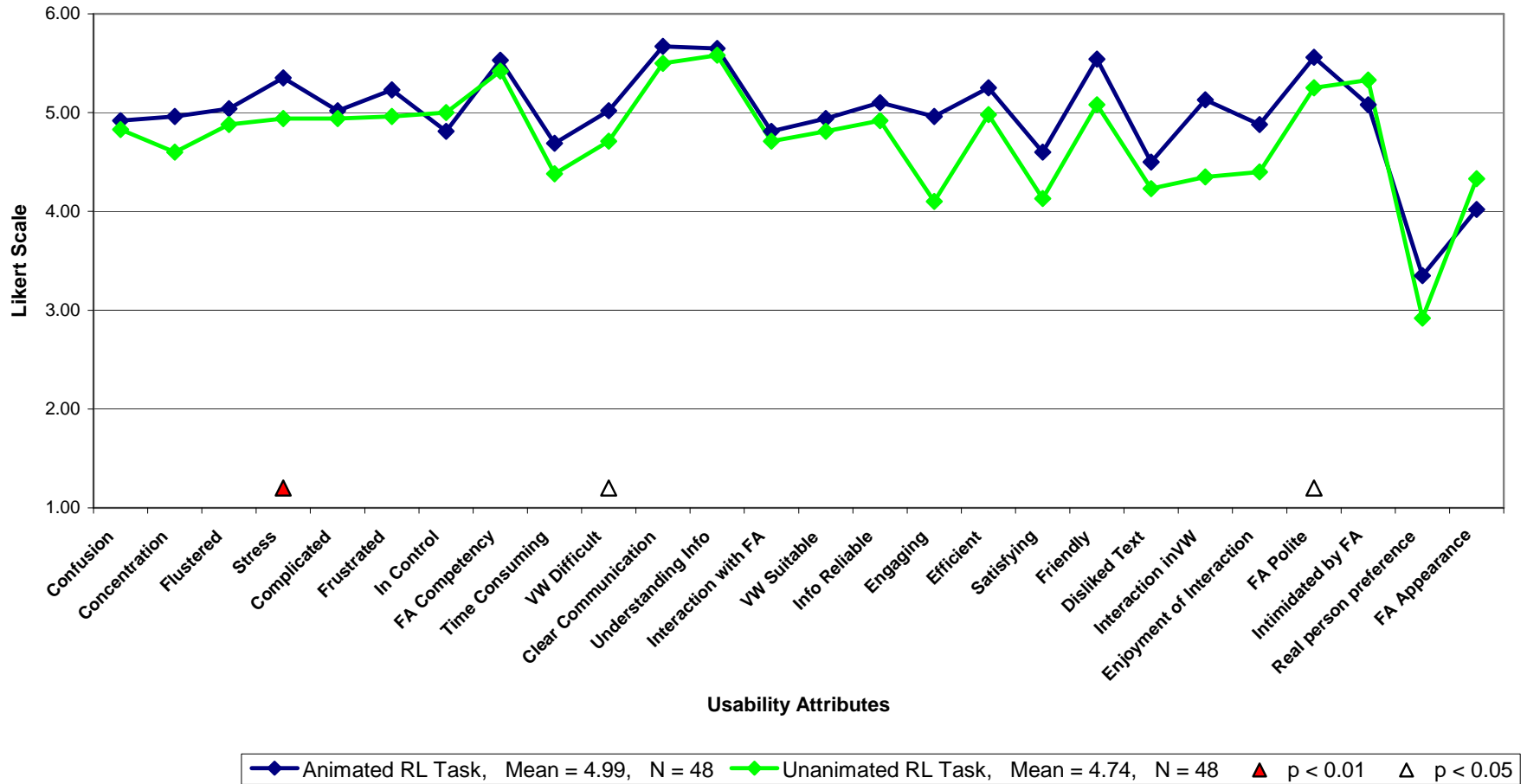


Chart 6: Usability Scores for Animated Avatar Vs Unanimated Avatar (RL Context)



### **3.4.3 Attribute Analysis: Usability Questionnaire**

The results of the attribute analysis of the usability questionnaire used in The Interaction Experiment showed a large number of significant differences between the three financial agent avatars within both the real-life and Second Life task contexts. The greatest number of significant differences appeared unsurprisingly between the humanoid and unanimated financial agent avatars (see Appendix 7 for full usability attribute analysis).

In the Second Life task context, when interacting with the humanoid financial agent avatar, participants felt significantly less confused, did not have to concentrate as hard, felt that interactions were less complicated, were less frustrated and felt that their interactions were less time consuming. Participants would be significantly happier to interact with the humanoid financial agent avatar again than the animated and unanimated avatars as well as feeling that the humanoid avatar helped them feel the most engaged in the virtual world. They found the information supplied by both the humanoid and animated avatars to be significantly more reliable than that supplied by the unanimated financial agent avatar. Perhaps surprisingly, interactions with the animated financial agent avatar were rated as the most efficient, closely followed by those with the humanoid avatar though less so with the unanimated avatar. The humanoid financial agent avatar was thought to be friendlier and participants enjoying their interactions the most with this avatar. The appearance of the humanoid financial agent avatar was also rated as being the least distracting.

In the real-life task context, when interacting with the humanoid financial agent avatar participants felt significantly less confused, less flustered, less stressed, found their interactions to be the least complicated, were less frustrated, felt more in control during their interactions, understood the information given to them to a greater extent and would be happiest to interact with this avatar again. Information supplied during the tasks by the humanoid financial agent avatar was thought to be the most reliable and this avatar also helped participants to feel engaged in the virtual world to the greatest extent. The humanoid financial agent avatar was also rated as the most efficient, providing the most satisfying interactions, with participants also enjoying their interactions significantly more so than with the animated and unanimated financial agent avatars. The humanoid financial agent avatar was also rated as being the most polite, participants were least intimidated by it and would be less likely to opt for an interaction with a real person than if they were interacting with the other two financial agent avatars. Participants were also least distracted by the appearance of the humanoid financial agent avatar.

There were also a number of significant within-subject effects and interactions of age group, gender and version order along the usability attributes. In many cases, the 18-34 year age groups experienced higher levels of usability during interactions with the financial agent avatars than the 35+ year age group, as will be discussed later in this chapter (also see Appendix 7 for full usability attribute analysis).

#### **3.4.4 Hypotheses relating to Usability**

Recalling Hypothesis A relating to the perceived usability of the three financial agent avatars:

<b>H<sub>0A</sub>:</b>	<b>There will be no significant differences between the usability for each of the financial agent avatars.</b>
<b>H<sub>1A</sub>:</b>	<b>There will be significant differences between the usability for each of the financial agent avatars</b>

Sufficient evidence exists to reject the null hypothesis as significant differences were found between the three financial agent avatars on many of the usability attributes within both the real-life and Second Life task contexts, as well as a significantly higher mean usability score for the humanoid financial agent avatar.

### ***3.5 SVE Social Presence Perception Scale Results***

#### **3.5.1 Mean Social Presence Scores**

Overall, within the Second Life financial task context participants rated the humanoid financial agent avatar as affording the highest level of social presence followed by the animated financial agent avatar, with the lowest levels of social presence reported within the Second Life financial task context during interactions with the unanimated financial agent avatar, see Table 3.14. Table 3.15 shows the overall within-subjects effects amongst the three avatars in terms of social presence in the Second Life task context, as well as providing a breakdown by age, gender and version.

<b>Financial Agent Avatar</b>	<b>Mean Social Presence Score</b>
Humanoid (H)	4.46
Animated (A)	4.1
Unanimated (U)	4.0

**Table 3.14: Mean Social Presence Scores (Second Life Tasks)**

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Avatar Second Life	Sphericity Assumed	5.973	2	2.978	24.010	.001	.889
	Greenhouse-Geisser	5.973	1.068	5.592	24.010	.014	.889
	Huynh-Feldt	5.973	2.000	2.987	24.010	.001	.889
	Lower-bound	5.973	1.000	5.973	24.010	.016	.889
Avatar Second Life*age	Sphericity Assumed	.113	2	.056	.453	.656	.131
	Greenhouse-Geisser	.113	1.068	.106	.453	.559	.131
	Huynh-Feldt	.113	2.000	.056	.453	.656	.131
	Lower-bound	.113	1.000	.113	.453	.549	.131
Avatar Second Life*gender	Sphericity Assumed	.839	2	.419	3.372	.104	.529
	Greenhouse-Geisser	.839	1.068	.786	3.372	.159	.529
	Huynh-Feldt	.839	2.000	.419	3.372	.104	.529
	Lower-bound	.839	1.000	.839	3.372	.164	.529
Avatar Second Life*version	Sphericity Assumed	2.225	22	.101	.813	.671	.749
	Greenhouse-Geisser	2.225	11.749	.189	.813	.656	.749
	Huynh-Feldt	2.225	22.000	.101	.813	.671	.749
	Lower-bound	2.225	11.000	.202	.813	.655	.749

**Table 3.15: Test of Within-Subjects Effects for Social Presence (Second Life Tasks)**

Table 3.16 shows the differences between the perceived levels of social presence reported during interactions with each of the avatars within the Second Life task context. It can be seen that there is a significant difference in the perceived levels of social presence between interactions with the humanoid financial agent avatar and the animated financial agent avatar within this task context ( $p < 0.01$ ). With a significance level of .053, the difference in the perceived level of social presence reported between the humanoid and unanimated financial agent avatars is only borderline significant ( $p > 0.05$ ). The difference between the levels of social presence reported during interactions with the animated and unanimated financial agent avatars within this task context is not significant ( $p > 0.05$ ).

Avatar (SL Task)		Mean Difference	Std.Error	Sig. (a)
Humanoid (H)	Animated (A)	.370*	.034	.005
Humanoid (H)	Unanimated (U)	.471	.099	.053
Animated (A)	Unanimated (A)	.100	.071	.761

Based on estimated marginal means

\*. The mean difference is significant at the 0.05 level.

a. Adjustment for multiple comparisons: Bonferroni.

**Table 3.16: Pairwise Comparisons for Social Presence by Avatar (Second Life Tasks)**

Within the real-life financial task context, participants similarly rated the humanoid financial agent avatar as affording the highest level of social presence, followed by the animated financial agent avatar and the lowest levels with the unanimated financial agent avatar, see Table 3.17. Table 3.18 shows the overall within-subjects effects amongst the three avatars in terms of social presence in the real-life task context, as well as providing a breakdown by age, gender and version.

Financial Agent Avatar	Mean Social Presence Score
Humanoid (H)	4.56
Animated (A)	4.13
Unanimated (U)	3.98

**Table 3.17: Mean Social Presence Scores (Real-life Tasks)**



Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Avatar Real-life	Sphericity Assumed	9.237	2	4.619	38.080	.000	.927
	Greenhouse-Geisser	9.237	1.077	8.574	38.080	.007	.927
	Huynh-Feldt	9.237	2.000	4.619	38.080	.000	.927
	Lower-bound	9.237	1.000	9.237	38.080	.009	.927
Avatar Real-life*age	Sphericity Assumed	.013	2	.006	.053	.949	.017
	Greenhouse-Geisser	.013	1.077	.012	.053	.848	.017
	Huynh-Feldt	.013	2.000	.006	.053	.949	.017
	Lower-bound	.013	1.000	.013	.053	.833	.017
Avatar Real-life*gender	Sphericity Assumed	.633	2	.316	2.608	.153	.465
	Greenhouse-Geisser	.633	1.077	.587	2.608	.200	.465
	Huynh-Feldt	.633	2.000	.316	2.608	.153	.465
	Lower-bound	.633	1.000	.633	2.608	.205	.465
Avatar Real-life*version	Sphericity Assumed	2.732	22	.124	1.024	.536	.790
	Greenhouse-Geisser	2.732	11.851	.230	1.024	.558	.790
	Huynh-Feldt	2.732	22.000	.124	1.024	.536	.790
	Lower-bound	2.732	11.000	.248	1.024	.561	.790

**Table 3.18: Test of Within-Subjects Effects for Social Presence (Real-life Tasks)**

Table 3.19 shows the differences between the perceived levels of social presence reported during interactions with each of the avatars within the real-life task context. It can be seen that there is a significant difference in the perceived levels of social presence between interactions with the humanoid and animated financial agent avatars within this task context as well as between the humanoid and unanimated financial agent avatars ( $p < 0.05$ ). Within this task context, it can also be seen that there is no significant difference in the levels of perceived social presence between the animated and unanimated financial agent avatars within the real-life task context ( $p > 0.05$ ).

Avatar (RL Task)		Mean Difference	Std.Error	Sig. (a)
Humanoid (H)	Animated (A)	.444*	.071	.025
Humanoid (H)	Unanimated (U)	.592*	.097	.027
Animated (A)	Unanimated (A)	.148	.034	.066

Based on estimated marginal means

\*. The mean difference is significant at the 0.05 level.

a. Adjustment for multiple comparisons: Bonferroni.

**Table 3.19: Pairwise Comparisons for Social Presence by Avatar (Real-life Tasks)**

Charts 7, 8 and 9 compare the mean social presence scores for all three versions of the financial agent avatar (humanoid, animated and unanimated) during the Second Life financial tasks on a pair-wise basis. It can be seen that significant differences on social presence attributes occur between the humanoid and animated financial agent avatars (Chart 7) whilst no significant differences occur between the animated and unanimated financial agent avatars (chart 9), but the most significant differences can be seen between the humanoid and the unanimated financial agent avatars (Chart 8).

Charts 10, 11 and 12 compare the mean social presence scores for all three versions of the financial agent avatar during the real-life financial tasks, also on a pairwise basis. Significant differences can also be seen to occur between the humanoid and animated financial agent avatars in the real-life task context (Chart 10) and the animated and unanimated financial agent avatars (Chart 12), but the most significant differences within this task context can be seen between the humanoid and unanimated financial agent avatars (Chart 11). Overall, more significant differences can be seen to occur within the real-life task context than the Second Life task context.

When comparing levels of perceived social presence for each set of financial agent avatars in each context, more significant differences amongst the social presence attributes can be seen to occur between the humanoid and animated financial agent avatars when carrying out the real-life financial tasks (Chart 10) than when carrying out the Second Life financial tasks (Chart 7). More significant differences can also be seen to occur amongst the social presence attributes between the humanoid and unanimated financial agent avatars when carrying out the real-life financial tasks (Chart 11) than when carrying out the Second Life financial tasks (Chart 8). Similarly,

in the real-life task context, significant differences occur between the animated and unanimated financial agent avatars in terms of the social presence attributes (Chart 12) whilst no significant differences occur between these two avatars in the Second Life context (Chart 9). Although this would suggest financial task context has an effect on the overall participant experience and the subsequent mean perceived social presence levels, the further analysis section of the report will show that the overall effect is not statistically significant.

Chart 7: Social Presence Scores for Humanoid Avatar Vs Animated Avatar (SL Context)

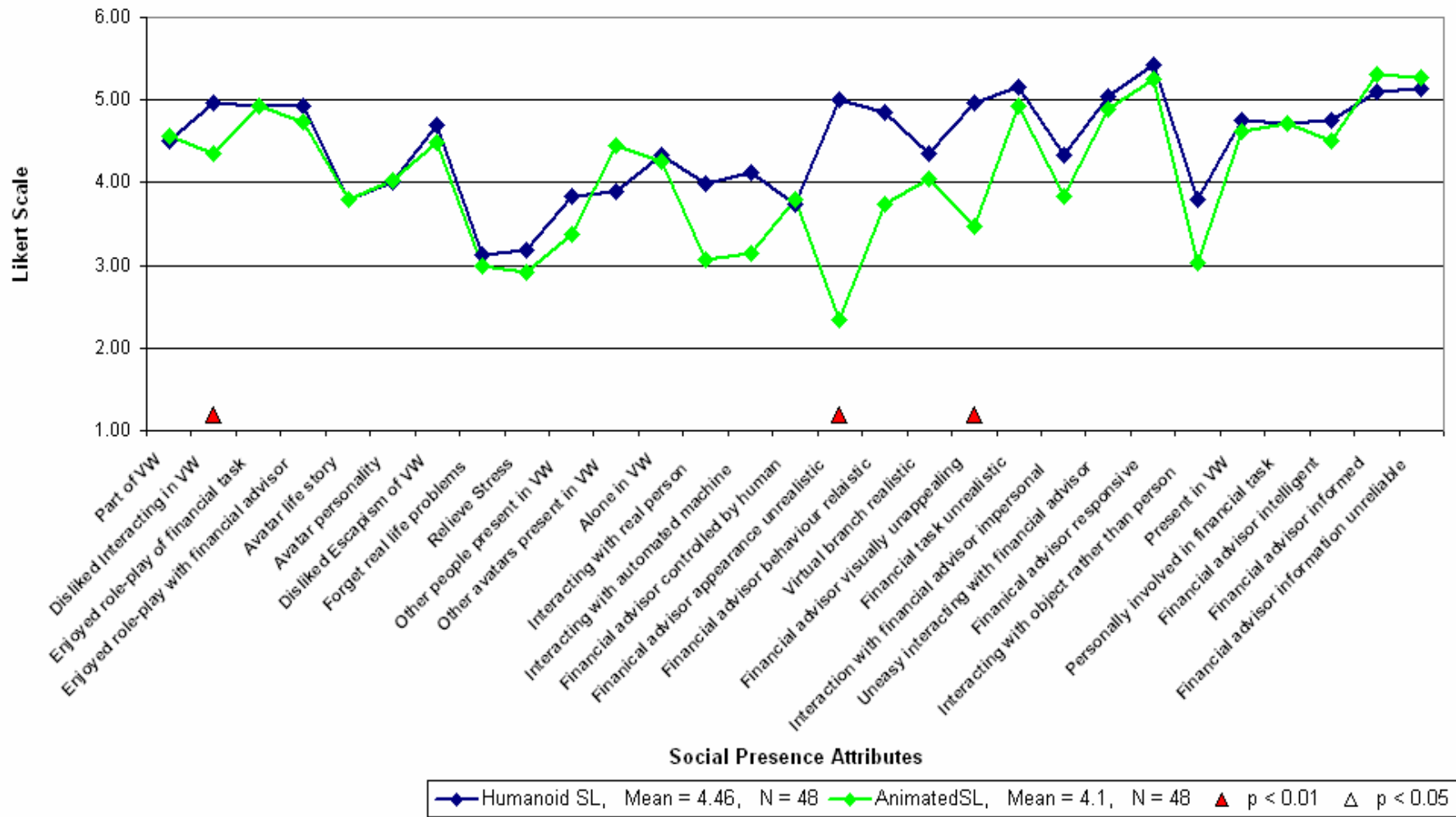




Chart 8: Social Presence Scores for Humanoid Avatar Vs Unanimated Avatar (SL Context)

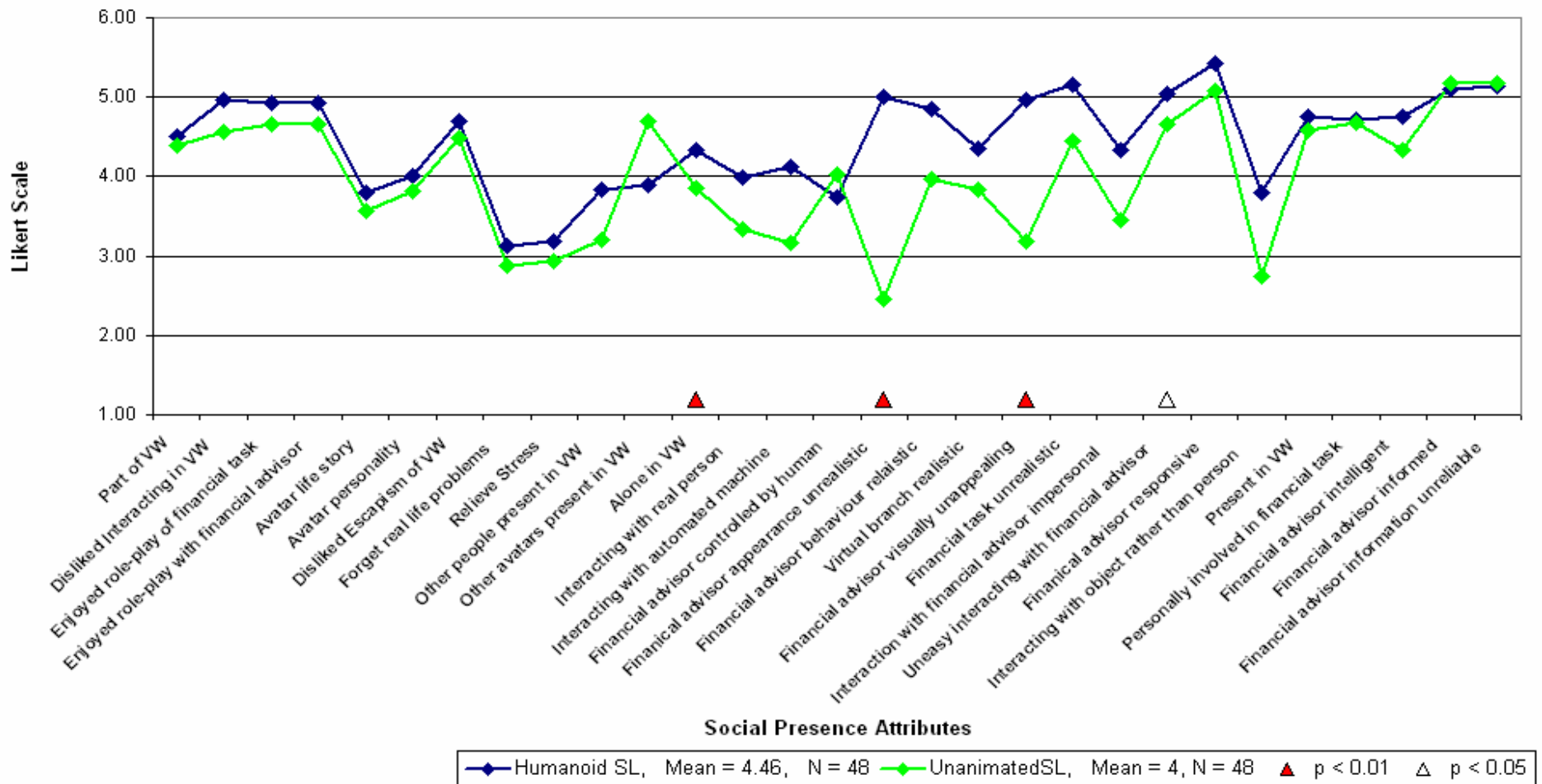




Chart 9: Social Presence Scores for Animated Avatar Vs Unanimated Avatar (SL Context)

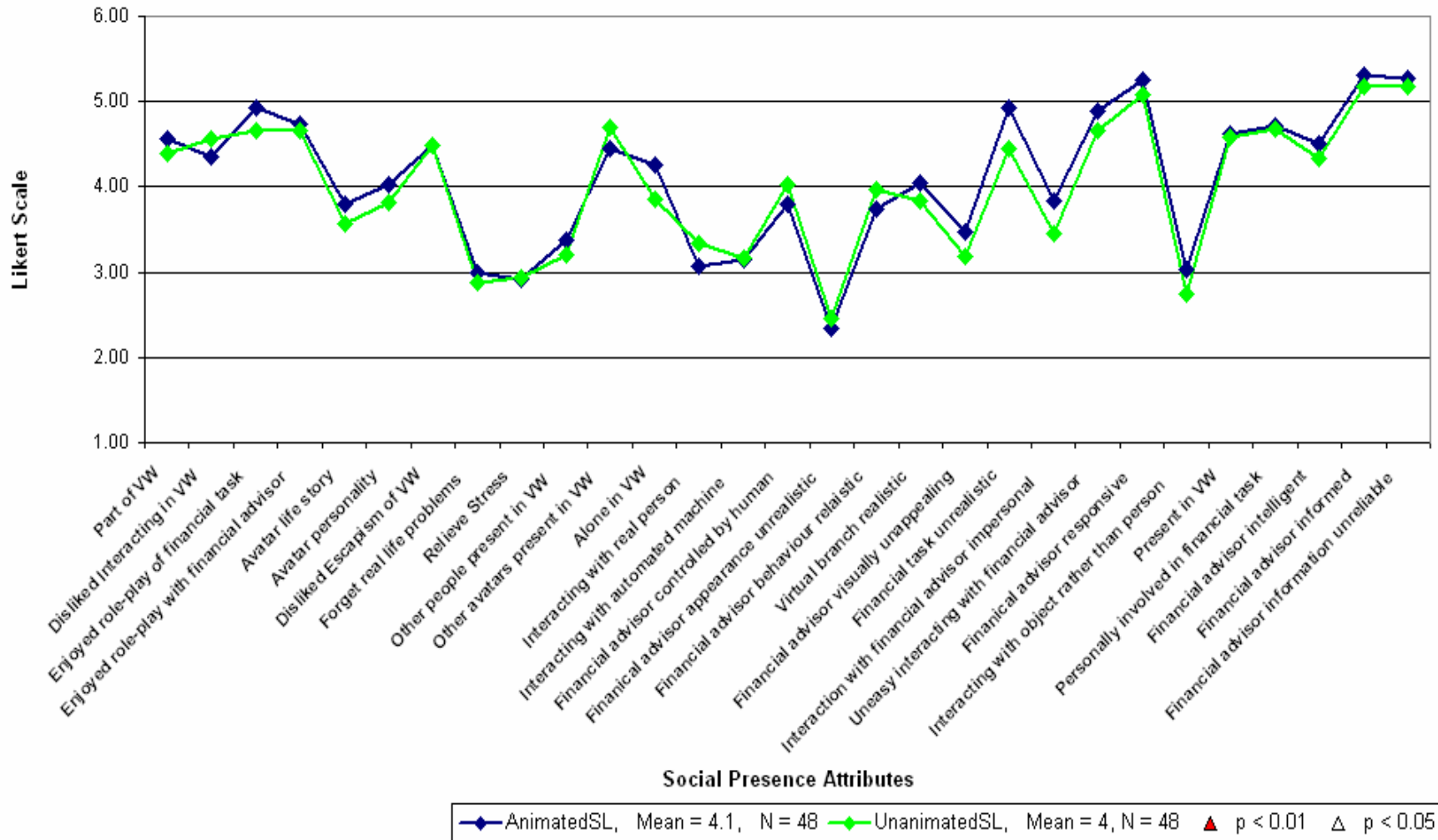






Chart 10: Social Presence Scores for Humanoid Avatar Vs Animated Avatar (RL Context)

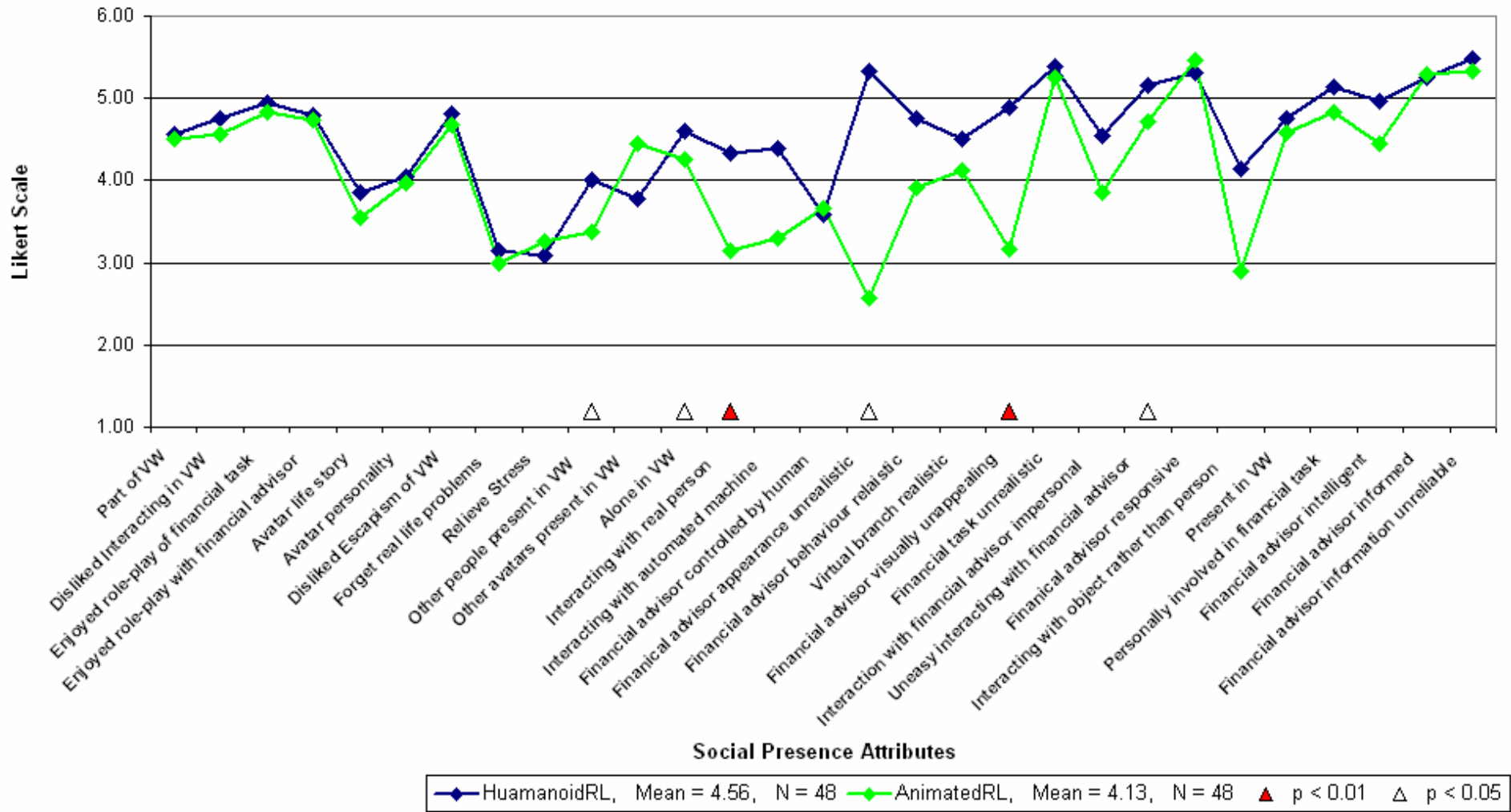


Chart11: Social Presence Scores for Humanoid Avatar Vs Unanimated Avatar (RL Context)

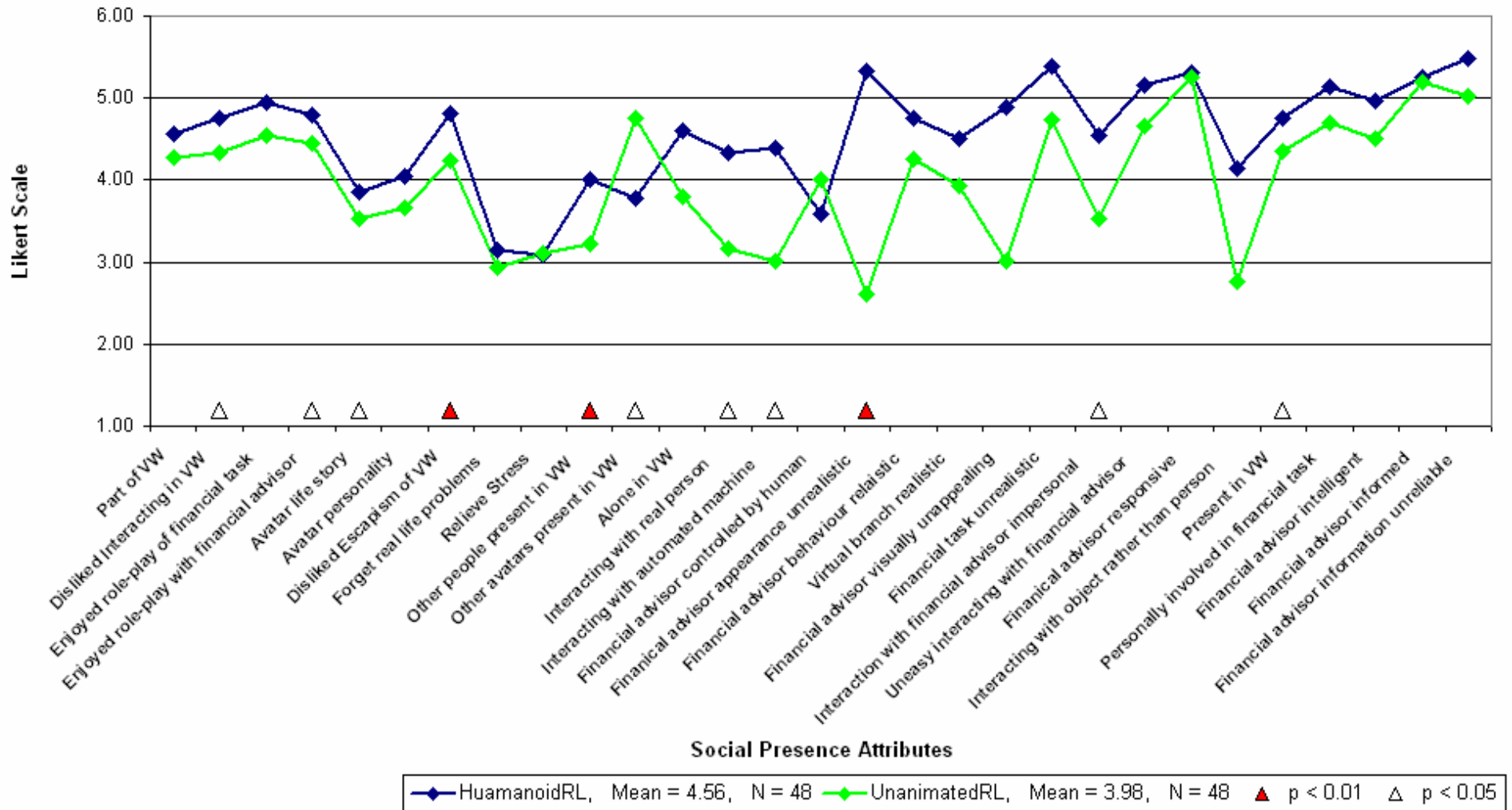
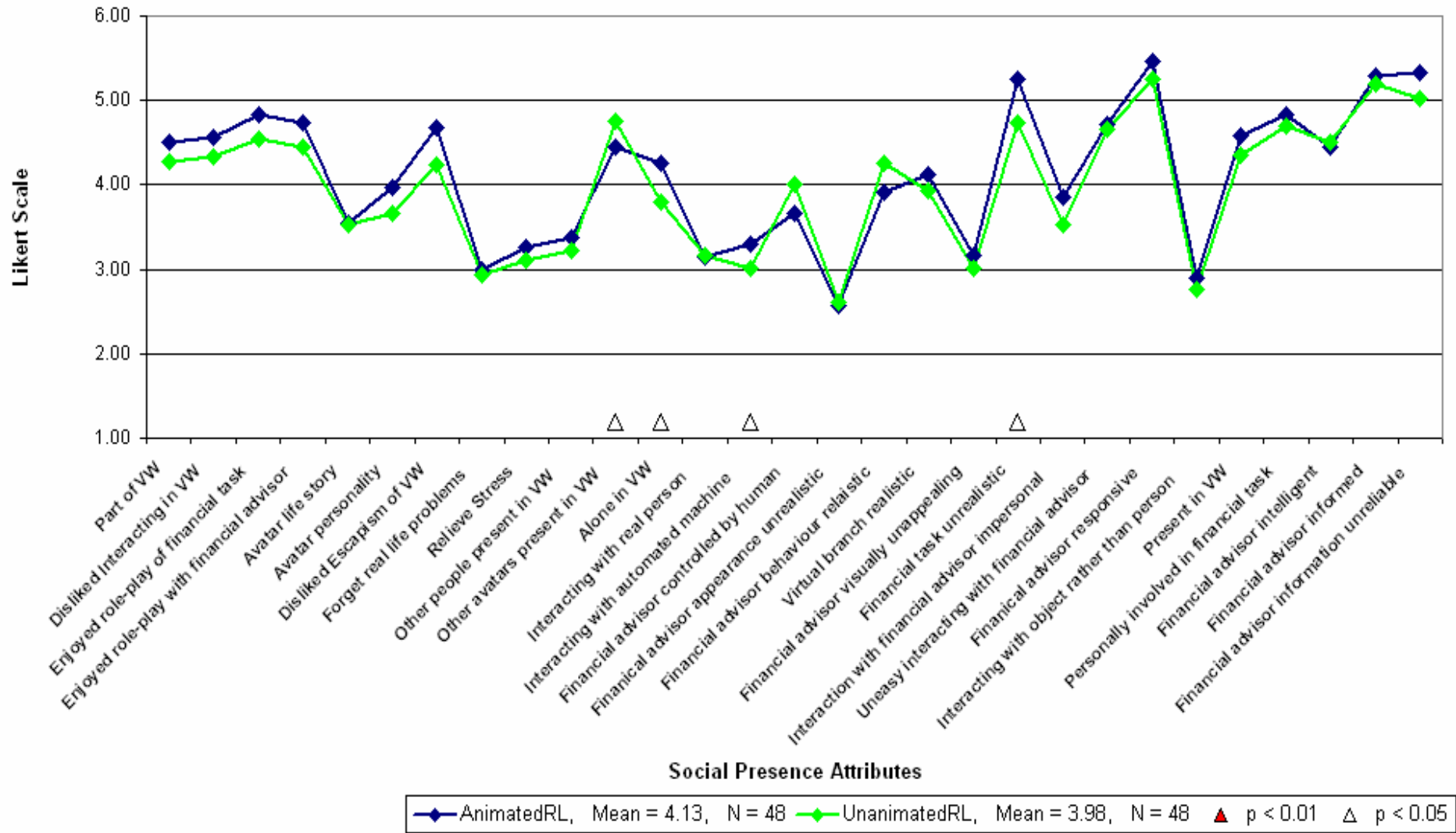


Chart 12: Social Presence Scores for Animated Avatar Vs Unanimated Avatar (RL Context)



### **3.5.2 Attribute Analysis: SVE Social Presence Perception Scale**

The results of the attribute analysis of the SVE Social Presence Perception scale questionnaire used in The Interaction Experiment showed a number of significant differences between the three financial agent avatars within both the real-life and Second Life task contexts. The greatest number of significant differences appeared between the humanoid and unanimated financial agent avatars. In terms of the two task contexts, the number of significant differences along the social presence attributes is greater in the real-life task interactions than in the Second Life task interactions (see Appendix 8 for full social presence attribute analysis).

In the Second Life task context participants liked interacting in the virtual world to a greater extent during interactions with the humanoid financial agent avatar. They also felt that other people were present with them within the virtual world during interactions with the humanoid and reported feeling less alone. Conversely they were more likely to feel like other avatars were present with them during interactions with the unanimated financial agent avatar. This difference is particularly interesting and is discussed later in this chapter. Participants felt most as though they were interacting with a real person when interacting with the humanoid avatar and most like they were interacting with an automated machine during interactions with the animated avatar. They also reported feeling that they were interacting with an object to a greater extent during interactions with the unanimated avatar. The appearance of the humanoid avatar was rated as the most realistic, whilst the animated avatar was rated as having the most unrealistic appearance, followed by the unanimated avatar. Overall, participants found the humanoid to be the most visually appealing whilst the unanimated avatar was rated as being the least visually appealing.

The behaviour of the humanoid avatar was rated as the most realistic and the behaviour of the animated avatar was thought to be the most unrealistic, followed by the unanimated avatar. Participants found the financial tasks to be most realistic during interactions with the humanoid avatar and the least realistic with the unanimated avatar. Interactions with the humanoid avatar were rated as the most personal and least so with the unanimated avatar.

In the real-life task context participants also liked interacting in the virtual world to the greatest extent during interactions with the humanoid avatar, followed by the animated avatar and least so with the unanimated avatar. Participants enjoyed the role play aspect of interacting with the financial advisor when communicating with the humanoid avatar followed by the animated avatar and the lowest levels of enjoyment along this attribute were experienced during interactions with the unanimated avatar. The escapism element of interacting within the virtual world was reported to be most enjoyable during interactions with the humanoid avatar and the lowest levels were reported during interactions with the unanimated avatar. Participants were significantly more likely to feel that other people were with them within the virtual world during interactions with the humanoid avatar, and less so with the animated followed by the unanimated avatars. On the other hand, they were more likely to feel that other avatars were present during interactions with the unanimated avatar, followed by the animated avatar and least so with the humanoid avatar. Perhaps as a result of this, participants felt least alone within the virtual world during interactions with the humanoid avatar, followed by the animated avatar and most alone during interactions with the unanimated avatar. Participants felt most as though they were interacting with a real person and less as though they were interacting with an automated machine during interactions with the humanoid avatar. Conversely, they

felt least as though they were interacting with a real person and most as though they were interacting with an automated machine during interactions with the unanimated avatar. Participants also reported feeling that they were interacting with an object during interactions with the unanimated avatar and least so during interactions with the humanoid avatar. There was a highly significant difference in terms of attitudes towards the appearance of the financial agent avatars, with the humanoid avatar rated as very realistic and the unanimated, closely followed by the animated, avatars rated as very unrealistic. In terms of behaviour of the financial agent avatars, the humanoid was rated to display the most realistic behaviour, followed by the unanimated and less so with regards to the animated avatar. Participants thought that the virtual bank branch itself was more realistic during interactions with the humanoid avatar and less so with the animated followed by the unanimated avatar. This finding is particularly interesting since the appearance of the virtual bank branch did not change throughout their exposures and so would suggest that the avatar had an affect on participants overall perceptions of their interactions. This will also be discussed at a later point in this chapter. Overall, participants found the appearance of the humanoid avatar to be the most visually appealing, followed by the animated avatar, with the unanimated avatar rated as the most visually unappealing. Whilst participants did not find any of the financial tasks to be unrealistic within the real-life context, tasks were rated to be the most realistic during interactions with the humanoid avatar, followed by the animated avatar and less so with the unanimated avatar. Interactions with the humanoid avatar were also rated as the most personal and least so during interactions with the unanimated avatar. Participants reported experiencing the greatest sense of presence within the virtual world during interactions with the humanoid avatar with the lowest levels experienced during interactions with the unanimated avatar. Finally,

participants rated the humanoid avatar as being the most intelligent, followed by the animated avatar, with the unanimated avatar being rated less positively.

Recalling hypothesis E which relates to the appearance of the financial agent avatars:

<b>H<sub>0E</sub>:</b>	<b>There will be no preference for the appearance of the financial agent avatars.</b>
<b>H<sub>1E</sub>:</b>	<b>There will be a preference for the appearance of the financial agent avatars.</b>

There is evidence here to support rejection of the null hypothesis since there is a significant difference between the financial agent avatars' appearance that participants preferred the most in both the Second Life ( $p < 0.01$ ) task context and the real-life task context ( $p < 0.05$ ). In both task context scenarios, the appearance of the humanoid avatar was preferred above both the animated and unanimated avatars.

There were also a number of significant within-subject effects and interactions of age group, gender and version order along the social presence attributes. In many cases, the 18-34 year age groups experienced higher levels of social presence during interactions with the financial agent avatars than the 35+ year age group, as will be discussed later in this chapter (see Appendix 8 for full social presence attribute analysis).

### 3.5.3 Hypotheses relating to Social Presence

Recalling hypothesis C relating to the perceived levels of social presence experienced during interactions with each of the financial agent avatars:

<b>H<sub>0C</sub>:</b>	<b>There will be no significant differences between the perceived levels of social presence experienced during interactions with each of the financial agent avatars.</b>
<b>H<sub>1C</sub>:</b>	<b>There will be significant differences between the perceived levels of</b>



	<b>social presence experienced during interactions with each of the financial agent avatars.</b>
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Sufficient evidence exists to reject the null hypothesis as significant differences were found between the three different financial agent avatars on many of the social presence attributes, as well as a significantly higher mean social presence score for the humanoid financial agent avatar.

**3.6 Further Analysis**

Separate analysis was conducted to assess levels of usability and levels of perceived social presence experienced during interactions with each of the avatars to provide a more in-depth and accurate study of customer attitudes. Throughout analysis of a number of the attributes, usability levels as well as perceived social presence appears to be greater during real-life task interactions than in Second Life task interactions. Analysis of within-subjects effects as well as pairwise comparisons show however, that the overall effect of task context on usability levels is not significant ( $p>0.05$ ).

Recalling hypothesis B relating to differences between the usability within the two financial enquiry contexts:

<b>H<sub>0B</sub>:</b>	<b>There will be no significant differences between the overall usability for the two financial enquiry contexts.</b>
<b>H<sub>1B</sub>:</b>	<b>There will be significant differences between the overall usability for the two financial enquiry contexts.</b>

Whilst slight differences in mean usability levels between the two task contexts may occur when looking at the differences between the usability attributes, the null hypothesis cannot be disregarded in this case to suggest a significant effect for task context on the overall levels of usability experienced.

Analysis of within-subjects effects as well as pairwise comparisons also show that overall, the effect of task context on levels of perceived social presence experienced is not significant ( $p>0.05$ ).

Recalling hypothesis D relating to differences between the perceived social presence experienced within the two financial enquiry contexts:

<b>H<sub>0D</sub>:</b>	<b>There will be no significant differences between the overall perceived levels of social presence experienced for the two financial enquiry contexts.</b>
<b>H<sub>1D</sub>:</b>	<b>There will be significant differences between the overall perceived levels of social presence experienced for the two financial enquiry contexts.</b>

Whilst slight differences in mean social presence levels between the two task contexts may occur when looking at the differences between the social presence attributes, the null hypothesis cannot be disregarded in this case to suggest a significant effect for task context on the overall levels of social presence experienced.

Throughout analysis of both usability and social presence attributes there was significant effects for version order, that is, the order to which participants were exposed to the financial advisor avatars. Whilst this is a possible area for further research, these findings were not explored more fully as they are not of particular relevance to the objectives of this experiment.

### **3.7 Exit Questionnaire**

The exit interview allows participants to express their views more fully and help explain their preferences. Within the exit interview, the majority of participants stated that they had no previous knowledge of Second Life and no experience of using it prior to the induction stage of the experiment.

The results from this experiment show that participants had a clear preference for interacting with the humanoid financial agent avatar over both the animated and unanimated financial agent avatars. When explaining their preference for the humanoid avatar, participants offered comments such as *“It was more realistic, you put more trust in her”*, *“It seemed much more like I was interacting with a real person”* and *“I knew straight away it was who I had to speak to”*. These comments suggest that when dealing with financial matters, participants preferred to interact with a more realistic avatar and felt that it offered a more credible and engaging interactive experience than both the animated and unanimated financial agent avatars. Although all participants involved within the experiment were given an induction session to familiarise them with Second Life and its functions, as well as being given instructions for use within the Second Life Journal, this virtual environment still remains a novel area for even more experienced Internet users. The human-like appearance of the humanoid financial agent avatar therefore offered participants a sense of realism when dealing with finances in this often, surreal environment.

In a number of the task scenarios, the experiment results suggest that participants also favoured interactions with the animated financial agent avatar. Comments such as *“It*

*was quite funny. Interesting to interact with*”, *“It was friendly and had eyes and it was easy to see that it was a financial advisor because of the coins”* and *“It stood out, you could see it was coins and it came towards you”* were offered. Since this avatar was in the form of an animated stack of coins, it can therefore be seen that participants felt that this offered a sometimes more interesting interactive experience and the fact that the coin animations were clear was in-keeping with a monetary theme. Reference to this avatar possessing human-like features such as eyes would suggest that within the banking scenario, participants felt more comfortable when interacting with avatars with higher levels of anthropomorphism. This appears to be the case in terms of both human-like features as well as human-like behaviour since this particular avatar also approached participants upon entry to the virtual bank branch in the same way as the humanoid avatar.

Despite finding interactions with the animated financial agent avatar amusing or interesting in a number of cases however, participants also stated a number of dislikes concerning its behaviour and appearance. A number of comments such as *“It wasn't appealing for a bank because it was 'cartoony' and money is serious”*, *“I thought it was strange, it was like talking to a robot. I felt a bit uncomfortable”*, *“I didn't like it. It seemed like it was leaning over me which was intimidating”* and *“It made it seem more like a game rather than being in a branch. It stared at you and it wouldn't be as effective if you were dealing with your own money. It doesn't feel as reliable”*. The animated financial agent avatar displayed the same behaviour as the humanoid avatar during interactions with each of the participants within both financial task contexts. This would therefore suggest that references towards the animated financial agent avatar such as *“...doesn't feel as reliable”* and *“...intimidating”* are based upon its

appearance alone. It is again interesting to note that since the appearance of this avatar was more cartoon-like, participants did not feel that it displayed a serious enough image which appears to be preferable when carrying out any form of financial based task.

Overall, the results from this experiment show that the unanimated financial agent was the least preferable amongst the participants. Comments from participants concerning this avatar included *“I wasn't sure whether it was an avatar at first. I thought it was an object obstructing the avatar”*, *“It was very impersonal. It didn't make me want to talk about my finances”*, *“I didn't like the fact that it didn't have any personality at all. It had no face”* and *“There was no focus, so it was difficult to interact with”*. The animated financial agent avatar displayed the lowest level of anthropomorphism in terms of both its' appearance and behaviour. From these comments it is clear that when carrying out financial tasks within Second Life, participants reacted negatively to a lack of human-like features and as a result found their overall interactions less personal and more difficult. Again, it is evident that when dealing with finances, participants preferred an increased sense of realism within the task scenarios.

The reaction towards carrying out real-life financial tasks within Second Life was mixed amongst participants. Positive comments included *“I thought carrying out the real-life tasks was good, it was very quick and there were no queues. They also came to you, so it was good”*, *“At first I was unsure and wary but as I went on, I got used to it and got more comfortable”*, *“It seemed quite realistic and reliable”* and *“...It is good though for people who like computer games”*. These comments suggest that

when carrying out financial tasks that related to real-life scenarios, participants felt that if such a service was available within Second Life, it may be beneficial to regular users of the online virtual environment. Negative comments towards carrying out real-life financial tasks within Second Life included *“I am not sure how accurate and reliable it would be, or how secure. Could everyone see the interaction?”*, *“It didn't seem real. It's quite a scary thing Second Life”* and *“It would be easy to get confused”*. Although participants were informed that by using the IM mechanism within Second Life as well as being given a security access code to gain entry to the branch and being asked for digits from their security number within the task scenario, with Second Life again being such an unfamiliar environment, there were still reservations as to the level of security provided.

It was also of importance to gain a more in-depth insight into participants' opinions of the virtual bank branch itself since the branch itself was designed to offer a futuristic experience in keeping with Second Life itself, but at the same time to incorporate elements from a traditional real-world branch. Positive comments concerning the virtual bank branch included *“It was good, it was realistic. It didn't look like a conventional bank I guess, it was futuristic”*, *“It met my expectations of a virtual world and of what should be in a virtual world”* and *“It was surprising how used to it I got. It was obvious I was dealing with someone else on the end. It was a little bit intimidating at first, but it is an alternative to a website”*. A number of comments given by participants suggested that the design of the branch mirrored the futuristic feel of Second Life and was functional in terms of usage, however increased familiarity with Second Life itself could increase their enjoyment and ease of use when carrying out financial tasks in-world.

Negative comments concerning the virtual bank branch included *“I didn't think it looked like a bank branch if that makes sense. The big bright light when you walked in wasn't particularly realistic”*, *“It was scary. Going in there as an elderly person, all I have is 'drawings' all around me. It's ok for young folk”*, *“It was quite bare and very cold. It was too futuristic and lacked warmth”* and *“I didn't think it was that realistic from the point of view there didn't seem to be any customers which is different to a normal branch”*. Such comments suggest that although Second Life on the whole is futuristic and surreal, within a financial scenario, participants would feel more comfortable interacting within an environment that mirrored a real-world bank branch. Older participants also indicated on a number of occasions that this form of technology would prove problematic for them in terms of carrying out financial tasks whilst more regular Internet users and younger participants were more positive in their attitudes towards this technology on the whole. The Bank's branding was not used within the virtual bank branch at this stage as the focus of this experiment was predominantly on their interactions with the three financial agent avatars and further stimuli in the form of branding may have influenced participant attitudes. A number of participants stated that they would have found the scenario more enjoyable if the financial advisor avatars had operated from behind the desk within the virtual bank branch, which further suggests a preference for real world “norms” and practices even within a virtual environment.

Participants were also asked for feedback on the usefulness of the Second Life Journal they were given at the induction stage of the experiment. A number of participants commented that they had difficulty setting up a Second Life account giving comments

such as “*When I came in before, I was excited to have a go after my introduction, but my computer at home kept crashing*”. Such comments indicate the limitations of the technology itself however. Comments concerning the Second Life Journal itself included “*I did find it helpful with the basic walking etc. Once you realise what you are doing with the chat it was fun. Some things were hard though because I must admit I've never done anything like it*”, “*Everything in the Journal was straight forward and useful. Even today as the tasks go on, it feels more like second nature*”, “*It was helpful, I talked to lots of people when they were around and got used to the controls*” and “*...if I had come in raw, I would have been all over the place. Forewarned is forearmed*”. This feedback suggests that the Second Life Journal was an important factor in helping participants navigate around and become accustomed to Second Life out-with the confines of the experimental setting. It also indicates that participants are likely to become more comfortable with utilising Second Life for real-world banking purposes if they were more skilled and experienced in using it.

It was also of interest to ask participants about their attitudes towards the possible benefits of Second Life and its potential uses most notably in the fields of education and socialising. In terms of education, the majority of participants stated that they did think it would be an effective tool, providing comments such as “*It would certainly provide a richer environment for educating students who are geographically very distant*”, “*Definitely. It's a good way to grab the attention of the younger generation I'd say*” and “*In this day in age, yes, for school kids, definitely for them. It's all going to go this way in the future*”. These comments show that participants did see potential in the use of Second Life for education however many viewed it as a tool which would be more beneficial for a younger, more ‘tech-savvy’ generation. Comments



concerning the potential of Second Life for socialising included; *“It’s like msn, Bebo and Facebook. I personally don’t know how to do anything with Second Life. There is definitely a focus on interaction. I think it’s quite good”*, *“It was, it was just really a fancy chat-room”* and *“I think it could, more for kids and teenagers who are into instant messaging and stuff. My generation may be more likely to think ‘what do we need that for?’”*. In general, the feedback surrounding the effectiveness of Second Life as a tool for socialising pointed towards the generational issue, in that younger participants were more likely to comment positively and whilst a number of the older participants indicated they could see the potential of Second Life for socialising, they did not feel that it was a medium that they would be interested in using. In terms of banking purposes, it could be suggested that Second Life would be better aimed at a younger generation of customers who are more likely to use virtual environments in a personal capacity.

### **3.8 Discussion and Conclusions**

This chapter has detailed the results of the first experiment in the project involving a series of three large-scale usability experiments focusing on interaction, collaboration and learning respectively within the on-line virtual world of Second Life. The first experiment, The Interaction Experiment, assesses the attitudes of The Bank’s customers towards interacting with three different financial agent avatars within the virtual bank branch in Second Life to carry out a series of tasks relating to both real-world as well as ‘in-world’ Second Life financial enquiries. Customer’s perceived level of ‘social presence’ was analysed along with the ‘immersion’ and ‘escapism’ factors derived from a five-factor model of user motivations in shared virtual environments (Yee, 2006). An objective analysis of usability engineering issues is

also provided. The theory of social presence when applied to human-computer interaction provided the basis of this analysis.

The results show that in both the Second Life task context and real-life task context scenarios, interactions with all three of the financial agent avatars were rated above neutral, indicating a good design in terms of usability. This therefore shows a clear effect of avatar appearance on the usability of interacting within the virtual bank branch within Second Life to carry out financial enquiries. The one attribute where all three avatar versions, within both financial task contexts, scored negatively was “real person preference”, showing that overall participants would prefer to interact with a human. It should be noted however, that such a design as the one employed in the current research would not be designed to replace humans, but would instead be aimed at making banking options available to a wide market who are increasingly spending more and more time logging into and navigating within virtual environments (Hedley, 2006).

The main result from the usability attribute analysis of interactions with each of the avatars in both the Second Life and real-life contexts is that overall participants preferred to interact with the humanoid financial agent avatar. This supports the hypothesis that the level of anthropomorphism (the extent to which an avatar resembles a human being) affects people’s social judgements of their interaction partners (Nowak, 2001). In both task contexts, the most significant differences occurred when comparing interactions with the humanoid and unanimated financial agent avatars. Since these avatars differed the most in terms of number of human characteristics and behavioural traits they displayed this again reinforces the

hypothesis that anthropomorphism levels affect social judgements of interaction partners. Less significant differences appeared when comparing usability levels reported during interactions with the animated and unanimated avatars (in both task contexts), further supporting the above hypothesis since these two avatars were more similar in appearance.

Further analysis showed that task context had no significant effect upon overall usability during interactions with the financial agent avatars. Although, in general, mean scores show that in many cases participants rated more positively during interactions with each of the avatars when carrying out real life tasks than when carrying out Second Life tasks. This could be attributed to the fact that Second Life and indeed virtual worlds on the whole, are a very new concept for many people and the participants found the scenarios to be of more relevance when carrying out real-life financial tasks rather than utilising Second Life for only “in-world purposes”. Despite more significant differences also occurring between social presence attributes within the real-life task context than in the Second Life task context, there was also no significant effect overall for task context on perceived levels of social presence.

Of great importance within any financial enquiry or transaction, and increasingly in a novel environment such as Second Life, is how reliable customers believe the information they are receiving to be. Within the Second Life and real-life task contexts, participants reported finding the information supplied by the humanoid avatar to be the most reliable, whilst information given to them by both the animated and unanimated avatars was perceived as less so. This finding supports the hypothesis

that androgynous avatars are perceived as less trustworthy than ones that are clearly either male or female (Nowak and Rauh, 2007).

Within the real-life financial task context, participants reported finding it more difficult to interact within the virtual world, on the whole, during interactions with the unanimated avatar and the least difficult during interactions with the humanoid avatar. The humanoid avatar provided a more interactive and responsive experience to participants, greeting them upon entry to the virtual branch and manoeuvring during the interaction, whilst the unanimated avatar remained stationary throughout. The more realistic behaviour displayed by the humanoid avatar, combined with its appearance may explain why participants found it easier to interact within the virtual world than when interacting with the unanimated avatar.

In terms of the usability attributes “efficient”, “engaging”, “satisfying” and “enjoyment of interaction”, participants rated interactions with the humanoid avatar more highly than with the animated and unanimated avatars in both task contexts. The humanoid avatar was also rated as being more polite than both the animated and unanimated avatars, which both supports the anthropomorphism hypothesis as well as the Computers As Social Actors paradigm (CASA, Reeves & Nass, 1996).

Participants further rated on “financial advisor appearance”, in terms of whether or not the appearance of the financial agent avatar distracted them from carrying out their financial tasks. Within the Second Life task context, participants reported being most distracted by the appearance of the animated avatar whilst in the real-life context they were most distracted overall by the appearance of the unanimated avatar. The

appearance of the humanoid avatar was rated positively overall, and the results show that it was found to be the most aesthetically pleasing and did not provide any particular distractions in both the Second Life task context ( $p < 0.01$ ) and real-life task context ( $p < 0.05$ ).

The results of the SVE Social Presence Perception Scale show that the overall levels of perceived social presence were greatest during interactions with the humanoid avatar. There are a greater number of significant differences in the levels of perceived social presence experienced in the real life task interactions than in the Second Life task interactions. This could be explained again, as the real-life task context would have provided a greater sense of relevance and meaning to participants, as the majority were not regular “gamers” or experienced in interacting within virtual worlds and therefore not accustomed to the ‘fantasy’ element that is a dominant theme in many of the existing virtual worlds.

When comparing the overall social presence scores between the humanoid and unanimated avatars within the Second Life task context, a number of significant differences can be seen. Whilst participants did not particularly dislike interacting within the virtual world, their level of enjoyment was significantly higher during interactions with the humanoid avatar than with animated avatar ( $p < 0.01$ ). The other significant difference of importance when comparing these two avatars within this task context can be seen in the analysis of the social presence attribute “financial advisor visually unappealing”. Participants reported finding the humanoid avatar significantly more appealing than the animated avatar ( $p < 0.01$ ).

The overall social presence scores between the humanoid and unanimated avatars within the Second Life task context also reveal significant differences. Interestingly, participants reported to feeling significantly more alone within the virtual world during interactions with unanimated avatar than during interactions with the humanoid avatar, with which they rated positively on this attribute “alone in virtual world” ( $p < 0.01$ ). This would suggest that participants feel a greater level of social presence during interactions with the humanoid avatar that displayed more human-like behaviour as well as features than the unanimated avatar. This brings to attention one of the dominant themes of social presence, being that user’s sense that there are other social entities co-situated within some interpersonal environment appear to be greatest in interactions with the humanoid avatar. Throughout interactions with the financial agent avatars, and particularly during interactions with the humanoid financial agent avatar, participants appeared to adhere to real-world ‘norms’ concerning spatial awareness in terms of the distance to which they positioned their own avatars when carrying out enquiries. This again emphasises the idea that participants did experience a level of social presence during interactions. There was also a significant difference between attitudes towards the appearance of these two avatars with the humanoid avatar being rated as more visually appealing than the unanimated avatar ( $p < 0.01$ ). Further to this, participants reported feeling more “uneasy” interacting with the unanimated avatar than the humanoid avatar ( $p < 0.05$ ). Within the Second Life task context, there were no significant differences between the animated and unanimated avatars.

Overall social presence scores between the humanoid and animated avatars within the real-life context also show a number of significant differences. Participants reported

feeling more as though other people were present with them within the virtual world during interactions with the humanoid avatar than with the animated avatar ( $p < 0.05$ ). Since the behaviour of these two avatars was the same, this would suggest that avatar appearance had an effect on the extent to which others appeared to be real (that is, a user's sense that they are interacting with a person instead of an agent or some other social entity). Participants also reported feeling significantly more alone within the virtual world during interactions with the animated avatar than during interactions with the humanoid avatar within the real-life task context ( $p < 0.05$ ). A further significant difference was seen in that overall, participants felt that they were interacting with a real person during interactions with the humanoid avatar, whilst interactions with the animated avatar were viewed negatively within this category ( $p < 0.01$ ). This again provides support for the CASA paradigm (Reeves & Nass, 1996). Within this task context, participants also found the animated avatar significantly more visually unappealing than the humanoid avatar ( $p < 0.01$ ). The final significant difference in the comparison of these two avatars can be seen in that participants felt more at ease when interacting with the humanoid avatar than with the animated avatar ( $p < 0.05$ ).

Of all the comparisons between the financial agent avatars, the greatest numbers of significant differences appear between the humanoid and unanimated avatars within the real-life task context. Participants reported higher levels of enjoyment when interacting within the virtual world during interactions with the humanoid avatar ( $p < 0.05$ ). Levels of enjoyment of the role-play aspect of interacting with the financial agent avatar were significantly greater with the humanoid avatar than with the unanimated avatar ( $p < 0.05$ ). Participants were significantly less likely to feel that

their own avatar had its own life story during interactions with the unanimated avatar than the humanoid avatar ( $p < 0.05$ ). Although participants did not generally attach such meaning to their avatars, this finding suggests that the interaction partner had an effect upon how participants viewed their own avatar. This attribute was included based upon the assertion that users of online environments may associate their avatars with having their own histories (Yee, 2006). Participants also enjoyed the escapism element of the virtual world significantly more during real-life task interactions with the humanoid avatar than with the unanimated avatar ( $p < 0.01$ ).

Participants also felt more so that other people were present with them within the virtual world during interactions with the humanoid avatar than with the unanimated avatar within the real-life task context ( $p < 0.01$ ). Interestingly, participants reported feeling more as though other avatars were present with them within the virtual world during interactions with the unanimated avatar than with the humanoid avatar ( $p < 0.05$ ). This again brings the theory of social presence to the forefront and suggests that participants were more likely to experience higher levels of social presence during interactions with the humanoid avatar in that other people were with them within the virtual world, as opposed to simply viewing them as other avatars. Overall, participants felt as though they were interacting with a real person during interactions with the humanoid avatar than during interactions with the unanimated avatar ( $p < 0.05$ ). On a similar vein, participants reported feeling more as though they were interacting with an automated machine during real-life task interactions with the unanimated avatar than with the humanoid avatar ( $p < 0.05$ ).



Real-life task interactions with the humanoid avatar were rated as being significantly more personal than with the unanimated avatar ( $p < 0.05$ ). This suggests that participants found scenarios where the financial agent avatar approached them and interacted with them on an increasing level within the virtual bank branch as opposed to the stationary avatar with no animation. Finally, participants reported feeling significantly more present within the virtual world when carrying out real-life task interactions with the humanoid avatar than with the unanimated avatar ( $p < 0.05$ ).

When comparing social presence scores of the animated avatar against the unanimated avatar within the real-life task context, a small number of significant differences are present. Firstly, participants felt that other avatars were present within the virtual world to a greater extent during interactions with the unanimated avatar than during interactions with the animated avatar ( $p < 0.05$ ). The unanimated avatar displayed lower levels of anthropomorphism than the animated avatar in terms of behaviour and appearance which could therefore explain participants' perception of other avatars being present with them within the virtual world, as opposed to feeling other people were present with them. Participants reported feeling more alone within the virtual world during interactions with the unanimated avatar than during interactions with the animated avatar ( $p < 0.05$ ), suggesting that the human-like behaviour and appearance of the financial advisor avatar affords participants a greater perceived level of social presence. Participants also felt less like they were interacting with an automated machine during interactions with the animated avatar than during interactions with the unanimated avatar with the real-life task context ( $p < 0.05$ ). Finally, participants reported finding the financial task less realistic when carrying out real-life tasks with the unanimated avatar and more realistic during interactions with the animated avatar.

This is of importance since this would suggest that increased levels of anthropomorphism afford higher levels of credibility and trust to customers when utilising a virtual world to carry out financial tasks.

As previously mentioned, all participants took part in a one-hour induction session to Second Life in order to ensure, as much as possible, that all participants were at a similar level of competence when returning to take part in The Interaction Experiment. This was done to allow participants to become accustomed to this particular virtual environment, as at this stage in the infancy of virtual worlds, it would be difficult to achieve a demographic of experienced Second Life users. Feedback from the Second Life Journal as well as the exit interview suggest that older participants experienced more difficulties, firstly setting up and installing Second Life in their home computers, as well as subsequently interacting within it. Results from the usability and social presence attribute analyses also show a significant effect for age. In many cases the 18-34 year age group experienced higher levels of both usability and social presence during interactions with the financial agent avatars than the 35 and over age group. This would suggest an increased acceptance as well as higher levels of experience in the use of technology amongst the younger age group. This finding supports research that shows 18-34 year olds (predominantly male) to be the most frequent users of computer games (Hedley, 2006). Although in many cases, Second Life is not considered a 'game' as such due to its persistent and collaborative nature.

Since there are no overall significant differences for the levels of usability and social presence experienced by customers between both the Second life and real-life task

scenarios, this would suggest that Second Life could act as an effective User Interface Metaphor for the provision of real-world financial services.

The SVE Social Presence Perception Scale will be further developed to build upon the immersion and escapism elements from the five-factor model of user motivations (Yee, 2006). The achievement, relationship and manipulation factors will be incorporated to provide a more in-depth analysis of the attitudes of The Bank's customers towards interacting within the virtual bank branch in Second Life to carry out real-world financial tasks. The virtual bank branch within Second Life will also be modified to take into account customer preferences, in that even although Second Life contains many surreal features, when dealing with finances, participants on the whole stated a preference for a more "realistic" bank branch. Incorporation of The Bank's branding within the virtual bank branch would be an element of consideration to build trust with customers in terms of utilising Second Life for financial means. Further experiments will include the humanoid financial agent avatar, as shown within this experiment to prove the most effective in terms of usability and the levels of social presence that it affords.

### **3.9 Summary**

This chapter details the results from an experiment assessing the attitudes of customers of the case bank towards interacting with three different financial agent avatars within the virtual bank branch in Second Life to carry out tasks relating to both real-world as well as 'in-world' financial enquiries. The three avatars involved in this experiment differed in levels of anthropomorphism, that is, the extent to which the avatar resembled a human being (unanimated, animated and humanoid). The SVE

Social Presence Perception Scale was developed to analyse customer's perceived level of social presence, also incorporating the 'immersion' and 'escapism' factors derived from a five-factor model of user motivations in shared virtual environments. An objective analysis of usability engineering issues was also provided. Customers preferred interacting with the humanoid financial agent avatar, supporting the hypothesis that the level of anthropomorphism affects peoples' social judgements of their interaction partners (Nowak, 2001). Levels of perceived social presence and usability were highest during interactions with the humanoid avatar. Results also showed that participants found the information given to them by the humanoid avatar during interactions to be the most reliable, which is of great importance when carrying out any form of financial enquiry and particularly within an environment such as Second Life which may be novel to many users. This finding supports previous research that suggests that androgynous avatars are perceived as less trustworthy than ones that can be clearly identified as either male or female (Nowak & Rauh, 2007).

This experiment attempts to lay the foundation for providing the most enjoyable and immersive experience for customers when interacting within the virtual bank branch in Second Life. The Interaction Experiment assessed attitudes towards the financial avatar itself before looking to assess further behaviours within the virtual bank branch. Having established that Second Life can be used effectively to carry out real-world financial tasks and that a more realistic appearance of the avatars and the virtual bank branch itself are preferable, it is now possible to progress to assess collaborative behaviours within this context.

## Chapter 4

## ***The Collaboration Experiment: The Effect of Communication Medium on Usability and Perceived Social Presence when Collaborating on financial tasks in Second Life***

### ***4.1 Introduction***

This chapter discusses the results of an empirical evaluation assessing customer attitudes towards collaborating with other customers on financial-based tasks within the virtual bank branch in Second Life through two communication mediums - text messaging and voice (VoIP). Customer's perceived level of 'social presence' was analysed along with the 'immersion', 'escapism', 'relationship', 'achievement' and 'manipulation' factors derived from a five-factor model of user motivations in shared virtual environments (Yee, 2006). An objective analysis of usability engineering issues is also provided.

With the introduction of voice communication in Second Life, it was of importance to assess if communication medium had an effect on customers' attitudes towards using Second Life for financial purposes. Whilst text messaging is still the dominant mode of communication within Second Life, voice can in many cases offer a more immediate response from interaction partners which may in turn affect attitudes towards collaborating within the virtual bank branch. One such metric is designed and investigated here. The Collaboration Experiment builds upon the findings from the previous Interaction Experiment to provide a platform for the development of a valid and reliable metric for the assessment of attitudes towards collaboration within Second Life. This metric has specific practical relevance to the financial services sector.

All of the five factors of user motivation were incorporated within the SVE Social Perception Scale metric presented in this chapter as they were all relevant to the collaborative nature of the scenario.

## **4.2 *Second Life Bank Branch Used in the Research***

The shared virtual environment of Second Life is employed as the basis of this experiment, and provided the arena in which participants collaborated with their (experiment) partner to alter the appearance of financial agent avatars and choose the features of a credit card. The virtual bank branch within Second Life was modified accordingly to take into account usability and customer preferences expressed in The Interaction Experiment. Participant feedback indicated that even in an environment where surreal designs are commonplace, when dealing with finances, a more realistic and traditional layout is preferable (see Figure 4.1). Since the findings of the Interaction Experiment also showed that humanoid avatars were preferable when carrying out financial tasks within the virtual bank branch, both a ‘male’ and ‘female’ avatar were used (see Figures 4.2 and 4.3). Since part of the task was to alter the appearance of the financial agent avatar, the clothing on each of the avatars was set to resemble a basic professional appearance since participants had indicated this to be preferable in the previous experiment. The case bank’s logo and style of furnishings were used in the design of the new virtual bank branch in order to add a sense of realism and authenticity to customer’s interactions. Participants’ avatars were positioned in the starting area outside the virtual bank branch at the beginning of each collaborative interaction (see Figure 4.4). They were then instructed to enter the virtual bank branch and navigate their avatars towards the ‘advisor appearance area’ to meet their partner and begin the task (see Figure 4.5). In The Interaction

Experiment, participants were issued with a security access code during each exposure to the virtual branch, and only after entering this code were they granted access. Whilst this would perhaps increase participants' sense of security, since they were not regular users of Second Life it was important to minimise any tasks prior to their interaction within this experiment and not overwhelm them. A security access code was therefore not used in the following experiments. Only participants' avatars (as well as the financial agent avatars) could access the virtual bank branch within Second Life since it is on a privately 'owned' area of land. When participants had collaborated to decide upon the appearance of the financial advisor they then 'activated' the financial advisor who then led them to the credit card selection area (see Figure 4.6). Participants carried out this advisor appearance task twice, once in the text condition and once in the voice condition.



**Figure 4.1: Virtual Bank Branch Interior**

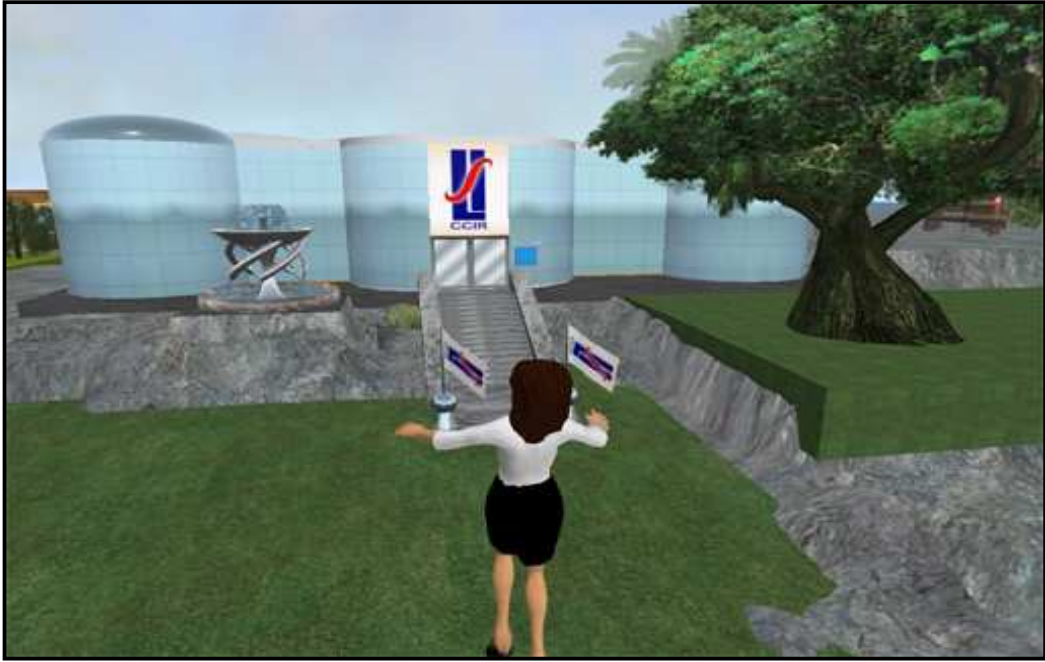




**Figure 1.2: Male Financial Agent Avatar**



**Figure 4.3: Female Financial Agent Avatar**



**Figure 4.4: Virtual Bank Branch Exterior**



**Figure 4.5: Change Advisor Appearance Area**



**Figure 4.6: Credit Card Selection Area**

### ***4.3 Experiment Design and Procedure***

In this Collaboration Experiment there were two manipulated variables: - the collaboration medium (instant text messaging and voice) and financial agent gender (male and female). A full-factorial experiment design was employed, Table 4.1:

**T** = instant text messaging condition

**V**= voice messaging condition

**M**= male financial agent avatar

**F**= female financial agent avatar

<b>Order 1</b>	<b>T, M (1)</b>	<b>V, F (2)</b>
<b>Order 2</b>	<b>V, M (2)</b>	<b>T, F (1)</b>
<b>Order 3</b>	<b>T, F (1)</b>	<b>V, M (2)</b>
<b>Order 4</b>	<b>V, F (2)</b>	<b>T, M (1)</b>

**Table 4.1: Full Factorial Design**

In table 4.1, numbers **1** and **2** correspond to the details on the task sheets handed to the participants. Details were varied on the task sheets to ensure they differed for each exposure, resulting in four possible orders of exposure.

Two participants collaborated with one another to carry out two sets of tasks within the virtual bank branch, at the same time interacting with a humanoid financial agent avatar. Each pair of participants was balanced in terms of age group and gender to ensure the richest set of results possible. The two tasks were as follows:

1. In the first task participants were asked to discuss how they would both want a financial agent avatar to look in a virtual bank branch setting within Second Life. Prior to the task, they were given a list of the features that could be altered (see Table 4.2) and were asked to discuss and come to an agreement on each of them in the order that they appeared. This was carried out in the assigned ‘Advisor Appearance’ section of the branch and whilst they were carrying out their discussion the confederate researcher controlling the financial agent avatar was altering the appearance as they progressed through the categories. When they came to the end of the features list, participants ‘activated’ the financial agent avatar to continue with their financial task.

<b>Feature</b>	<b>Sub-categories</b>
Shirt	Colour
Trouser	Colour
Skirt	Length Colour
Hair	Style Colour
Shoes	Platform Heel Colour

**Table 4.2: Changeable Financial Advisor Features**

2. In the second task, participants again collaborated with each other to agree on a list of features for a credit card for an on-line organisation / club that “they both belonged to”. Prior to the task, participants were given a profile of an organisation that they both belonged to which provided the basis for their collaborative interaction. During this collaboration, participants also interacted with the financial agent avatar that guided them through the process. The credit card features and images were displayed on a screen (see Figure 4.6) within the virtual bank branch, with the slides being controlled by the financial agent avatar. Once participants had discussed and decided on the best option for their organisation with their collaboration partner, they informed the advisor of the number (one, two or three) which they agreed upon and the financial agent advisor moved on to the next category (see Appendix 9 for example of participant task sheet).

The financial agent avatars were again controlled by hidden researchers (male or female as required) situated in a separate area of the research centre. Participants avatars were situated in the 'starting area' outside the virtual bank branch in Second Life at the beginning of each interaction with an aim to achieving as uniform an experience as possible. Participants were instructed to enter the virtual bank branch and go to the 'Advisor Appearance' area where they would meet and introduce themselves to their partner and begin the first part of the task. To ensure security, only participants' avatars (as well as financial agent avatars) had access to the virtual bank branch. When participants had completed the first task, they then 'activated' the financial agent avatar who would then guide them through the second task. Once these were completed, participants were instructed to exit the virtual bank branch. The confederate researchers controlling the avatars followed a basic script to ensure, as far as possible, uniform interactions (see Appendix 10 for Confederate Script outline). After each interaction participants completed a usability questionnaire regarding their attitude towards the collaboration as well as a SVE Social Presence Perception questionnaire, to assess how socially present they felt during the interaction. This was done twice, once following collaboration in the text condition and once in the voice condition. At the end of the session participants took part in an exit interview to gain a more qualitative insight into their attitudes towards their collaborations in both the text and voice conditions within the virtual bank branch as their overall experience of utilising Second Life for financial purposes.

A cohort of 64 customers of the case bank was recruited for the experiment. Participants were recruited from a database of customers of the bank who had given prior consent to being contacted to take part in studies. Participants were given an

honorarium of £30 as a thank you for taking part. The participants were balanced for gender and age (male and female; and two age groups: ages 18-34 and 35 and over, see Table 4.3). Gender biases and preferences were investigated as well as the attitudes and preferences of different age groups. These age groups were based on findings showing that 18-34 year olds make up the main demographic within the gaming industry and are likely to be more technologically driven (Jupiter Communications, 1999).

<b>Participants</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
Age 18 – 34	16	16	32
Age 35 and over	16	16	32
Total	32	32	64

**Table 4.3: Participants by Gender and by Age Group**

The procedure consisted of a set of clear tasks. Participants were told that they would be using Second Life to collaborate with another customer of the Bank logged in somewhere else in Edinburgh to edit the appearance of a financial agent avatar and choose the features of a credit card for an online forum that they had both created. Participants were seated in front of a desktop monitor screen and given their first task sheet containing a list of the characteristics of the financial agent avatar's appearance that they could alter. Once completed, the researcher placed the second task sheet in front of them that contained details of the online forum that they had created in conjunction with their partner. The same task sheet was given to both participants with the needs of the forum to encourage collaboration as much as possible. Once the first task was finished the financial agent asked (through either typed text or voice) how they could help the participants and at this point proceeded on to the second part

of the collaboration. When the set of tasks was completed, the financial agent thanked the participant for using the virtual bank branch and informed them that their credit card with their chosen features would be sent out to them in the following few working days. The participant was then instructed to exit the virtual branch in the same way that they entered.

After each set of collaborations participants were asked to complete a usability questionnaire relating to the scenario and a questionnaire to assess the perceived level of social presence experienced during the collaboration. The usability questionnaire items were 7-point Likert attitudinal statements presented randomly via a laptop (see Appendix 11 for usability questionnaire). The social presence questionnaire items were 7-point Likert scale statements also presented randomly via laptop (see Appendix 12 for SVE Social Presence Perception Scale). In all questionnaires, statements were balanced for polarity (equal number of positively and negatively worded statements). After participants had experienced both of the communication mediums they were asked open-ended questions (see Appendix 13) on their opinions regarding their collaborations with their partner, as well as the financial agent in both the text and voice conditions.

The experiment was developed to examine the following hypotheses:

<b>H<sub>0A</sub>:</b>	<b>There will be no significant differences between attitudes towards collaboration through the two communication mediums (text and voice) (Usability)</b>
<b>H<sub>1A</sub>:</b>	<b>There will be significant differences between attitudes towards collaboration through the two communication mediums (text and voice)</b>
<b>H<sub>0B</sub>:</b>	<b>There will be no significant preference shown towards one gender for the financial agent avatar (Usability)</b>



<b>H<sub>1B</sub>:</b>	<b>There will be a significant preference shown towards one gender for the financial agent avatar</b>
<b>H<sub>0C</sub>:</b>	<b>There will be no significant differences between the perceived levels of social presence experienced when collaborating through the two mediums (text and voice) (SVE Social Presence Perception Scale)</b>
<b>H<sub>1C</sub>:</b>	<b>There will be significant differences between the perceived levels of social presence experienced when collaborating through the two mediums (text and voice)</b>
<b>H<sub>0D</sub>:</b>	<b>There will be no significant differences in attitudes towards collaboration partners when communicating through the two mediums (SVE Social Presence Perception Scale)</b>
<b>H<sub>1D</sub>:</b>	<b>There will be significant differences in attitudes towards collaboration partners when communicating through the two mediums</b>

**Table 4.4: The Alternative and Null Hypotheses**

### **4.3.1 Usability Questionnaire Design**

An established usability questionnaire again provided the basis to assess the contributions to usability made by a set of key attributes. It uses a 7-point scale on which participants indicate the extent to which they agree or disagree with statements that relate to each key usability attribute. The usability questionnaire employed in this experiment consists of 27 statements that will allow for an overall measurement of the usability for each of the designs; in turn this measurement will act as a predictor of customer behaviour (See Appendix 11 for the fully formatted usability questionnaire, for a summary see Table 4.5).

<b>Usability Questionnaire Statements</b>	
<b>Cognitive</b>	I thought that collaborating with my partner was confusing.
	I had to concentrate hard when collaborating with my partner.
	I got flustered when collaborating with my partner.
	I felt under stress whilst collaborating with my partner.
<b>Fluency</b>	I thought collaborating within the virtual world was complicated.
	I felt frustrated when collaborating with my partner.
	I felt in control when collaborating within the virtual world.
	I thought the financial advisor was competent in supplying the necessary information.
	I felt that collaborating with my partner took too long.
<b>Transparency</b>	I found it difficult to collaborate within the virtual world.
	I thought that my partner communicated clearly.
	I understood the information the financial advisor gave me during the interaction.
<b>Quality</b>	I would be happy to collaborate with my partner again.
	The virtual world was suited to the financial task.
	I think the information supplied during the collaboration was reliable.
	My partner helped me feel engaged within the virtual world.
	I thought that the collaboration with my partner was efficient.
	I found the collaboration with my partner satisfying.
<b>Engagement</b>	I thought that my partner was friendly.
	I thought the financial advisor was friendly.
	I disliked communicating with my partner.
	I would be happy to use the virtual world again.
	I disliked collaborating with my partner.
	I disliked interacting with the financial advisor.
	I thought my partner was polite.
	I felt intimidated by my partner.
I would prefer to interact with real people.	

**Table 4.5: Usability Questionnaire Summary**

In this experiment, the focus was on assessing levels of usability when participants were collaborating with their partner. The usability questionnaire was then adapted from that used in the Interaction Experiment to focus specifically on this aspect. There were a number of questions included pertaining to interactions with the financial advisor. These were included to take into account attitudes towards customer service in both the text and voice conditions and whether the mode of communication had any effect.

### **4.3.2 SVE Social Presence Perception Scale Design**

The Shared Virtual Environment (SVE) Social Presence Perception Scale for this research consists of 40 statements (7-point Likert scale) in which participants' rate the extent to which they agree or disagree with each statement. The SVE Social Presence Perception Scale seeks to look at customers' perceived levels of Achievement, Relationship, Immersion, Escapism, Manipulation, Social Presence and Credibility during their collaborations with their partner (and financial agent avatars) within the virtual branch in Second Life in both text and voice conditions.

For the first experiment in the study (The Interaction Experiment), only the Immersion and Escapism elements were relevant for analysis. In this second experiment in the study however (The Collaboration Experiment), all five factors of user motivation were incorporated within the SVE Social Presence Perception Scale to create a reliable and valid metric for the assessment of attitudes towards interaction and collaboration. The items used within the SVE Social Presence Perception Scale were based on items that have previously been tested for internal consistency, displaying Cronbach's coefficient alpha values above the acceptable standards of 0.70 and above. (Yee, 2006; McCroskey & Young, 1981; Short et al., 1976). These statements can therefore be interpreted as measuring the same phenomenon (Bowers & Courtright, 1984). This scale will be further developed in the final experiment in the study (The Learning Experiment).

## **Immersion**

The items from this empirical framework were used in the Interaction Experiment and adapted to have specific relevance to measuring attitudes towards collaborating to carry out financially based tasks within the virtual bank branch in Second Life.

The five statements in this group are:

- I felt as though I was actually part of the virtual world.
- I disliked collaborating in the virtual world.
- I enjoyed the role playing aspect of carrying out the financial task.
- I disliked the role playing aspect of collaborating with my partner.
- I disliked the role playing aspect of interacting with the financial advisor.

## **Escapism**

The second group of statements are specifically aimed at assessing levels of escapism experienced by participants during their collaborations with their partner within Second Life and were also included in the metric used within the Interaction Experiment. These statements were based upon items taken from the 'Escapism' items and adapted with specific relevance to the financially based collaborations within Second Life.

The three statements in this group are:

- I disliked the escapism element of the virtual world.
- Whilst collaborating within this environment I was very easily distracted.

- I was very aware of using the computer to control my avatar.

### **Relationship**

The third group of statements were aimed at assessing the extent to which participants were willing to interact with their collaboration partner and how likely they would be to form a relationship with their partner within Second Life. These statements were based upon items taken from the 'Relationship' items and adapted with specific relevance to the financially based collaborations within Second Life. The 'Relationship' factor was included at this stage in the study since the focus was on collaboration. If a participant is to form any sort of relationship with another when collaborating in Second Life through their avatars, this may have an effect on overall levels of perceived social presence.

The three statements in this group are:

- I felt that my conversations with my partner were worthwhile.
- I felt that I had nothing in common with my partner.
- I felt that my partner's opinions were important.

### **Manipulation**

The fourth group of statements are specifically aimed at assessing how likely participants would be to attempt to take control of collaborations with their partner and to what extent they felt that they and their partner contributed to the financial tasks within Second Life. Participants who score highly on the 'Manipulation' factor are more likely to enjoy dominating others within the collaborations. These statements

were based upon items taken from the 'Manipulation' items and adapted with specific relevance to the financially based collaborations within Second Life. The 'Manipulation' factor was included in the Collaboration Experiment since the focus was on interactions with a partner, it was of interest to look at the dynamic of these interactions and how personalities may play a role in the collaboration tasks.

The six statements in this group are:

- I felt like I dominated the collaboration.
- I felt that I contributed more to the task than my partner.
- I felt that my partner listened to my opinions.
- I felt that I listened to my partner's opinions before making decisions.
- I felt that my opinion had a great deal of effect on my partner's decisions.
- I felt that my partner's opinion had no effect at all upon my final decisions.

### **Achievement**

The final group of statements were specifically aimed at assessing what participants felt they had gained during collaborations with their partner and to what extent they felt in control of interactions as well as their contribution towards it. These statements were aimed at giving an insight into the social dynamics of the collaboration between the two participants. These statements were based upon items taken from the 'Achievement' items and adapted with specific relevance to the financially based collaborations within Second Life. This factor was included in the Collaboration Experiment since both of the participants had a shared goal and looking at whether or not participants were motivated by a sense of achievement was of interest.

The three statements in this group are:

- I felt in control when collaborating with my partner.
- It felt it was very important to carry out the tasks to the best of my ability.
- I felt it was very important to work with my partner to reach decisions.

### **Social Presence**

The statements within this group were adapted from the Interaction Experiment to assess collaboration within the virtual bank branch specifically.

The seventeen statements in this group are:

- I felt that other people were with me within the virtual world.
- I felt that other avatars were present within the virtual world.
- I felt all alone within the virtual world.
- I felt like I was interacting with real people.
- I felt like I was interacting with an automated machine.
- I felt that the financial advisor avatar was being controlled by another human being.
- I felt that my partner's avatar was being controlled by another human being.
- I thought the financial advisor's behaviour was realistic.
- I thought my partner's behaviour was unrealistic.
- I thought the virtual bank branch was unrealistic.
- I thought the financial task was unrealistic.
- I felt that interacting with my partner was impersonal.

- I felt uneasy collaborating with my partner.
- I felt that my partner was responsive towards me.
- I felt that the financial advisor was responsive towards me.
- I felt present within the virtual world.
- I felt personally involved in the financial task.

### **Credibility**

Although the focus in this experiment was not on the financial agent avatar in particular, it was important to assess attitudes regarding the credibility since the collaborations were taking place within a financial services context where credibility is of great importance.

The three statements in this group are:

- I thought that my partner was competent.
- I thought that the financial advisor was informed.
- I thought that the financial advisor was unreliable.

Table 4.6 provides a summary of the SVE Social Presence Perception Scale (See Appendix 12 for fully formatted questionnaire).



<b>SVE Social Presence Perception Scale</b>	
<b>Main Concepts</b>	<b>Questionnaire Statements</b>
<b>Immersion</b>	I felt as though I was actually part of the virtual world.
	I disliked collaborating in the virtual world.
	I enjoyed the role playing aspect of carrying out the financial task.
	I disliked the role playing aspect of collaborating with my partner.
	I disliked the role playing aspect of interacting with the financial advisor.
<b>Escapism</b>	I disliked the escapism element of the virtual world.
	Whilst collaborating within this environment I was very easily distracted.
	I was very aware of using the computer to control my avatar.
<b>Relationship</b>	I felt that my conversations with my partner were worthwhile.
	I felt that I had nothing in common with my partner.
	I felt that my partner's opinions were important.
<b>Manipulation</b>	I felt like I dominated the collaboration.
	I felt that I contributed more to the task than my partner.
	I felt that my partner listened to my opinions.
	I felt that I listened to my partner's opinions before making decisions.
	I felt that my opinion had a great deal of effect on my partner's decisions.
<b>Achievement</b>	I felt that my partner's opinion had no effect at all upon my final decisions.
	I felt in control when collaborating with my partner.
	It felt it was very important to carry out the tasks to the best of my ability.
<b>Social Presence</b>	I felt it was very important to work with my partner to reach decisions.
	I felt that other people were with me within the virtual world.
	I felt that other avatars were present within the virtual world.
	I felt all alone within the virtual world.
	I felt like I was interacting with real people.
	I felt like I was interacting with an automated machine.
	I felt that the financial advisor avatar was being controlled by another human being.
	I felt that my partner's avatar was being controlled by another human being.
	I thought the financial advisor's behaviour was realistic.
	I thought my partner's behaviour was unrealistic.
	I thought the virtual bank branch was unrealistic.
	I thought the financial task was unrealistic.
	I felt that interacting with my partner was impersonal.
	I felt uneasy collaborating with my partner.
	I felt that my partner was responsive towards me.
I felt that the financial advisor was responsive towards me.	
I felt present within the virtual world.	
I felt personally involved in the financial task.	
<b>Credibility</b>	I thought that my partner was competent.
	I thought that the financial advisor was informed.
	I thought that the financial advisor was unreliable.

**Table 4.6: SVE Social Presence Perception Scale Summary**

Table 4.7 presents a summary of the experimental design.

	<b><i>Second Life: The Collaboration Experiment - Design Details</i></b>
<b>Experiment purpose:</b>	<b><i>Experimental exploration of usability and customer attitude towards the use of Second Life as a User Interface Metaphor for the Provision of Real-World Financial Services</i></b>
<b>Experiment hypotheses:</b>	<p><b>H<sub>0A</sub>:</b> There will be no significant differences between attitudes towards collaboration through the two communication mediums (text and voice) (Usability)</p> <p><b>H<sub>1A</sub>:</b> There will be significant differences between attitudes towards collaboration through the two communication mediums (text and voice)</p> <p><b>H<sub>0B</sub>:</b> There will be no significant preference shown towards one gender for the financial agent avatar (Usability)</p> <p><b>H<sub>1B</sub>:</b> There will be a significant preference shown towards one gender for the financial agent avatar</p> <p><b>H<sub>0C</sub>:</b> There will be no significant differences between the perceived levels of social presence experienced when collaborating through the two mediums (text and voice) (SVE Social Presence Perception Scale)</p> <p><b>H<sub>1C</sub>:</b> There will be significant differences between the perceived levels of social presence experienced when collaborating through the two mediums (text and voice)</p> <p><b>H<sub>0D</sub>:</b> There will be no significant differences in attitudes towards collaboration partners when communicating through the two mediums (SVE Social Presence Perception Scale)</p> <p><b>H<sub>1D</sub>:</b> There will be significant differences in attitudes towards collaboration partners when communicating through the two mediums</p>
<b>Experiment design:</b>	Participants experience collaboration through two mediums (text and voice), performing two tasks in a 2 cell, repeated measures, within-subjects design with balanced order.
<b>Dependent variables:</b>	Perceived usability and attitude towards collaboration within Second Life Perceived level of social presence
<b>Other data:</b>	Exit questionnaire data Demographic data
<b>Independent variables:</b>	Experiment – 2 treatments (text, voice), 2 avatar genders (within-subjects, balanced for order) Participant – Gender (2 genders, balanced), age group (2 groups, balanced) (Participants paired by gender and age group)
<b>Confounding variables:</b>	Researcher bias (randomised) Experiment Room (randomised) Tasks (matched task sheets)
<b>Cohort:</b>	N = 64: 2 treatment orders x 2 avatar gender orders x 2 participant genders x 2 participant age groups = 16 ( x2 = 32 pairs)
<b>Honorarium</b>	Personal cheque for £30
<b>Duration:</b>	1 hour

**Table 4.7: The Collaboration Experiment Summary**

## 4.4 Results

### 4.4.1 Usability Questionnaire Results

#### 4.4.2 Mean Usability Scores

Overall, participants rated collaboration through voice as having the highest usability, with lower levels experienced during collaboration through the use of instant text messaging, as shown in Table 4.8.

The results of an Analysis of Variance Test (ANOVA) as show in Table 4.9 confirm that the difference in overall usability between the two modes was statistically very highly significant ( $p < 0.000$ ) and that there were no overall within-subjects effects between the two communication mediums in terms of age group, gender ( $p = 0.070$  is approaching significance for gender) and order of treatment in the experiment.

Mode of communication	Mean Usability Score
Text (T)	4.98
Voice (V)	5.28

**Table 4.8: Mean Usability Scores**

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Mode	Sphericity Assumed	2.873	1	2.873	14.843	.000
	Greenhouse-Geisser	2.873	1.000	2.873	14.843	.000
Mode*age	Sphericity Assumed	.348	1	.348	1.798	.186
	Greenhouse-Geisser	.348	1.000	.348	1.798	.186
Mode*gender	Sphericity Assumed	.664	1	.664	3.431	.070
	Greenhouse-Geisser	.664	1.0	.6	3.4	.070
Mode*order	Sphericity Assumed	.547	3	.182	.943	.427
	Greenhouse-Geisser	.547	3.000	.182	.943	.427

**Table 4.9: Test of Within-Subjects Effects for Usability**

Communication medium		Mean Difference	Std. Error	Sig. (a)
Text (T)	Voice (V)	.296*	.077	.000

Based on estimated marginal means

\*. The mean difference is significant at the 0.05 level.

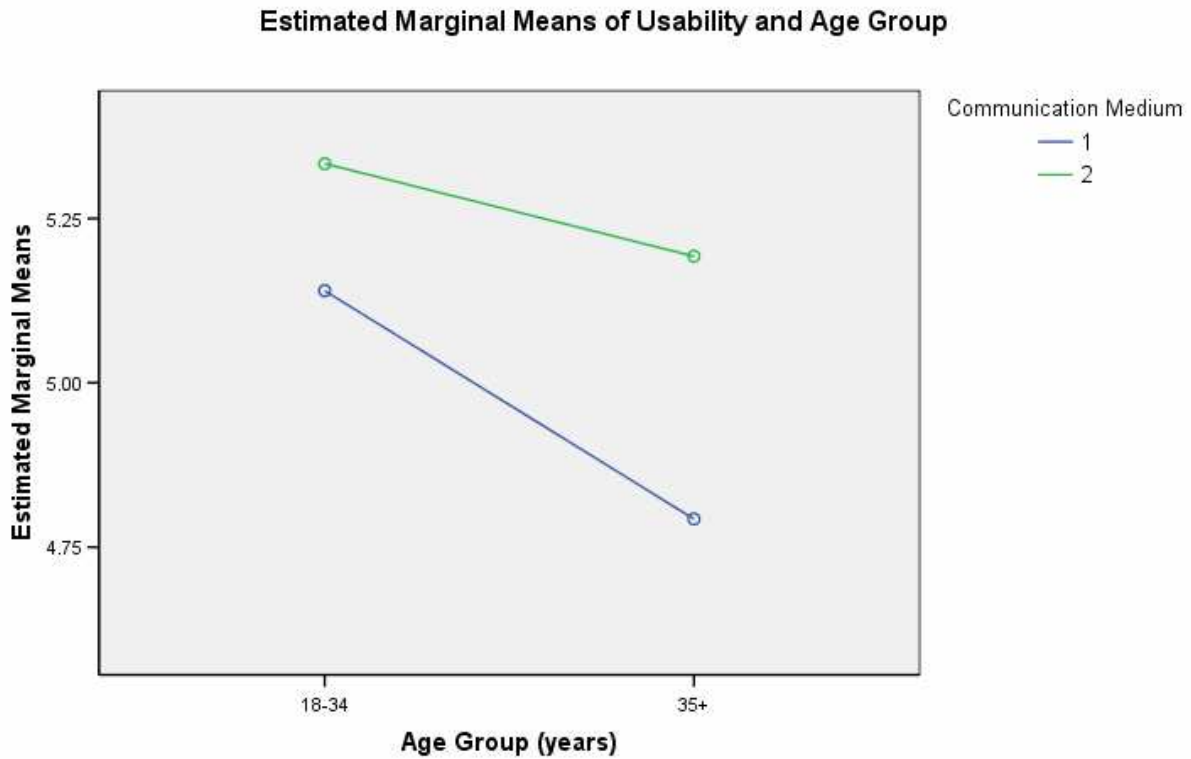
a. Adjustment for multiple comparisons: Bonferroni.

**Table 4.10: Pairwise Comparisons (ANOVA) for Usability**

Table 4.10 confirms that the difference between the usability scores for the two communication mediums is very highly significant ( $p=0.000$ ).

Whilst there were no significant within-subject effects of age group, gender or order on total usability levels, there was however a significant between-subject effect of order on overall levels of usability ( $p=0.035$ ), Figure 4.7.

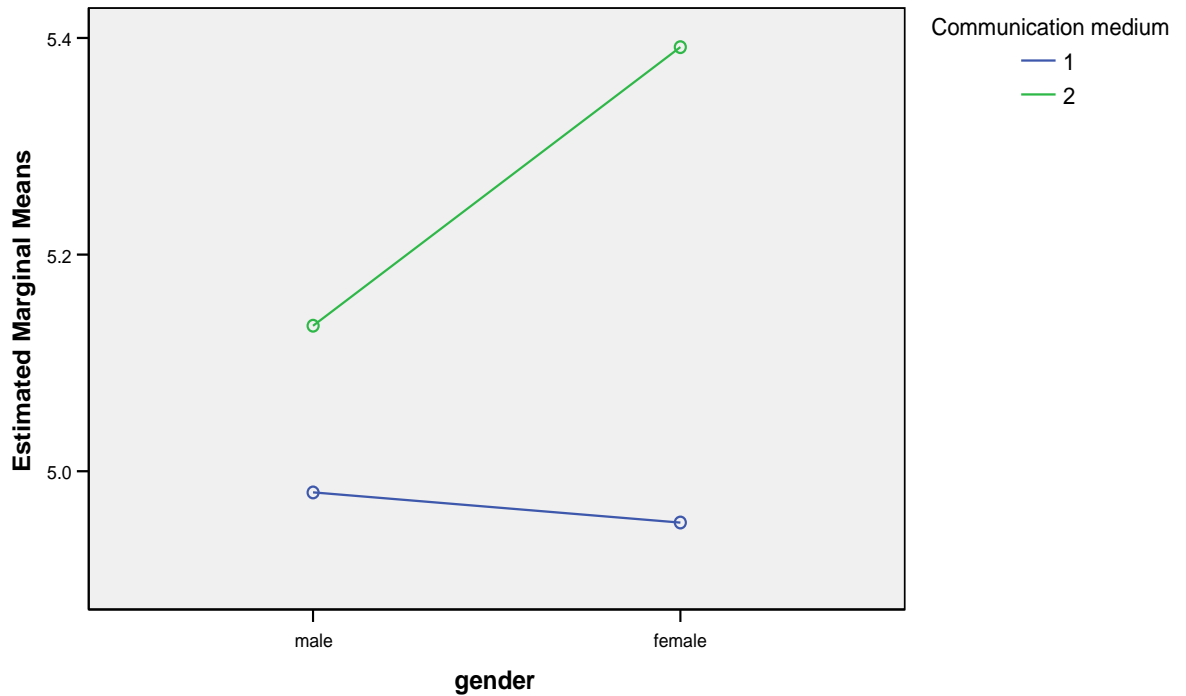
.



**Figure 4.7: Estimated Marginal Means for Usability by Age Group (1=Text, 2=Voice)**

Although the overall difference in usability between the two age groups is not statistically significant, Figure 4.7 above shows that overall the 18-34 year age group scored usability higher when collaborating through both text and voice than the 35+ year age group.

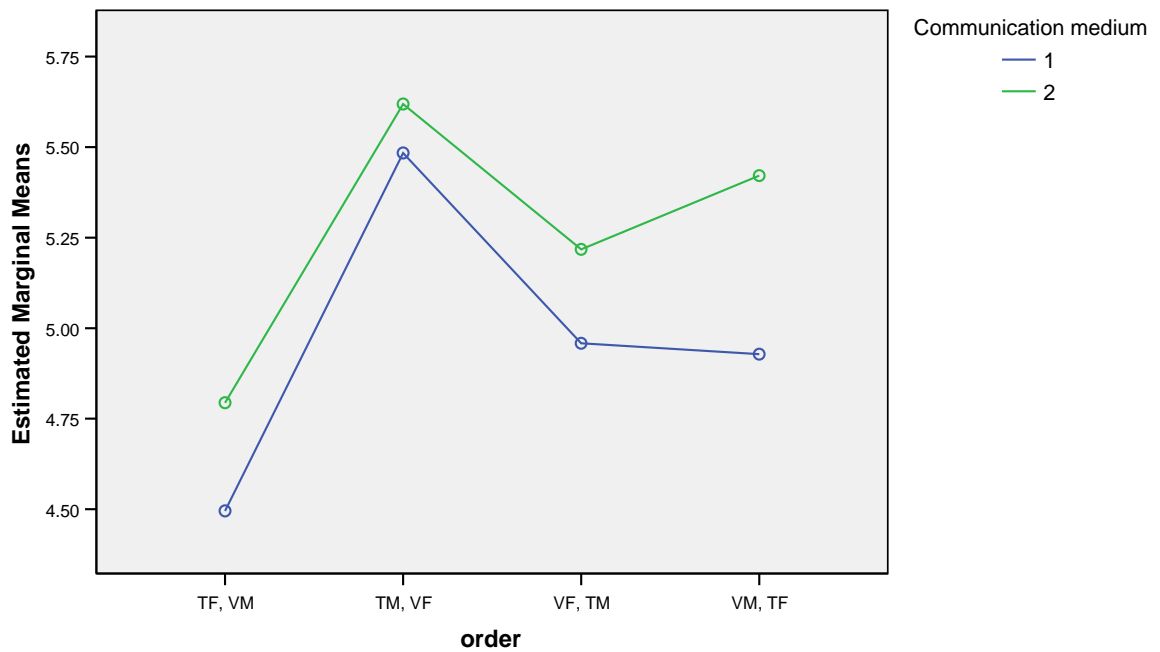
**Estimated Marginal Means of Usability and gender**



**Figure 4.8: Estimated Marginal Means for Usability and Gender (1=Text, 2=Voice)**

Although the overall difference in usability between male and female participants was also not statistically significant, Figure 4.8 above shows that in general, both males and females scored usability higher when collaborating through voice than through text. It also shows that females experienced higher levels of usability in the voice condition than males.

**Estimated Marginal Means of Usability and Order**

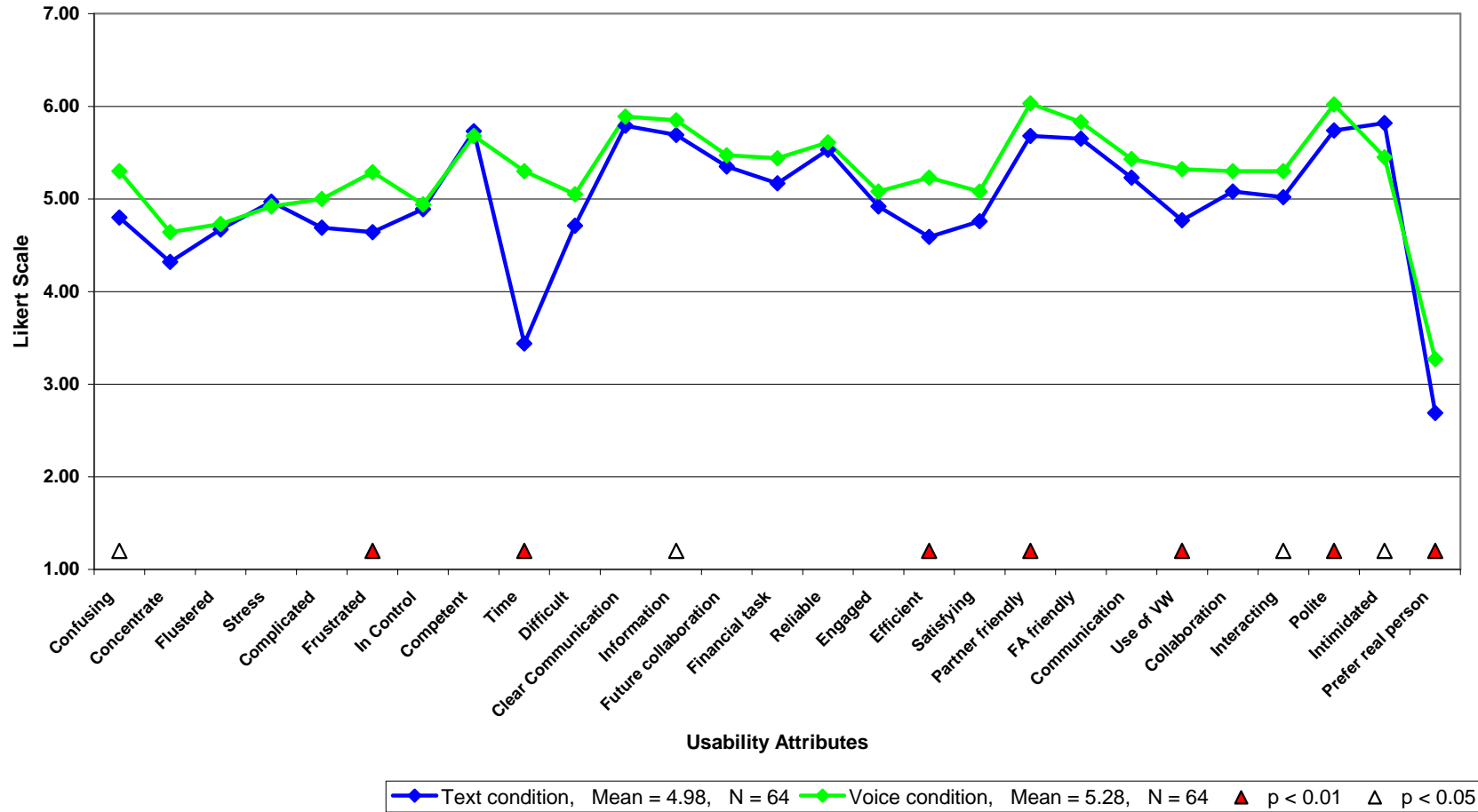


**Figure 4.9: Estimated Marginal Means for Usability and Order (1=Text, 2=Voice)**

Figure 4.9 above shows that the highest levels of usability were generally experienced by participants who experienced the order TM, VF (text with a male financial advisor followed by voice with a female financial advisor). The lowest usability levels were experienced in the order TF, VM (text with a female financial advisor followed by voice with a male financial advisor).

Chart 13 compares the mean usability scores for the two collaboration conditions (text and voice). A total of 11 usability attributes are shown to have significant differences in scores between the two modes of communication.

Chart 13: Usability Scores for Text Vs Voice





## 4.5 Analysis of Individual Usability Attributes

The results of the attribute analysis of the usability questionnaire used in The Collaboration Experiment showed a number of significant differences between the two communication mediums (see Appendix 14 for full usability attribute analysis).

In the voice condition participants found collaborating with their partner less confusing, were less frustrated as well as finding it less time consuming and more efficient. They understood the information given to them by bank staff better and enjoyed interacting with them to a greater extent. They also viewed their partner as being more polite and friendly as well as less intimidating. As a result participants would be happier to use the virtual world again in the voice condition than through text messaging.

Whilst there were no overall within-subjects effects on total usability, there were a number of within-subjects effects, particularly of age and gender along the usability attributes, as will be discussed later in this chapter. There were also significant between-subjects effects for age and order along the usability attributes (also see Appendix 14 for full usability attribute analysis).

### 4.5.1 Hypotheses Relating to Usability

Recalling Hypothesis A relating to the perceived usability of the two communication mediums:

<b>H<sub>0A</sub>:</b>	<b>There will be no significant differences between attitudes towards collaboration through the two communication mediums (text and voice).</b>
<b>H<sub>1A</sub>:</b>	<b>There will be significant differences between attitudes towards collaboration through the two communication mediums (text and voice).</b>

Sufficient evidence exists to reject the null hypothesis as 11 usability attributes showed statistically significant differences between the two communication mediums, and there was a significantly higher mean usability score overall for the voice (VoIP) condition.

### 4.6 SVE Social Presence Perception Scale Results

Overall, participants rated collaboration through voice as affording the highest level of social presence, with lower levels experienced during collaboration through the use of instant text messaging, as shown in Table 4.11.

The results of an Analysis of Variance Test (ANOVA) as show in Table 4.12 confirm that the difference in overall social presence scores between the two modes was statistically very highly significant ( $p=0.002$ ) and that there were no overall within-subjects effects between the two communication mediums in terms of age group, gender and order of treatment in the experiment.

<b>Mode of communication</b>	<b>Mean Social Presence Score</b>
Text (T)	4.98
Voice (V)	5.17

**Table 4.11: Mean Social Presence Scores**

<b>Source</b>		<b>Type III Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
Mode	Sphericity Assumed	1.051	1	1.051	10.617	.002
	Greenhouse-Geisser	1.051	1.000	1.051	10.617	.002
Mode*age	Sphericity Assumed	.003	1	.003	.027	.871
	Greenhouse-Geisser	.003	1.000	.003	.027	.871
Mode*gender	Sphericity Assumed	.000	1	.000	.002	.961
	Greenhouse-Geisser	.000	1.000	.000	.002	.961
Mode*order	Sphericity Assumed	.460	3	.153	1.551	.213
	Greenhouse-Geisser	.460	3.000	.153	1.551	.213

**Table 4.12: Test of Within-Subjects Effects for Social Presence**

<b>Communication medium</b>		<b>Mean Difference</b>	<b>Std. Error</b>	<b>Sig. (a)</b>
Text (T)	Voice (V)	.179*	.055	.002

Based on estimated marginal means

\*. The mean difference is significant at the 0.05 level.

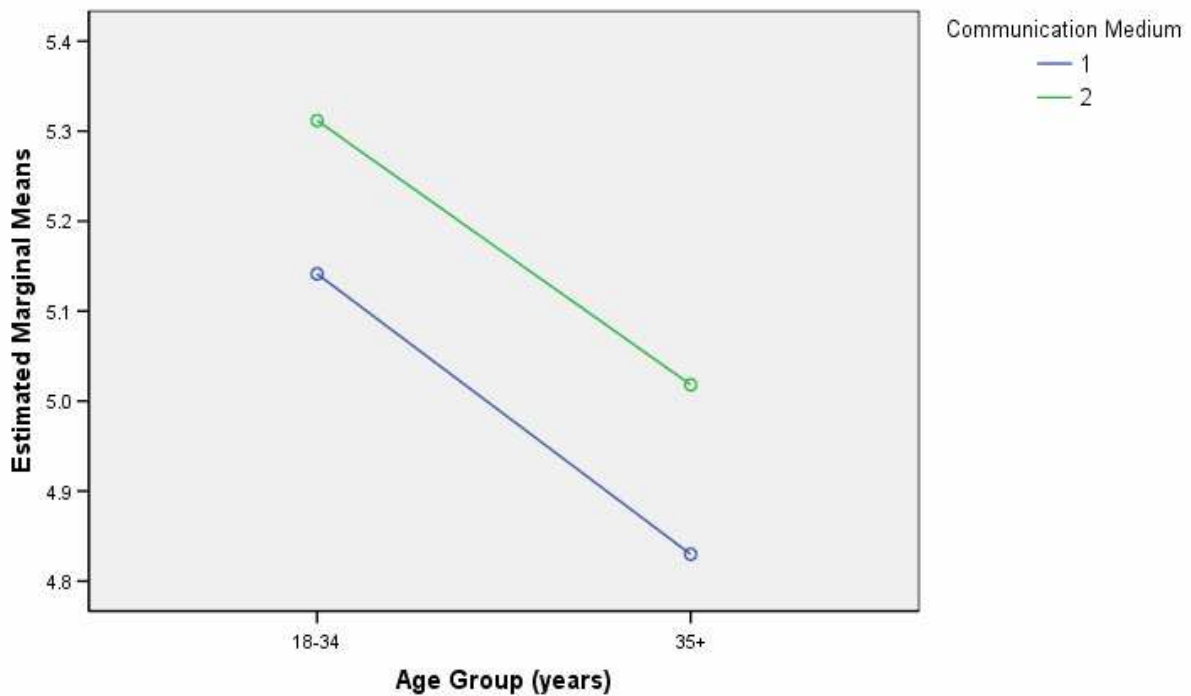
a. Adjustment for multiple comparisons: Bonferroni.

**Table 4.13: Pairwise Comparisons (ANOVA) for Social Presence**

Table 4.13 confirms that differences between the social presence scores for the two communication mediums to be highly significant ( $p=0.002$ ).

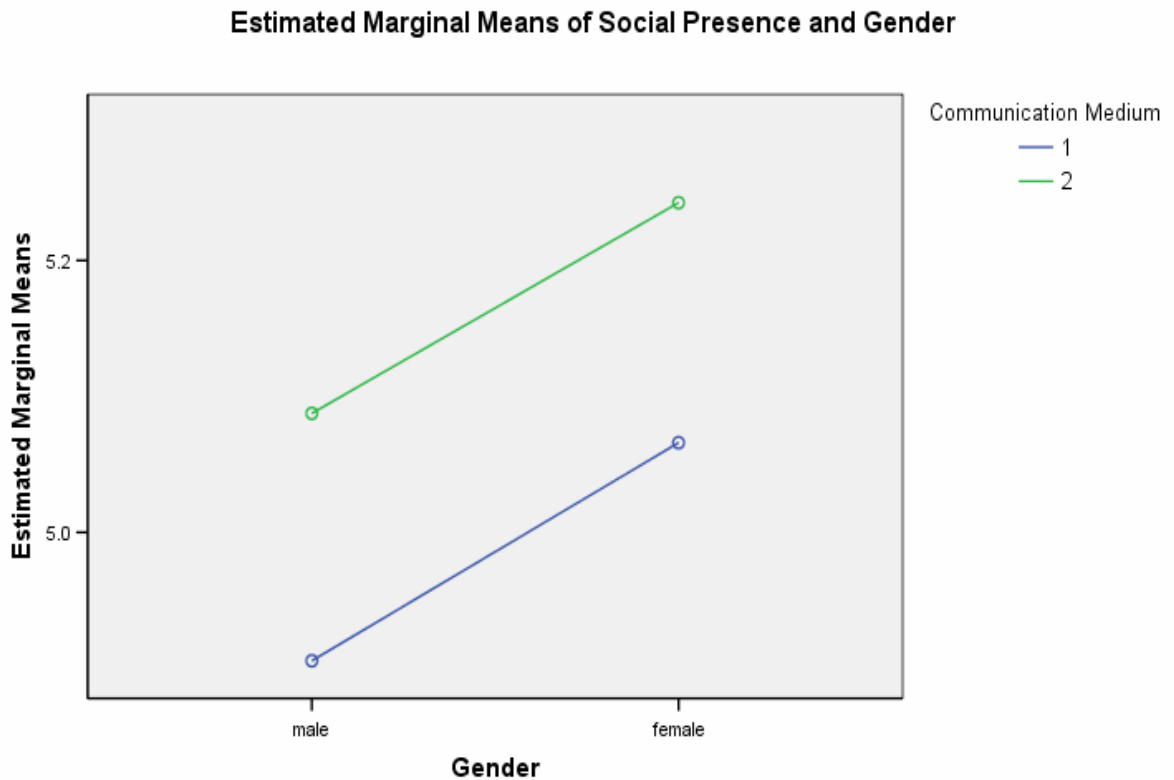
Whilst there were no significant within-subject effects of age group, gender or order on total levels of perceived social presence, there was however a significant between-subject effect of order on overall levels of perceived social presence ( $p=0.025$ ).

**Estimated Marginal Means of Social Presence and Age Group**



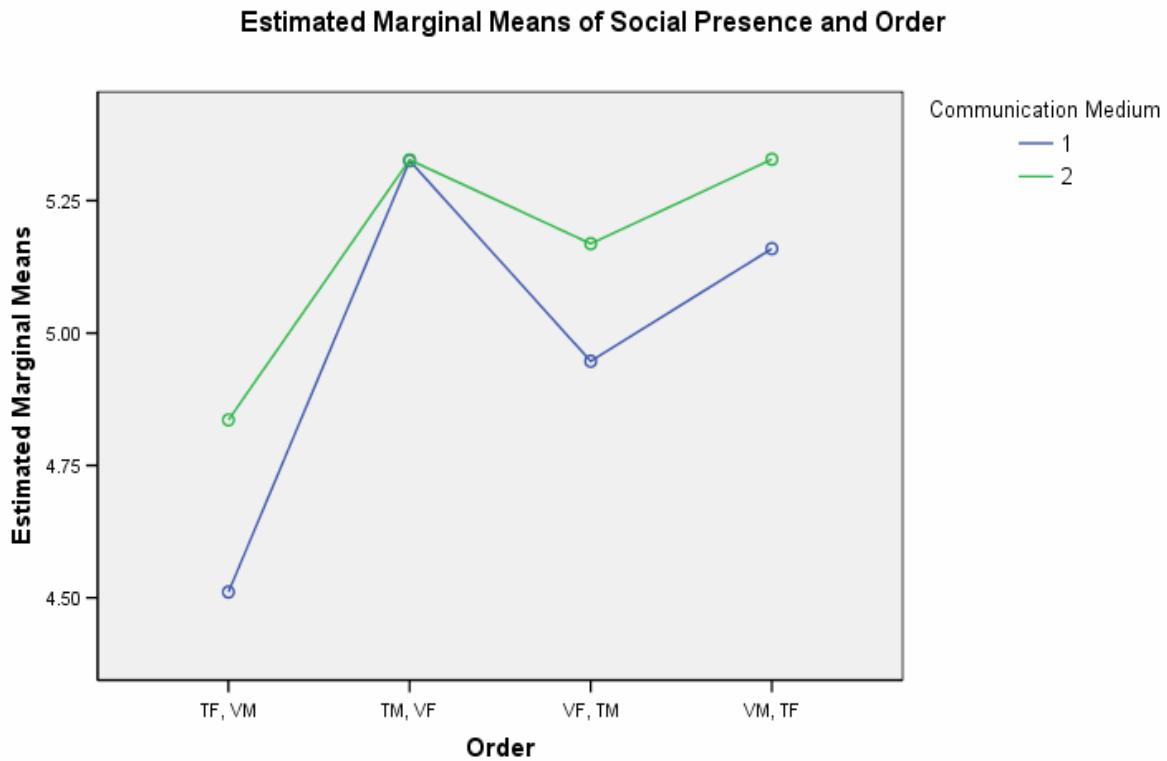
**Figure 4.10: Estimated Marginal Means for Social Presence and Age Group (1=Text, 2=Voice)**

Although the overall difference in levels of perceived social presence between the two age groups is not statistically significant, Figure 4.10 above shows that overall the 18-34 year age group experienced higher levels of social presence when collaborating through both text and voice than the 35+ year age group.



**Figure 4.11: Estimated Marginal Means for Social Presence and Gender (1=Text, 2=Voice)**

Although the overall difference in levels of perceived social presence between male and female participants was also not statistically significant, Figure 4.11 above shows that in general, both males and females experienced higher levels of social presence when collaborating through voice than through text. It also shows that females experienced higher levels of social presence in the text and voice conditions than males did.

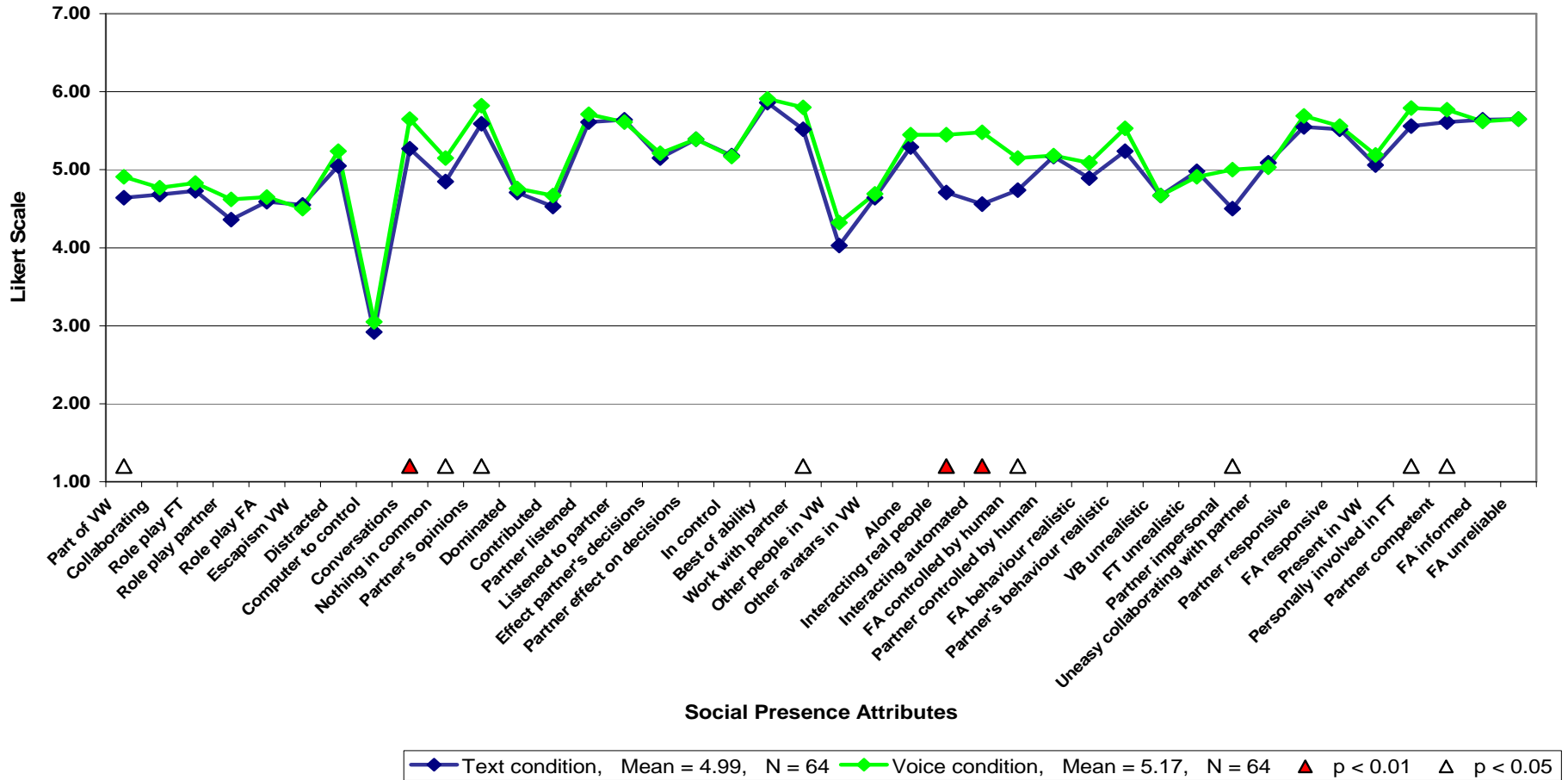


**Figure 4.12: Estimated Marginal Means for Social Presence and Order (1=Text, 2=Voice)**

Figure 4.12 above shows that (as for usability scores) the highest levels of social presence were generally experienced by participants who experienced the order TM, VF (text with a male financial advisor followed by voice with a female financial advisor). The lowest social presence levels were experienced in the order TF, VM (text with a female financial advisor followed by voice with a male financial advisor).

Chart 14 compares the mean social presence scores for the two collaboration conditions (text and voice). A total of 11 attributes show statistically significant differences in social presence scores between the two conditions.

Chart 14: Social Presence Scores for Text Vs Voice



#### **4.6.1 Analysis of Individual Social Presence Attributes**

The results of the attribute analysis of the SVE Social Presence Perception Scale questionnaire used in The Collaboration Experiment showed a large number of significant differences between the two communication mediums (see Appendix 15 for full social presence attribute analysis).

In the voice condition, participants felt more so that they were actually part of the virtual world, that their conversations with their partner were more worthwhile as well as feeling that they had more in common with them. They also felt that their partner's opinions were more important as well as finding the experience of collaborating with them a more personal one. They felt that their partner was more competent when collaborating through voice as well as finding it more important to work with them to reach decisions. Participants felt like they were interacting with real people and less like an automated machine when collaborating through voice and more like the financial advisor was being controlled by a human. As a result, participants felt more personally involved in the financial task when collaborating through voice than through text messaging.

There were significant within-subjects effects and between-subjects effects, particularly of age and gender along the social presence attributes. There were also significant between-subject effects of order along the social presence attributes, as discussed later in this chapter (see Appendix 15 for full social presence attribute analysis).



## 4.6.2 Hypotheses Relating to Social Presence

Recalling hypothesis C relating to the perceived levels of social presence experienced during collaborations through each of the two mediums:

<b>H<sub>0C</sub>:</b>	<b>There will be no significant differences between the perceived levels of social presence experienced when collaborating through the two mediums (text and voice).</b>
<b>H<sub>1C</sub>:</b>	<b>There will be significant differences between the perceived levels of social presence experienced when collaborating through the two mediums (text and voice).</b>

Sufficient evidence exists to reject the null hypothesis as significant differences were found between the text and voice communication mediums on many of the social presence attributes, as well as a significantly higher mean social presence score for the voice (VoIP) condition.

Recalling hypothesis D relating to attitudes towards partners during collaborations through each of the two mediums:

<b>H<sub>0C</sub>:</b>	<b>There will be no significant differences in attitudes towards collaboration partners when communicating through the two mediums.</b>
<b>H<sub>1C</sub>:</b>	<b>There will be significant differences in attitudes towards collaboration partners when communicating through the two mediums.</b>

Sufficient evidence exists to reject the null hypothesis as 11 attributes showed statistically significant differences between the two communication mediums, and there was a significantly higher mean social presence score overall for the voice (VoIP) condition.

### 4.6.3 Hypotheses Relating to Financial Agent avatar gender

Recalling Hypothesis B relating to a preference shown towards one gender for the financial advisor avatar:

<b>H<sub>0B</sub>:</b>	<b>There will be no significant preference shown towards one gender for the financial advisor avatars.</b>
<b>H<sub>1B</sub>:</b>	<b>There will be significant preference shown towards one gender for the financial advisor avatars.</b>

The results of an Analysis of Variance Test (ANOVA) confirm that there was no significant preference shown towards one gender of the financial agent avatar. ( $p>0.05$ ) Sufficient evidence therefore exists to support the null hypothesis.

### 4.7 Exit Questionnaire

The exit interview allows participants to express their views more fully and help explain their preferences. In the exit interview, the majority of participants stated that they actually had no previous knowledge of Second Life and no experience of using it beyond their inclusion in the prior Interaction Experiment.

The results from the experiment show that participants had a clear preference for collaborating through voice rather than text messaging. When explaining their preference for communicating through voice (VoIP), participants offered comments such as *“I much prefer verbal interaction between both the financial advisor and my partner, it was clear and relevant and more realistic”*, *“It was easier and quicker, you could move through the credit card selection a lot more quickly”* and *“It was just as good as talking to someone who was actually with you”*. These comments suggest that in a financial scenario where there is a selection process, participants preferred to

interact through voice as it was an instant mode of communication where discussions could take place within a shorter time period.

Although voice collaboration was rated more highly than collaborating through text messaging, comments regarding text messaging included “*When I was typing I could think about what I was about to say*” and “*It was easier to communicate with someone I didn’t know*”. It was interesting to note that in a number of collaborations participants were less likely to dispute certain decisions when communicating through voice and more likely to express their own opinions when communicating through text. This observation mirrors ideas proposed in the Online Disinhibition Effect (Suler, 2004) which proposes that in an online environment, where face-to-face cues are absent, with use of text communication, people can in certain instances be more expressive and more likely to assert their opinions. In the voice condition, whilst there was still no face-to-face interaction the number of social cues were increased and this could have had an effect upon how readily participants were to dispute certain decisions with their partner during collaborations.

It was also of importance to gain a more in-depth insight into participants’ opinions of the virtual bank branch itself since the branch was modified from the previous experiment to create a more realistic environment based on customer feedback as well as incorporating the case bank’s logo into its design. Positive comments concerning the virtual bank branch included “*It certainly looks good, very modern*”, “*Well designed, it was a recognisable bank*”, “*Great, very realistic and easy to get around. I noticed the [the Bank’s] sign as soon as I walked in*”. These comments suggest that even in a virtual environment like Second Life where many elements and designs are

surreal in nature, when dealing with finances, participants would prefer to do so in a more realistic environment that is recognisable to them and includes visible branding of the Bank. Negative comments included *“There was too much space”* and *“I got a bit lost at one point and wasn’t sure where I was supposed to go”*. These comments were predominantly evident amongst older participants who indicated that this type of technology would prove problematic for them in terms of carrying out financial tasks whilst more regular Internet users and younger participants were more positive towards Second Life technology on the whole.

Participants were also asked about their attitudes towards the possible benefits of Second Life and its potential uses, most notably in the field of education. The majority of participants stated that they did think it would be an effective tool, providing comments such as *“Definitely, for younger people who are online all the time”*, *“My daughter shows me how to use the computer, they grew up using them so it would good for her”* and *“It would be a good thing for people who lived far apart”*. These comments show that participants did see potential in the use of Second Life for education however many viewed it as a tool which would be more beneficial for a younger, more ‘tech-savvy’ generation. In general, the feedback surrounding the effectiveness of Second Life as a tool for socialising pointed towards the generational issue, in that younger participants were more likely to comment positively and whilst a number of the older participants indicated they could see the potential of Second Life for socialising, they did not feel that it was a medium that they would be interested in using. In terms of for banking purposes, it could be suggested that Second Life would be better aimed at a younger generation of customers who were more likely to utilise virtual environments for other purposes.

Finally, participants were asked if they would use a virtual bank branch in Second Life if the Bank were to create one. Responses included “*Certainly, I would have a play around on it, maybe to consider credit cards.*”, “*Yes it would let a whole new generation interact with banks in a new way. It’s fine if you are alone in the branch but if there were loads of people around you might be wondering about security.*”, “*I might go into it out of curiosity, but it’s not for me*”, “*I would use it if I was on my lunch break and I couldn’t actually make it to the bank on time if I could talk to someone quickly in the virtual branch*” and “*I would rather go into a branch and speak to someone*”. There were a number of positive responses regarding the possible use of a virtual bank branch within Second Life, mainly making reference to an increasing population of online users and the convenience of various forms of online banking. Negative responses were again touching upon the possible benefits to younger users as opposed to an older generation who may not find this particular form of technology suitable to their banking needs.

#### **4.8 Discussion and Conclusions**

This chapter details the results of the second experiment in this study involving the on-line virtual world of Second Life. The first experiment, the Interaction Experiment, showed that customers prefer interacting with humanoid avatars when utilising the virtual world of Second Life to carry out tasks relating to financial enquiries. It also showed that the level of anthropomorphism (displayed in financial agent avatars) affects people’s social judgements of their interaction partners as well as the levels of perceived usability and social presence experienced.

The second experiment described in this chapter, The Collaboration Experiment, assessed the attitudes of the Bank's customers towards collaborating with one another to edit the appearance of a financial agent avatar and choose the features of a credit card within the virtual bank branch in Second Life. Customer's perceived level of 'social presence' was analysed along with the 'immersion', 'escapism', 'relationship', 'achievement' and 'manipulation' factors derived from a five-factor model of user motivations in shared virtual environments (Yee, 2006). An objective analysis of usability engineering issues is also provided. The theory of social presence when applied to human-computer interaction provided the basis of this analysis.

The results show both the instant text messaging and voice collaboration scenarios were rated above neutral, indicating a good design in terms of usability. This therefore shows a clear effect of communication medium on the usability of collaborating within the virtual bank branch in Second Life to carry out financial tasks. The one usability attribute where both versions of the design scored negatively was "real person preference", showing that overall participants would still prefer to interact with a human. It should be noted however, that such a design as the one employed in the current research would not be designed to replace humans, but would instead be aimed at making banking options available to a wide market who are increasingly spending more and more time logging into and navigating within virtual environments (Hedley, 2006). The one social presence attribute where both versions of the design scored negatively "using computer to control avatar" shows that participants were very aware of using their computer to control their avatar. This finding would have been expected however since the cohort of participants were not generally regular users of Second Life and also due to the new nature of the technology itself.

The main result from the usability attribute analysis of collaborations in each of the communication mediums is that overall, although both collaboration conditions were rated positively, participants preferred to collaborate through voice ( $p < 0.01$ ). This finding is supported by the social agency theory which suggests that social cues in multimedia messages can encourage people to interpret human-computer interactions as more similar to human-human conversation (Mayer et al, 2003).

Further analysis showed that there were no significant within-subject effects of age group, gender or order on total usability levels. Although, in general, mean scores show that the 18-34 year age group experienced higher levels of usability when collaborating through both text and voice than the 35+ year age group. This would suggest an increased acceptance as well as higher levels of user experience in the use of technology amongst the younger age group. In terms of gender, although there were no significant overall differences in usability between male and female participants, both males and females experienced higher levels of usability when collaborating through voice than text. Females however experienced higher levels of usability in the voice condition than males. There was however a significant between-subject effect of order on overall levels of usability ( $p < 0.05$ ). The order TM, VF (text with a male financial agent avatar followed by voice with a female financial agent avatar) was rated most highly. Since the participants included in this study were not regular users of Second Life, this order could have been preferable as the initial text context would have allowed them to familiarise themselves with the environment and the task at hand without the sense of immediacy that the voice condition may afford in terms of responding to their collaboration partner. Therefore, when moving on to

collaborate in the voice condition, participants may have felt more in control when collaborating as well as increasingly comfortable with using Second Life to carry out their task.

Participants felt that collaborating with their partner through voice was less confusing ( $p<0.05$ ), less frustrating ( $p<0.01$ ), more efficient ( $p<0.01$ ) and less time consuming ( $p<0.01$ ). They also understood the information given to them by the financial agent better when collaborating through voice than text messaging ( $p<0.05$ ) and would be happier to interact with the financial advisor again ( $p<0.05$ ). They felt that their partner was more polite ( $p<0.01$ ) and friendly ( $p<0.01$ ) and were less intimidated by them ( $p<0.05$ ) in the voice condition. As a result, participants reported that they would be happier to use the virtual world again in the voice condition than in the text messaging condition ( $p<0.01$ ).

There were a number of significant within-subject effects, particularly of age and gender along the usability attributes. In terms of age, the 18-34 year age group reported being significantly less flustered collaborating through text than voice. Conversely, the 35+ year age group were more flustered in the text condition than in the text messaging condition. The 18-34 year age group also understood the information the financial advisor gave them during the interaction equally in both collaboration conditions whilst the 35+ year age group found the information given to them easier to understand in the voice condition. These findings suggest that younger participants were more accustomed to using online instant messaging applications and as a result did not find this method of communication necessarily more difficult to use within a Second Life setting. They may also reflect the wide-spread use of text-based



communication such as SMS messaging amongst younger generations and their level of comfort with applying it to new forms of technology (Grinter & Eldridge, 2001).

In terms of gender, male participants reported being significantly less flustered when collaborating through text than voice whilst females were less flustered during voice-based collaborations. Males also experienced less stress in the text condition whilst females experienced less stress collaborating in the voice condition. Females also felt that the collaboration in the text condition than males. Male participants also reported being less intimidated when collaborating through text than females, whilst females were less intimidated when collaborating through voice than males. These findings would suggest that male participants were generally more comfortable using text whilst females preferred voice, though it should be noted that the overall effects for age and gender on usability levels was not significant.

There were also significant between-subject effects on usability for age. Participants in the 18-34 year age group were less frustrated when collaborating with their partner than the 35+ year age group ( $p < 0.05$ ). The 18-34 year age group also felt that their partner was more friendly than the 35+ year age group did ( $p < 0.05$ ). These findings again suggest that younger age groups are more accepting of technology and perhaps had more experience in communicating in an online environment.

The results of the SVE Social Presence Perception Scale show that overall levels of perceived social presence were greater in the voice condition than in the text messaging condition ( $p < 0.01$ ). This finding supports the concept that the capacity that

a medium has to transmit social information such as facial expressions, or in the case of this study tone of voice, affects people's notion of social presence (Sallnas, 2005).

Further analysis showed that there was no significant overall within-subject effect of age group, gender or order on total social presence levels. Although, in general, mean scores show that the 18-34 year age group experienced higher levels of social presence when collaborating through both text and voice than the 35+ year age group. This again indicates an increased level of acceptance of technology and newer forms of communication in the younger age group. In terms of gender, although there were no significant overall differences in social presence between male and female participants, both males and females experienced higher levels of social presence when collaborating through voice than text. Females however experienced higher levels of social presence than males in both the text and voice conditions. As seen in the usability analysis, there was a significant between-subject effect for order on perceived levels of social presence. Participants that experienced the order TM, VF (text with a male financial agent avatar followed by voice with a female financial agent avatar) also reported the highest levels of social presence ( $p < 0.05$ ).

In the voice condition, participants felt more so that they were actually part of the virtual world ( $p < 0.05$ ), felt that their conversations with their partner were more worthwhile ( $p < 0.01$ ) as well as feeling that they had more in common with them ( $p < 0.05$ ). They also felt that their partner's opinions were more important ( $p < 0.05$ ) as well as finding the experience of collaborating with them a more personal one ( $p < 0.05$ ). They felt that their partner was more competent ( $p < 0.05$ ) when collaborating through voice as well as finding it more important to work with them to

reach decisions ( $p < 0.05$ ). Participants felt like they were interacting with real people ( $p < 0.01$ ) and less like an automated machine ( $p < 0.01$ ) when collaborating through voice and more like the financial advisor was being controlled by a human ( $p < 0.05$ ). As a result, participants felt more personally involved in the financial task when collaborating through voice than through text messaging ( $p < 0.05$ ). These findings suggest that the increased number of social cues present when communicating through voice rather than text had a significant effect upon participant's perceived level of social presence during collaborations with their partner.

There were significant within-subject effects, particularly of age and gender along the social presence attributes. Participants in the 18-34 year age group enjoyed the role playing aspect of collaborating with their partner more so in the text condition than through voice. Conversely, the 35+ year age group enjoyed the role playing aspect of collaborating with their partner more so in the voice condition than through text. This again suggests increased acceptance of collaboration within virtual worlds in younger age groups. Participants in the 35+ year age group felt that the financial agent was more responsive towards them in the text condition than the 18-34 year age group did whilst in the voice condition the 18-34 year age group felt that the financial agent was more responsive towards them than the 35+ year age group did.

There were also significant between-subject effects on social presence for age and gender. Participants in the 18-34 year age group felt that their partner listened to their opinions to a greater extent during collaborations than the 35+ year age group ( $p < 0.05$ ). The 18-34 year age group were significantly more likely to feel that other people were with them within the virtual world than the 35+ year age group ( $p < 0.05$ ).

On a similar note, the 18-34 year age also felt significantly less alone within the virtual world than the 35+ year age group ( $p<0.01$ ). The 18-34 year age group also felt that they were interacting with real people during their collaborations to a greater extent than the 35+ year age group ( $p<0.05$ ). The 35+ year age group were significantly more likely to feel as though they were interacting with an automated machine than the 18-34 year age group ( $p<0.05$ ). The 18-34 year age group were significantly more likely to feel as though the financial advisor was being controlled by a human than the 35+ year age group ( $p<0.01$ ). The 18-34 year age group were also significantly more likely to feel that their partner's avatar was being controlled by another human being than the 35+ year age group ( $p<0.01$ ). These findings again show that the 18-34 year age group generally experienced higher levels of social presence when collaborating within Second Life. In terms of gender, the only significant between-subject affect was evident with females feeling more strongly that they contributed more to the task than their partner than males did ( $p<0.05$ ).

A number of significant between-subject effects of order were evident in both the usability and social presence attributes. In general, participants who experienced the voice condition first (VF, TM and VM, TF) felt that collaborations with their partner took longer than those who experienced the text condition first (TF, VM and TM, VF). This suggests that participants place emphasis on time and efficiency when using the internet to carry out financial tasks and that the immediate responses and ability to discuss issues more quickly was of importance. Although this finding was not of particular relevance to the aims of the study, it will be noted in future experiment designs. It should also be noted that there were no significant overall effects for financial advisor gender.

Overall, although both modes of communication were rated positively, voice was found to be the preferable mode of communication when collaborating on financial tasks within the virtual world of Second Life. The increased number of social cues that interaction through voice affords would appear to increase both usability and social presence experienced by customers. In general, the 18-34 year age group experienced higher levels of both usability and social presence during collaborations through both text messaging and voice than the 35+ year age group. This would suggest an increased acceptance as well as higher levels of experience in the use of technology amongst the younger age group. This finding supports research that shows 18-34 year olds (predominantly male) to be the most frequent users of computer games (Hedley, 2006). Although in many cases, Second Life is not considered a ‘game’ as such due to its persistent and collaborative nature.

The next and final experiment therefore includes interaction through only voice (VoIP) as shown to be the most effective mode of communication in this study. The next study will explore usability and perceived levels of social presence in a learning scenario within Second Life with specific relevance to the financial services sector.

#### **4.9 Summary**

This chapter details the results from an experiment to assess customer attitudes towards collaborating with other customers on financial-based tasks within the virtual bank branch in Second Life through two communication mediums – text messaging and voice (VoIP). The SVE Social Presence Perception Scale was developed to assess collaboration in particular and all five factors from the five-factor model of user

motivations in shared virtual environments were incorporated. Customers preferred to collaborate through voice, with levels of usability and perceived social presence being significantly higher in the voice condition than in the text messaging condition. These results are consistent with the social agency theory which suggests that social cues in multimedia messages can encourage people to interpret human-computer interactions as more similar to human-human interactions (Reeves & Nass, 1996). They also support previous research that suggests that the capacity that a medium has to transmit social information like facial expressions, or in this case, tone of voice, affects people's notion of social presence. With the relatively recent introduction of voice communication to Second Life, this experiment was particularly important to assess which mode of communication provided the most effective experience for customers of the case bank. This preferred mode of communication was therefore used in the following experiment to assess customer attitudes towards learning within the virtual bank branch in Second Life.

## Chapter 5

## ***The Learning Experiment: The Effect of Information Delivery Method on Usability and Perceived Social Presence when viewing information about The Bank in Second Life***

### ***5.1 Introduction***

This chapter discusses the results of an empirical evaluation assessing customer attitudes towards using the virtual bank branch to view and learn historical and current information relating to the case bank. Customers also interacted with a financial agent avatar to answer questions relating to the information they had viewed and communicated through voice. In this between-subjects design, half of the customers viewed the information through basic text display and the other half through a video stream. The text presentation included was very basic with text alone whilst the video stream involved images and a narrative of the same information. This was done in order to test previous theories that streaming media such as video and audio can aid learning (Klass, 2003; Michelich, 2002) as well as research suggesting that combining audio narrations with graphics improves learning (Mayer, Heiser and Lonn, 2001; Moreno and Mayer, 2002).

Virtual worlds constitute a growing space for collaborative play, learning, work and e-commerce. Second Life in particular is being used by a number of educational institutions as an alternative learning environment. With students becoming increasingly comfortable both interacting online as well as using it as a primary source of information, it is important to consider the different ways of displaying information within virtual worlds, and in this case, Second Life to provide the optimum experience for users. Since real-world norms and practices do not necessarily translate directly to the virtual world, new, more innovative information



display methods may need to be developed. More standard classroom practices may prove ineffective in comparison to more interactive methods that a virtual world can perhaps provide with more ease and less cost than would be possible in the real world.

Customer's perceived level of 'social presence' was analysed along with the 'immersion', 'escapism', 'relationship' and 'achievement' factors derived from a five-factor model of user motivations in shared virtual environments (Yee, 2006). The 'manipulation' factor included in The Collaboration Experiment was not used in The Learning Experiment since it was not applicable to the task scenario or hypotheses. An objective analysis of usability engineering issues is also provided. The theory of social presence when applied to human-computer interaction provided the basis of this analysis. The Learning Experiment builds upon the findings from the previous two experiments to provide a platform for the development of a valid and reliable metric for the assessment of attitudes towards interaction, collaboration and learning within Second Life. This metric will have specific practical relevance to the financial services sector.

The main aim of this experiment was to measure and compare the impact of viewing information relating to the case bank through text or video stream within the virtual bank branch in Second Life on customer attitudes towards learning within this environment; as well as to test the effect on the usability of the service. A second aim was to assess and compare the effect that the two different information delivery methods had upon customers' perceived level of social presence within Second Life.

## **5.2 Second Life Bank Branch Used in the Research**

Participants viewed both historical and current information about the case bank. Participants were seated in front of a desktop monitor, using a headset to interact within the virtual world (see Figure 5.1). The video stream was constructed using information from the Bank's official website and both past and present issues displayed within the media. The images were also sourced from the Bank's official website as well as various internet and media sources. The narration was supplied by a member of the research team and was pre-recorded. The moving images were added using Lightwave 3D<sup>22</sup> and the narration was added and synchronised with Cakewalk, Sonar 8<sup>23</sup>. The basic text display contained the same information in the same order as was contained within the video stream. This bullet point text display was constructed using Photoshop<sup>24</sup>.

The virtual bank branch within Second Life was modified accordingly to take into account usability and customer preferences expressed in The Interaction and The Collaboration Experiments. Participant feedback indicated that even in an environment where surreal designs are commonplace, when dealing with finances, a more realistic and traditional layout is preferable. The case bank's logo and style of furnishings were therefore used in the design of the modified virtual bank branch used in The Collaboration Experiment in order to add a sense of realism and authenticity to customer's interactions and these features remained in place for The Learning Experiment discussed here. Participants' avatars were positioned in the starting area

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<sup>22</sup> <http://www.newtek.com/lightwave/>

<sup>23</sup> <http://www.cakewalk.com/Products/SONAR/>

<sup>24</sup> <http://www.adobe.com/products/photoshop/compare/>

outside the virtual bank branch at the beginning of the task (see Figure 5.2). They were then instructed to enter the virtual bank branch where they would be greeted by a financial advisor and to inform them of the enquiry they wanted to make (see Figure 5.3). By way of further increasing security, only participants' avatars were added to a list of users that could access the virtual bank branch as the land itself is private within Second Life. When participants informed the financial advisor that they were looking to find out some information about the case bank, the financial advisor led them over to the first screen where they would view information on the history of the Bank through either text display (see Figure 5.4) or video stream (see figure 5.5). When the participant indicated that they had finished, the financial advisor asked them three basic questions relating to the information they had just viewed. The participant was then led to another screen displaying present information about the Bank in either the text condition (see Figure 5.6) or the video stream condition (see Figure 5.7). When they were finished viewing the information the financial agent again asked them three questions relating to it. On one side of the branch were the two screens, one showing historical information and the other present information via text display and on the other side of the branch there were two screens displaying the same information in a video stream. Half of the participants experienced the text only condition whilst the other half experienced the video stream condition. All participants interacted with the financial advisor through voice.



**Figure 5.1: Participant logged into Second Life**



**Figure 5.2: Virtual Bank Branch Exterior**



Figure 5.3: Financial Agent Avatar



Figure 5.4: Text Display 'History' Presentation



Figure 5.5: Text Display 'Present' Presentation



Figure 5.6: Video Stream 'History' Presentation



**Figure 5.7: Video Stream 'Present' Presentation**

### ***5.3 Experiment Design and Procedure***

In the Learning Experiment there was one manipulated variable – the information delivery method (text and video stream). In this between-subjects design, half of the participants viewed information through basic text presentation and the other half viewed the information through video stream (voice over and images).

A cohort of 64 customers of the case bank was recruited for the experiment. Each of the participants was recruited from a database of customers of the bank who had given prior consent to taking part in studies relating to the bank. The vast majority of those who took part in the previous two studies took part in the Learning Experiment.

Participants were given an honorarium of £30 as a thank you for taking part. The participants were balanced for gender and age (male and female; and two age groups: ages 18-34 and 35 and over, see Table 5.1). Gender biases and preferences will be investigated as well as the attitudes and preferences of different age groups. These age groups were based on findings that show 18-34 year olds make up the main demographic within the gaming industry and are likely to be more technologically driven (Jupiter Communications, 1999). Data released by Linden Labs, the creators of Second Life, also stated that over 26 percent of those with Second Life accounts are between 18 and 24 years old, and another 38 percent are between 25 and 34 (Linden, 2007), therefore allowing us for the purposes of this research to support grouping participants into the two age brackets. The large majority of the participants involved in The Learning Experiment had taken part in the previous Interaction and Collaboration Experiments.

<b>Participants</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
Age 18 – 34	16	16	32
Age 35 and over	16	16	32
Total	32	32	64

**Table 5.1: Participants by Gender and by Age Group**

The procedure consisted of a set of clear stages. Participants were told that they would be using Second Life to view historical and current information about the case bank and would be asked questions about what they had learned. Participants were seated in front of a desktop monitor screen and told about the ‘new virtual bank branch’ set up in Second Life and the information available to them. When participants had viewed both information presentations and answered the questions posed to them by the financial agent after each, the financial agent thanked the participant for using the virtual bank branch and informed them the service would be available should they



wish to learn more about their bank in future. The participant was then instructed to exit the virtual branch in the same way that they entered.

After the task set participants were asked to complete a usability questionnaire relating to the scenario and a questionnaire to assess the perceived level of social presence experienced during the task. The usability questionnaire items were 7-point Likert attitudinal statements presented randomly via a laptop (see Appendix 16 for usability questionnaire). The social presence questionnaire items were 7-point Likert scale statements also presented randomly via laptop (see Appendix 17 for SVE Social Presence Perception Scale). In all questionnaires, statements were balanced for polarity (equal number of positively and negatively worded statements). After participants had experienced both of the presentations within their assigned information delivery condition they were asked open-ended questions (see Appendix 18) on their opinions regarding learning within Second Life, as well as the financial agent.

One participant took part in the experiment to carry out one set of tasks within the virtual bank branch at any given time, during which they would also be interacting with the humanoid financial agent avatar. The set of tasks consisted of two stages in which participants will view both a 'history' and a 'present' presentation of information relating to the case bank (See Appendix 19 for the information contained in both presentations). Participants controlled the speed at which they viewed the information in both the text display and video stream conditions using clearly marked arrow buttons on the text display screens and stop and pause button on the video stream screen .The financial agent avatar was present throughout the task to answer

any questions that the participant may have had. After viewing the 'history' presentation, the financial agent asked the participant three basic questions based on the information they have just viewed (See Appendix 20 for participant questions). Participants were assured that these questions were being asked not to test them but instead to help improve the way that the information was presented. These answers were recorded by the financial agent in order to test information recall levels within each condition. Information recall will only act as an indicator of how effective each information delivery method is in presenting the information within Second Life with the main focus of this research being on customer attitudes towards learning within this environment and context. This approach is therefore a subjective one and further research could take a more objective approach towards 'measuring' learning. This same procedure was also carried out for the 'present' presentation.

The financial agent avatars were again controlled by hidden researchers situated in a separate area of the research centre. Participants avatars were situated in the 'starting area' outside the virtual bank branch in Second Life at the beginning of each interaction with an aim to achieving as uniform an experience as possible as well as allowing them to have a view of the outside of the virtual bank branch and to move their avatar inside to add a sense of realism. Participants were instructed to enter the virtual bank branch and where they would be greeted by a financial advisor to whom they could make their request to receive some information about the case bank. To ensure security, only participants' avatars (as well as financial agent avatars) had access to the virtual bank branch. When participants had completed the first part of the task, the financial agent would then guide them on to the second part. Once these were completed, participants were instructed to exit the virtual bank branch. The

confederate researcher controlling the avatars followed a basic script to ensure, as far as possible, uniform interactions. After each interaction participants completed a usability questionnaire regarding their attitude towards the learning within the virtual bank branch in Second Life as well as a SVE Social Presence Perception questionnaire, to assess how socially present they felt during the task. At the end of the session participants took part in an exit interview to gain a more qualitative insight into their attitudes towards viewing information and learning within the virtual bank branch.

The experiment was developed to examine the following hypotheses:

<b>H<sub>0A</sub>:</b>	There will be no significant differences between the usability for the two information delivery methods (Usability)
<b>H<sub>1A</sub>:</b>	There will be significant differences between the usability for the two information delivery methods
<b>H<sub>0B</sub>:</b>	There will be no significant differences between the perceived levels of social presence experienced for the two information delivery methods (SVE Social Presence Perception Scale)
<b>H<sub>1B</sub>:</b>	There will be significant differences between the perceived levels of social presence experienced for the two information delivery methods
<b>H<sub>0C</sub>:</b>	There will be no significant differences in attitudes towards learning through the two information delivery methods
<b>H<sub>1C</sub>:</b>	There will be significant differences in attitudes towards learning through the two information delivery methods
<b>H<sub>0D</sub>:</b>	There will be no significant differences in attitudes towards the financial agent avatar when viewing the information through the two information delivery methods
<b>H<sub>1D</sub>:</b>	There will be significant differences in attitudes towards learning through the two information delivery methods
<b>H<sub>0E</sub>:</b>	There will be no significant differences in information recall between the two information delivery methods
<b>H<sub>1E</sub>:</b>	There will be significant differences in information recall between the two information delivery methods

**Table 5.2: The Alternative and Null Hypotheses**

### 5.3.1 Usability Questionnaire Design

An established usability questionnaire again provided the basis to assess the contributions to usability made by a set of key attributes. It uses a 7-point scale on which participants indicate the extent to which they agree or disagree with statements

that relate to each key usability attribute. The usability questionnaire employed in this experiment consists of 27 statements that will allow for an overall measurement of the usability for each of the designs; in turn this measurement will act as a predictor of customer behaviour (See Appendix 16 for the fully formatted usability questionnaire, for a summary see Table 5.3).

<b>Usability Questionnaire Statements</b>	
<b>Cognitive</b>	I thought that viewing the information was confusing.
	I had to concentrate hard when viewing the information.
	I got flustered when viewing the information.
	I felt under stress whilst viewing the information.
<b>Fluency</b>	I thought viewing the information within the virtual world was complicated.
	I felt frustrated when viewing the information.
	I felt in control when viewing the information.
	I felt that viewing the information took too long.
<b>Transparency</b>	I found it difficult to view the information within the virtual world.
	I thought that the information was presented clearly.
	I understood the information presented to me during the task.
<b>Quality</b>	I would be happy to view information in this way again.
	The virtual world was suited to the task.
	I think the information supplied during the task was unreliable.
	The way the information was presented helped me feel engaged within the virtual world.
	I found the way that the information was presented efficient.
	I found this way of viewing information satisfying.
<b>Engagement</b>	I thought the financial advisor was friendly.
	I disliked interacting with the financial advisor.
	I would be happy to use the virtual world again.
	I disliked viewing the information.
	I didn't like using voice to communicate with the financial advisor.
	I thought the financial advisor was polite.
	I felt intimidated by the financial advisor.
	I would prefer to interact with real people.

**Table 5.3: Usability Questionnaire Summary**

In this experiment, the focus was on assessing levels of usability when participants were viewing information within the virtual world. The usability questionnaire was adapted and developed upon from that used in the Collaboration Experiment to focus specifically on this aspect. There were again a number of questions included

pertaining to interactions with the financial advisor. These were included to take into account attitudes towards customer service in both the text display and video stream conditions and whether the information delivery method had any effect.

### **5.3.2 SVE Social Presence Perception Scale Design**

The Shared Virtual Environment (SVE) Social Presence Perception Scale for this research consists of 32 statements (7-point Likert scale) in which participants' rate the extent to which they agree or disagree with each statement. The SVE Social Presence Perception Scale in this experiment seeks to look at customers' perceived levels of Achievement, Relationship, Immersion, Escapism, Social Presence and Credibility during learning scenarios within the virtual branch in Second Life when interacting through VoIP in both the text display and video stream conditions.

For the first experiment in the study (The Interaction Experiment), only the Immersion and Escapism elements were relevant for analysis. In the second experiment in the study however (The Collaboration Experiment), all five factors of user motivation were incorporated within the SVE Social Presence Perception Scale to create a reliable and valid metric for the assessment of attitudes towards interaction and collaboration. In the final experiment in the study, (The Learning Experiment) discussed in this chapter, only four of the five factors were included. The Manipulation factor was not used since it was not of relevance to the learning scenario as the focus was not on collaboration or even interaction with others but instead on utilising the virtual bank branch to gain certain information.

#### **Immersion**

The first group of statements draw specifically on 'Immersion' items from the five factor model. The items from this empirical framework were adapted to have specific relevance to measuring attitudes towards learning based tasks within the virtual bank branch in Second Life.

The five statements in this group are:

- I felt as though I was actually part of the virtual world.
- I disliked interacting in the virtual world.
- I disliked viewing information in the virtual world.
- I enjoyed the role playing aspect of carrying out the task.
- I disliked the role playing aspect of interacting with the financial advisor.

### **Escapism**

The second group of statements are specifically aimed at assessing levels of escapism experienced by participants during their learning tasks. These statements were based upon items taken from the 'Escapism' items and adapted with specific relevance to the information based tasks within Second Life.

The three statements in this group are:

- I disliked the escapism element of the virtual world.
- Whilst viewing information within this environment I was very easily distracted.
- Whilst interacting with the financial advisor I was very easily distracted.

- I was very aware of using the computer to control my avatar.

### **Relationship**

The relationship statement was included to look at the participants' attitude towards the financial advisor and to assess whether or not there is a difference in attitude depending on the information delivery method. Previous experiments included three or more statements within this grouping, however within the Learning Experiment we are not focusing on the participants relationship with others as much as their attitude towards using Second Life as a tool for education and viewing information. This statement was based upon items taken from the 'Relationship' items and adapted with specific relevance to the learning task within Second Life.

The statement in this group is:

- I feel that the financial advisor was there to offer support if I needed it.

### **Achievement**

The final group of statements were specifically aimed at assessing what participants felt they had gained during the learning tasks and to what extent they felt in control of interactions. These statements were based upon items taken from the 'Achievement' items and adapted with specific relevance to the learning based tasks within Second Life.

The four statements in this group are:

- I did not feel in control when collaborating with the financial advisor.
- It felt in control when viewing the information.
- I felt that I learned a lot in the task.
- I felt it was very important to carry out the task to the best of my ability.

### **Social Presence**

The social presence items were again adapted from those used in both the Interaction and Collaboration Experiments to focus specifically on assessing levels of perceived social presence when viewing information in the text display and video stream conditions.

The fifteen statements in this group are:

- I felt that other people were with me within the virtual world.
- I felt that other avatars were present within the virtual world.
- I felt all alone within the virtual world.
- I felt like I was interacting with real people.
- I felt like I was interacting with an automated machine.
- I felt that the financial advisor avatar was being controlled by another human being.
- I thought the financial advisor's behaviour was realistic.
- I thought my partner's behaviour was unrealistic.
- I thought the virtual bank branch was unrealistic.



- I thought the task was unrealistic.
- I felt that interacting with the financial advisor was impersonal.
- I felt uneasy interacting with the financial advisor
- I felt uneasy when viewing the information.
- I felt that the financial advisor was responsive towards me.
- I felt present within the virtual world.
- I felt personally involved in the task.

### **Credibility**

The three statements in this group are:

- I thought that the financial advisor was competent.
- I thought that the financial advisor was informed.
- I thought that the financial advisor was unreliable.

Table 5.4 provides a summary of the SVE Social Presence Perception Scale (See Appendix 17 for fully formatted questionnaire).

<b>SVE Social Presence Perception Scale</b>	
<b>Main Concepts</b>	<b>Questionnaire Statements</b>
<b>Immersion</b>	I felt as though I was actually part of the virtual world.
	I disliked interacting in the virtual world.
	I disliked viewing information in the virtual world.
	I enjoyed the role playing aspect of carrying out the task.
	I disliked the role playing aspect of interacting with the financial advisor.
<b>Escapism</b>	I liked the escapism element of the virtual world.
	Whilst viewing information within this environment I was very easily distracted.
	Whilst interacting with the financial advisor I was very easily distracted.
<b>Relationship</b>	I was very aware of using the computer to control my avatar.
<b>Relationship</b>	I felt that the financial advisor was there to offer support if I needed it.
<b>Achievement</b>	I did not feel in control when interacting with the financial advisor.
	It felt in control when viewing the information.
	I felt it was very important to carry out the task to the best of my ability.
<b>Social Presence</b>	I felt that other people were with me within the virtual world.
	I felt that other avatars were present within the virtual world.
	I felt all alone within the virtual world.
	I felt like I was interacting with a real person.
	I felt like I was interacting with an automated machine.
	I felt that the financial advisor avatar was being controlled by another human being.
	I thought the financial advisor's behaviour was realistic.
	I thought the virtual bank branch was unrealistic.
	I thought the task was unrealistic.
	I felt that interacting with the financial advisor was impersonal.
	I felt uneasy viewing the information.
	I felt that the financial advisor was responsive towards me.
	I felt present within the virtual world.
I felt personally involved in the task.	
<b>Credibility</b>	I thought that the financial advisor was competent.
	I thought that the financial advisor was informed.
	I thought that the financial advisor was unreliable.

**Table 5.4: SVE Social Presence Perception Scale Summary**

Table 5.5 presents a summary of the experimental design.

<b>Second Life: The Learning Experiment – Design Details</b>	
<i>Experiment purpose:</i>	<b>Experimental exploration of usability and customer attitude towards the use of Second Life as a User Interface Metaphor for the Provision of Real-World Financial Services</b>
<i>Experiment hypotheses:</i>	<p><b>H<sub>0A</sub></b>: There will be no significant differences between the usability for the two information delivery methods (Usability)</p> <p><b>H<sub>1A</sub></b>: There will be significant differences between the usability for the two information delivery methods (Usability)</p> <p><b>H<sub>0B</sub></b>: There will be no significant differences between the perceived levels of social presence experienced for the two information delivery methods (SVE Social Presence Perception Scale)</p> <p><b>H<sub>1B</sub></b>: There will be significant differences between the perceived levels of social presence experienced for the two information delivery methods (SVE Social Presence Perception Scale)</p> <p><b>H<sub>0C</sub></b>: There will be no significant differences in attitudes towards learning through the two information delivery methods</p> <p><b>H<sub>1C</sub></b>: There will be significant differences in attitudes towards learning through the two information delivery methods</p> <p><b>H<sub>0D</sub></b>: There will be no significant differences in attitudes towards the financial agent avatar when viewing the information through the two information delivery methods</p> <p><b>H<sub>1D</sub></b>: There will be significant differences in attitudes towards learning through the two information delivery methods</p> <p><b>H<sub>0E</sub></b>: There will be no significant differences in information recall between the two information delivery methods</p> <p><b>H<sub>1E</sub></b>: There will be significant differences in information recall between the two information delivery methods</p>
<i>Experiment design:</i>	<b>Participants experience one information delivery method (text display or video stream), performing one set of tasks in a 2 cell, between-subjects design with balanced order.</b>
<i>Dependent variables:</i>	<b>Perceived usability and attitude towards learning within Second Life Perceived level of social presence</b>
<i>Other data:</i>	<b>Exit questionnaire data Demographic data</b>
<i>Independent variables:</i>	<b>Experiment – 2 treatments (text display and video stream) (between-subjects) Participant – Gender (2 genders, balanced), age group (2 groups, balanced) (Participants paired by gender and age group)</b>
<i>Confounding variables:</i>	<b>Researcher bias (randomised) Experiment Room (randomised) Tasks (matched task sheets)</b>
<i>Cohort:</i>	<b>N = 64 2 treatment orders x 2 participant genders x 2 participant age groups = 8 ( x8 = 64)</b>
<i>Honorarium</i>	<b>Personal cheque for £30</b>
<i>Duration:</i>	<b>1 hour</b>

**Table 5.5: The Learning Experiment Summary**

## 5.4 Results

### 5.4.1 Usability Questionnaire Results

#### 5.4.2 Mean Usability Scores

Overall, participants rated viewing information via video stream as having the highest usability, with lower levels experienced when viewing information via a basic text display, as shown in Table 5.6.

The results of an Analysis of Variance Test (ANOVA) as show in Table 5.7 confirm that the difference in overall usability between the two information delivery methods was statistically highly significant ( $p=0.019$ ) and that there were no overall between-subjects effects between the two display methods in terms of age group or gender.

Information Delivery Method	Mean usability score
Text display (T)	5.03
Video stream (V)	5.52

**Table 5.6: Mean Usability Scores**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Information Delivery Method	3.848	1	3.848	5.824	.019
Age	.095	1	.095	1.798	.706
Gender	.007	1	.007	3.431	.916
Information Delivery Method*age	2.279	3	2.279	.943	.069
Information Delivery Method*gender	1.039	1	.323	1.039	.215

**Table 5.7: Tests of Between-Subjects Effects for Usability**

Information Delivery Method		Mean difference	Std. Error	Sig. (a)
Text Display (T)	Video stream (V)	.490*	.203	.019

Based on estimated marginal means

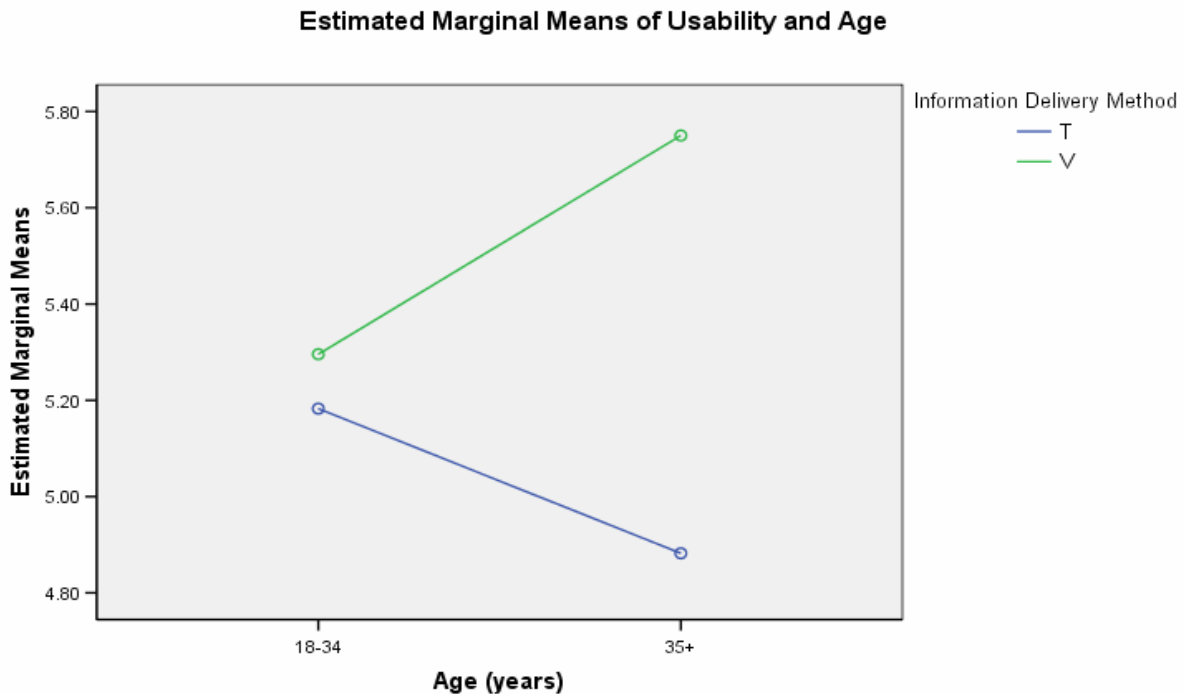
\*. The mean difference is significant at the 0.05 level.

a. Adjustment for multiple comparisons: Least significant difference (equivalent to no adjustments).

**Table 5.8: Pairwise Comparisons (ANOVA) for Usability**

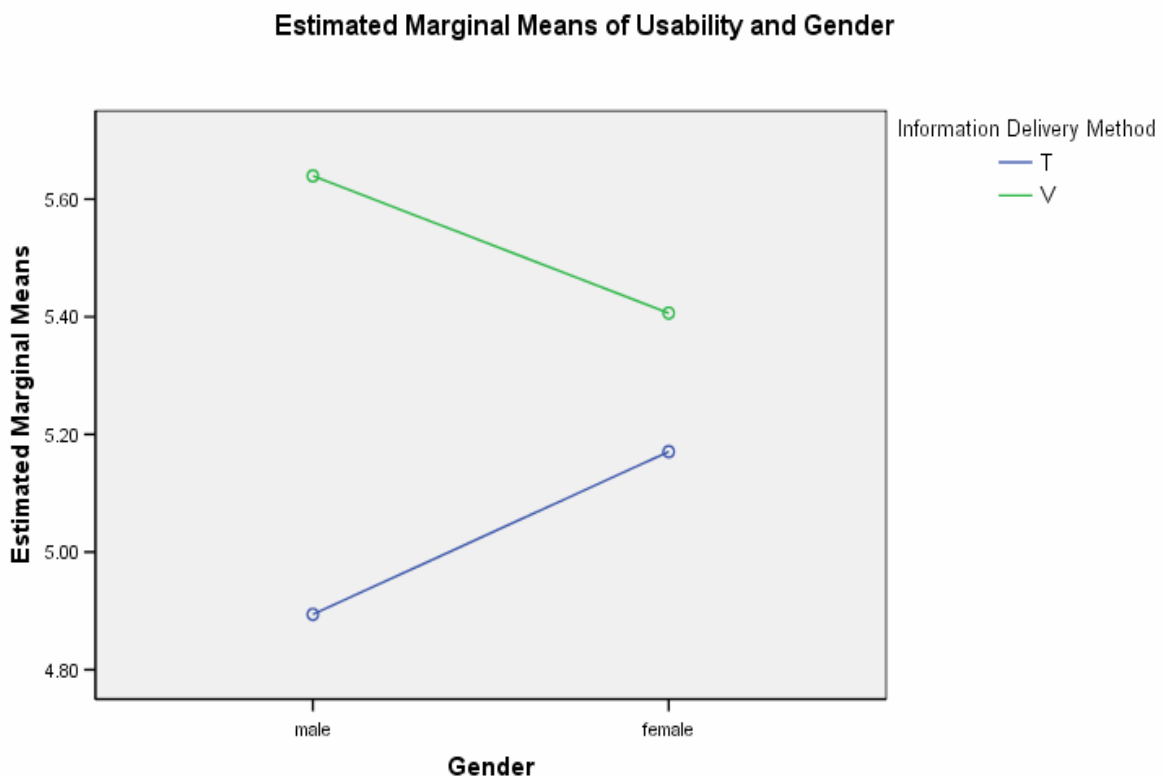
Table 5.8 confirms that the difference between the usability scores for the two information delivery methods is highly significant ( $p=0.019$ ).

Whilst there were no significant overall between-subjects effects of age group (information delivery method\*age interaction  $p=0.069$  is approaching significance) or gender, Figures 5.8 and 5.9 below show that general differences did occur between the two genders and two age groups.



**Figure 5.8: Estimated Marginal Means for Usability by Age Group (T=Text display, V=Video stream)**

Figure 5.8 above shows that overall, participants in the 18-34 year age group experienced higher levels of usability than the 35+ year age group in the text condition whilst the 35+ year age group experienced higher levels of usability than the 18-34 year age group in the video stream condition. From the figure above it can also be seen that both age groups experienced higher levels of usability whilst viewing information in the video stream condition than those that viewed the text display.



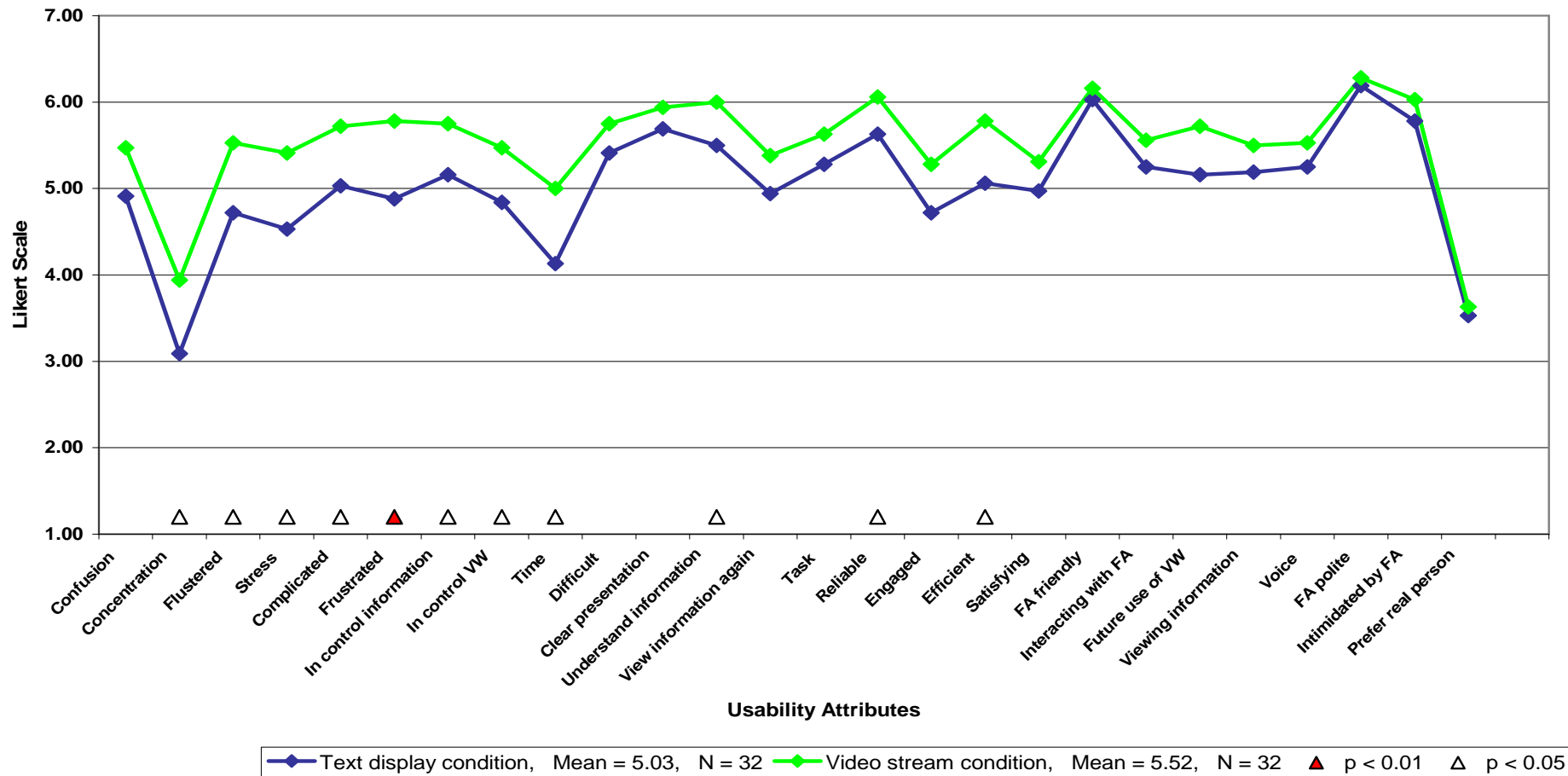
**Figure 5.9: Estimated Marginal Means for Usability and Gender (T=Text display, V=Video stream)**

Although the overall difference in usability between male and female participants was also not statistically significant, Figure 5.9 above shows that in general, in those that experienced the text display, males experienced lower levels of usability than females.

Conversely, in those that experienced the video stream, males experienced higher levels of usability than females. Overall however, both genders experienced higher levels of usability when viewing the video stream than when viewing the text display.

Chart 15 compares the mean usability scores for the two information delivery conditions (text display and video stream). A total of 11 usability attributes are shown to have significant differences in scores between the two information delivery methods.

Chart 15: Usability Scores for Text Display Vs Video stream





## 5.5 Analysis of Individual Usability Attributes

The results of the attribute analysis of the usability questionnaire used in The Learning Experiment showed a large number of significant differences between the two communication mediums (see Appendix 21 for full usability attribute analysis).

In the video stream condition, participants did not have to concentrate as much when viewing the information, were less flustered, stressed and frustrated and found viewing the information less complicated. They felt significantly more in control when viewing the information through video stream, more in control when interacting in the virtual world and found it less time consuming. They understood the information to a greater extent when viewing it through video stream, believed it to be more reliable and its' presentation efficient.

There were also a small number of significant between-subject effects of age group and gender along the usability attributes as well as for the presentation method\*age and presentation method\*gender interactions, as will be discussed later in this chapter (also see Appendix 21 for full usability attribute analysis).

### 5.5.1 Hypotheses Relating to Usability

Recalling Hypothesis A relating to the perceived usability of the two information delivery method conditions:

<b>H<sub>0A</sub>:</b>	There will be no significant differences between the usability for the two information delivery methods (text display and video stream).
<b>H<sub>1A</sub>:</b>	There will be significant differences between the usability for the two information delivery methods (text display and video stream).

Sufficient evidence exists to reject the null hypothesis as 11 usability attributes showed statistically significant differences between the two information delivery methods, and there was a significantly higher mean usability score overall for the video stream condition.

## **5.6 SVE Social Presence Perception Scale Results**

### **5.6.1 Mean Usability Scores**

Overall, participants rated viewing information via video stream as affording the highest level of social presence, with lower levels experienced when viewing information via a basic text display, as shown in Table 5.9.

The results of an Analysis of Variance Test (ANOVA) as shown in Table 5.10 show that the difference in overall social presence between the two information delivery methods narrowly misses being significant ( $p=0.09$ ) and that there were no overall between-subjects effects of the two information delivery methods in terms of age group or gender. There does however appear to be a significant between-subjects effect for the Information Delivery Method\*age interaction for overall levels of social presence ( $p=0.047$ ). The 18-34 year age group reported higher levels of social presence in the text display condition ( $M=5.14$ ) than the 35+ year age group ( $M=4.71$ ). Conversely, the 35+ year age group reported higher levels of social presence within the video stream category ( $M=5.39$ ) than the 18-34 year age group ( $M=5.08$ ). Overall, the 18-34 year age group felt more socially present when viewing information through text display than through video stream whilst the 35+ year age group felt more socially present when viewing information through video stream than through text display.

Information Delivery Method	Mean social presence score
Text display (T)	4.92
Video stream (V)	5.24

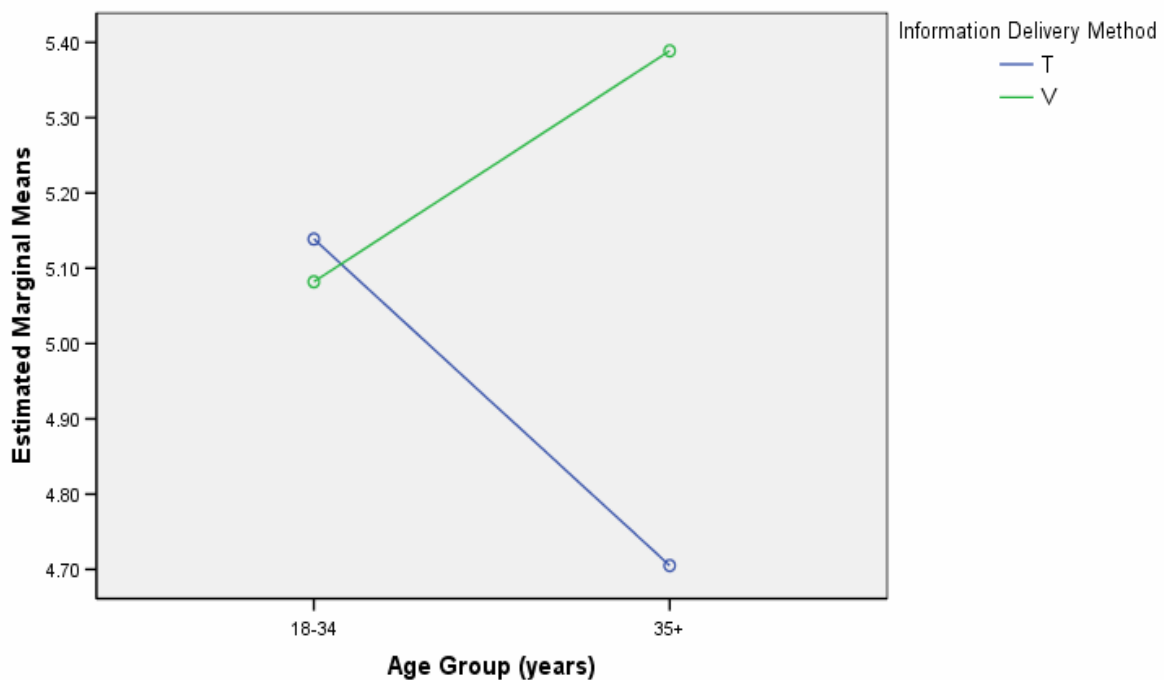
**Table 5.9: Mean Social Presence Scores**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Information Delivery Method	1.572	1	1.572	2.972	<b>.09</b>
Age	.064	1	.064	.122	.728
Gender	.223	1	.223	.422	.518
Information Delivery Method*age	2.192	1	2.192	4.143	<b>.047</b>
Information Delivery Method*gender	1.712	1	1.712	3.237	.077

**Table 5.10: Tests of Between-Subjects Effects for Social Presence**

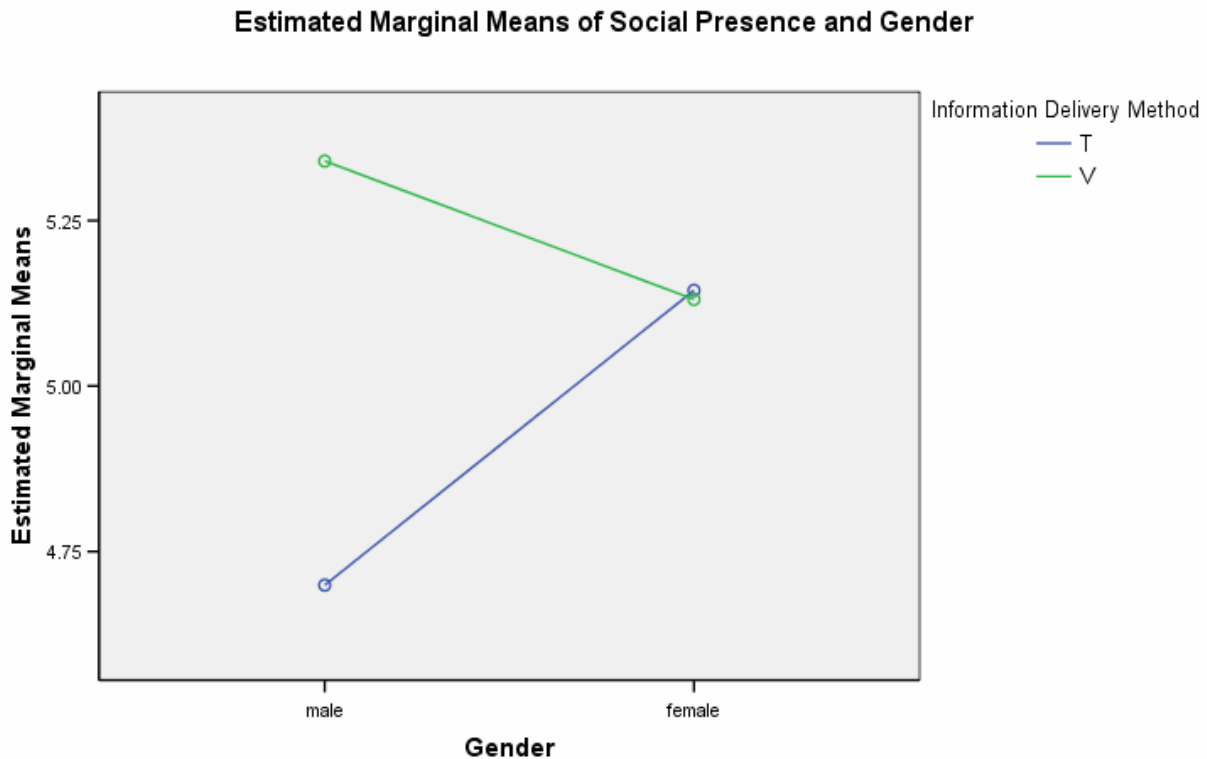
Whilst there were no significant overall between-subjects effects of age group or gender, there was a significant information delivery method\*age interaction ( $p=0.047$ ). Figures 5.10 and 5.11 below, show that general differences did occur between the two genders and the two age groups.

**Estimated Marginal Means of Social Presence and Age Group**



**Figure 5.10: Estimated Marginal Means for Social Presence and Age Group (1=Text display, 2=Video stream)**

Although the overall difference in levels of perceived social presence between the two age groups is not statistically significant, the information delivery method\*age interaction was significant which can be illustrated in Figure 5.10 above. It shows that overall the 18-34 year age group experienced higher levels of social presence when viewing information through text display ( $M=5.14$ ) than the 35+ year age group ( $M=5.08$ ) and conversely the 35+ year age group experienced higher levels of social presence when viewing information through video stream ( $M=5.39$ ) than the 18-34 year age group ( $M=4.71$ ). Within the 18-34 year age group, the highest levels of social presence were experienced in the text display condition, whereas in the 35+ year age group the highest levels were experienced in the video stream condition.

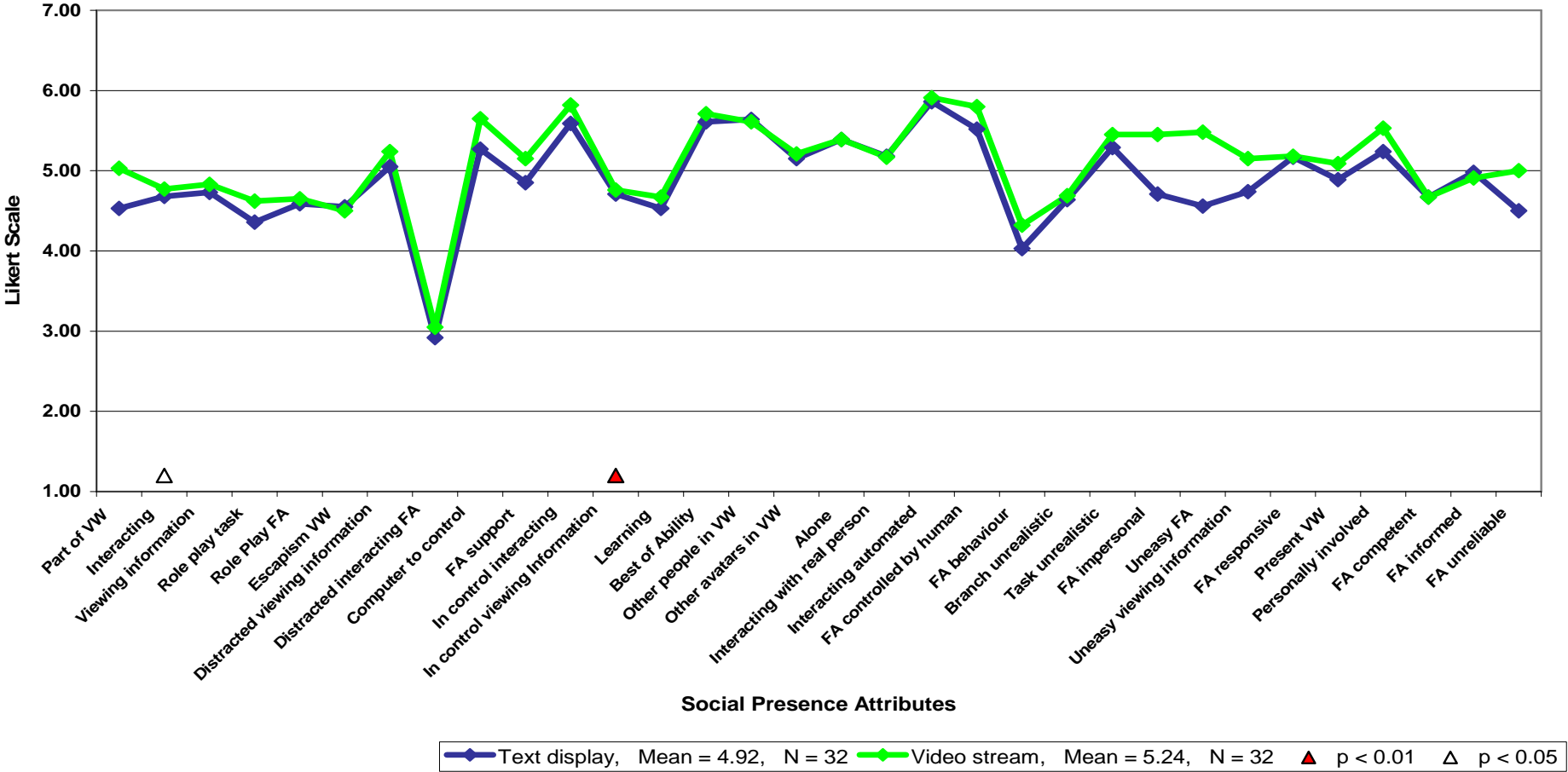


**Figure 5.11: Estimated Marginal Means for Social Presence and Gender (1=Text display, 2=Video stream)**

Although the overall difference in levels of perceived social presence between male and female participants was not statistically significant, Figure 5.11 above shows that in general, males experienced slightly higher levels of social presence in the video stream condition ( $M=5.34$ ) than females ( $M=5.13$ ) whilst females experienced higher levels of social presence in the text display condition ( $M=5.15$ ) than males ( $M=4.7$ ). Overall, males experienced higher levels of social presence within the video stream condition, whereas there does not appear to be any difference in the overall level of social presence experienced by females between the two information delivery conditions.

Chart 16 compares the mean social presence scores for the two information delivery method conditions (text display and video stream). Only two of the attributes show statistically significant differences in social presence scores between the two conditions.

Chart 16: Social Presence Scores for Text Vs Voice



## 5.7 Analysis of Individual Social Presence Attributes

The results of the attribute analysis of the SVE Social Presence Perception Scale questionnaire used in The Learning Experiment showed only two significant differences between the two communication mediums (see Appendix 22 for full social presence attribute analysis).

Participants liked interacting in the virtual world to a greater extent when viewing the information through video stream than through text display. They also felt significantly more in control when viewing the information through video stream.

There were also significant between-subject effects of age and particularly gender along the social presence attributes as well as for the presentation method\*age and presentation method\*gender interactions, as will be discussed later in this chapter (also see Appendix 22 for full social presence attribute analysis).

### 5.7.1 Hypotheses Relating to Social Presence

Recalling hypothesis B relating to the perceived levels of social presence experienced within the two information delivery method conditions:

<b>H<sub>0B</sub>:</b>	There will be no significant differences between the perceived levels of social presence experienced for the two information delivery methods (text display and video stream).
<b>H<sub>1B</sub>:</b>	There will be significant differences between the perceived levels of social presence experienced for the two information delivery methods (text display and video stream).



There is not enough sufficient evidence to reject the null hypothesis as only two overall significant differences were found between the text display and video stream conditions within the social presence attributes. The mean social presence score for the video stream condition is higher than that for the text display condition, though this difference is only approaching significance ( $p=0.09$ ).

There were however a number of significant between-subjects interaction effects for age and gender which would suggest that there was a difference in levels of social presence along a number of the attributes between the subsets of participants.

### 5.7.2 Participant Task Responses

As part of the task within the learning experiment participants were asked three basic questions after both the ‘history’ and ‘present’ presentations based on the information contained within them. The financial agent asked the questions within the virtual bank branch and recorded the participants’ responses. Overall, participants responded correctly more frequently within the video stream condition than in the text display condition as shown in Table 5.11. It is important to note however, that the focus of the experiment was not on information recall but instead on attitudes toward learning within Second Life within a financial setting.

<b>Information Delivery Method</b>	<b>Mean participant response score</b>
Text display (T)	8.44
Video stream (V)	9.59

**Table 5.11: Mean participant response scores**

The results of a t-test, as shown in Table 5.12, show that the difference in overall scores between the two information delivery methods is not significant.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper	
total	Equal variances assumed	.673	.415	-1.753	62	.085	-1.156	.660	-2.475	.162
	Equal variances not assumed			-1.753	59.933	.085	-1.156	.660	-2.476	.163

**Table 5.12: T-test of overall participant response scores**

Recalling hypothesis E relating to information recall within each of the information delivery methods:

<b>H<sub>0E</sub>:</b>	There will be no significant differences in information recall between the two information delivery methods
<b>H<sub>1E</sub>:</b>	There will be significant differences in information recall between the two information delivery methods

Whilst the mean participant response score within the video stream condition was higher than that within the text display condition, this difference is not significant. Therefore there is not enough sufficient evidence to reject the null hypothesis.

## **5.8 Exit Questionnaire**

The exit interview allows participants to express their views more fully and help explain their preferences. In the exit interview, the majority of participants stated that

they actually had no previous knowledge of Second Life and no experience of using it beyond their inclusion in the prior Interaction and Collaboration Experiments.

The results from the experiment show that participants had a preference for viewing information in the virtual bank branch in Second Life through video stream rather than text display. In terms of overall usability, this preference was significant though in overall levels of perceived social presence, whilst greater on average within the video stream condition, the difference was not significant. In general, participant responses were positive towards viewing information within each of the conditions which can be seen in the mean social presence and usability scores being above neutral. In terms of viewing the information through text display within Second Life, positive participant comments included *“I could read the information at my own pace”*, *“I could take as long as I needed to read it and because it was virtual there was no one there to get annoyed...I felt relaxed”* and *“When you’re on the phone and you’re told information you’ve got to listen carefully, but that was presented in front of you...you could take it at your own pace”*. Positive comments from participants in the majority of instances refer to the issue of time and being able to view the information at a speed that suited them individually. More negative comments relating to viewing the information through text display were *“I was easily distracted...I didn’t know if I was supposed to be reading aloud or to myself”*, *“There was too much text, it was a lot to take in”*, *“It’s like viewing a screen within a screen, you would be better just looking at a webpage”* and *“To me Second Life is all about interacting...doing something static like that doesn’t make sense...it was like a lecture with the bullet points”*.. These comments suggest that within a virtual environment

such as Second Life, participants had a level of expectation in terms of the media used to display information.

Reading text from a basic screen within Second Life may provide a similar experience to reading the information on the case bank's homepage for example and on a number of occasions participants commented that they would look to this source rather than using Second Life to find the same information. The comment making reference to "*viewing a screen within a screen*" conveyed a number of the participants' assertions that there are various other routes that they would go through first before utilising Second Life to view information in this particular way and that such a basic delivery method was slightly redundant in a virtual world. When discussing the use of multimedia in learning however, it has to be taken into account that when referring to a text display within The Learning Experiment, it is not simply a text display as it might normally be viewed, i.e. in basic website format on a monitor. The above quote highlights the issue that virtual worlds are a new and emergent domain to be studied and previous studies looking at text versus video may not be directly relevant. In more positive cases a sense of interactivity may already exist when a user is logged in to a virtual world and so viewing information via text display may not necessarily lack a sense of interaction to the same extent as it would when viewing a monitor out-with a virtual world setting. It also has to be taken into account throughout this analysis however that since the participants within this experiment were not regular users of Second Life they may find utilising the virtual environment for everyday purposes a novel and ambiguous concept.

In the video stream condition, positive comments included “*It was fun...an interesting way of doing things...it would appeal to a younger generation*”, “*It was definitely a lot more interesting than just reading a leaflet...I feel that I learned something about the bank and I’d remember it more*”, “*It was informative, I’m not a Second Life user but the more you use it the more you get used to it...I enjoyed it, it was like a game*” and “*It was like watching television, I think that I learned a bit about the bank...it felt quite personal*”. When participants were asked what they liked about viewing the information through video stream many of the comments made reference to learning and that through this method they felt that they had retained the information they had viewed within a more relaxed context. Interestingly, within the text display condition, a number of participants commented that they were very aware that they were going to be asked questions at the end of each section, more so than those who were viewing the information through video stream. This brings to light the idea that less ‘traditional’ forms of education may be more suitable for virtual environments such as Second Life rather than attempting to replicate a real-world learning setting and assume that these traditional forms will be as effective within the virtual world.

Negative responses about viewing information in this way included “*It could be a bit more interactive*”, “*I didn’t feel like I could go back and go through things that I missed*”, “*There were a lot of dates that weren’t put on the screen*” and “*Could have been shorter, punchier and possibly louder*”. The comments referring to the video stream lacking the factor of interaction for participants and them not being able to read back through previous information are perhaps the more positive elements that are included in the text display method. Whilst the video stream may be a more engaging form of media in overall, due to time constraints in the experimental setting

participants were not able to pause or rewind the video if they did not feel that they had retained any of the information.

In the Interaction Experiment, instant text messaging was the method of communication between the financial agents and participants whilst in The Collaboration Experiment both instant text messaging and voice (VoIP) methods were used. Since voice was found to be the preferred mode of communication, this alone was utilised in The Learning Experiment. It was therefore important to gauge participants' opinions towards using voice to communicate within this setting. Positive responses included *"It felt more personal than typing...you feel like you're speaking to a real person...it's quicker than typing...I can't type quickly"*, *"You felt like you were really interacting, it wasn't just a computer or automated service"*, *"I liked knowing that if I had a problem I could just ask and get a response straight away"* and *"You could do it in your own home which is nice. It's almost like the X-Box where you can communicate with people but not have to talk too much. It's a new idea, quite fresh."* The immediacy of communication through voice as well as the increased sense of personal interaction appeared to be the main benefits for participants in both conditions. From a usability perspective, the reference to typing speed may also be an issue for some users, with VoIP offering a more practical alternative in some cases. Although Second Life is not necessarily thought of as a 'game' by regular users, participants indicated that the game-like element was part of the appeal within this learning scenario. Another interesting observation could be seen within the text condition where a number of participants would ask during the exit interview if the voice of the financial agent was that of another person in real time. This was less common in the video stream setting.

More neutral comments included *“At first I was a bit put off but once you know what you’re doing, it’s ok”*. These types of comments were perhaps more indicative of the fact that participants were not regular users of Second Life and therefore not accustomed to communicating within the virtual environment, though they also suggest that continual usage may lead to an increased sense of ease when interacting within it. Negative comments surrounding using voice to communicate with the financial agent included *“I felt a bit embarrassed”*, *“You couldn’t really use it in a public place”* and *“If you’re doing banking this way, are things recorded...is your information safe?”*. Comments concerning feelings of embarrassment could perhaps be the result of the experimental setting itself with the presence of the researcher and financial agent asking the participant questions after viewing the information emphasising these feelings. The fact that participants were not regular Second Life users again has to be taken into account and increased usage may see a decrease in any such feelings. References to using voice to communicate within Second Life if a user was logged in, in a public place are very relevant, particularly when using Second Life for financial purposes. Communication through instant text messaging, whilst perhaps not affording the same level of usability or social presence provides an increased sense of privacy in these situations or for those with hearing difficulties for example and is still the most frequently used mode of communication within Second Life. The issue of privacy was also a cause for concern amongst participants since the environment is unfamiliar to them. Private chat mechanisms are available however when communicating through both text and voice, though again, since participants were not regular users of Second Life the environment may not have been one in

which they would want to discuss their finances. This is therefore why, within a financial context, Second Life may be more suitable for learning purposes.

There were minimal modifications to the virtual bank branch as a result of the positive feedback from the previous concerning the layout and appearance. It was still important however to get an insight into participants' opinions of the virtual bank branch since the screen areas where participants viewed information had been adapted and to take into account any impact that the task scenario may have had on overall opinions on its overall appearance. Comments concerning the appearance of the virtual bank branch were generally positive and included "*It was quite realistic to look at...although there was no other customers in the bank branch*", "*It was true to life. It looked like a real-life branch set-up*" and "*It was well laid out and it was clear where I had to go*". These comments suggest that even in a virtual environment like Second Life where many elements and designs are surreal in nature, when dealing with finances, participants would prefer to do so in a more realistic environment that is recognisable to them as a bank branch.

Participants were also asked about their attitudes towards the use of Second Life in the field of education. All of the participants asked, whether indicating that they themselves would use it or not, said that they could see the potential that Second Life holds within this area. Comments included "*I can definitely see it being effective in education...it's kind of like a chat room on the internet but you can kind of see the people there*", "*Yes, absolutely, maybe not for banking, but education, yes*", "*I think there's a section of the market that could gain from interacting with potential customers...the younger generation more so perhaps, older people might not be so*



*comfortable*". The comments indicated that whilst participants do see the educational benefits of Second Life, they are unsure as to how it would be implemented. A number of participants were interested to find out whether or not the case bank would actually be introducing a virtual bank branch and more importantly in which capacity it would be implemented, i.e. banking services or for general financial enquiries, referring to it as a "*fascinating concept*". References to being able to "*see people there*" were frequent amongst participants who were also very positive about being able to talk to a financial advisor that could help with any immediate enquiries which relates to the theory of social presence and the presence of the avatar. Overall, participants did see potential in the use of Second Life for education however many viewed it as a tool which would be more beneficial for a younger, more 'tech-savvy' generation.

Finally, participants were asked for their general comments and opinions on using Second Life for financial purposes and again their responses were on the whole very positive, even if asserting that they themselves would not use it. These included "*Although I'm a heavy computer user, my only exposure to Second Life has been through these experiments. I associate Second Life with younger people...to me it's more for people who are accustomed to video gaming. It could be a useful tool for building up trust and a relationship with a younger sector of the market*", "*It would be a good thing for helping kids understand how banking works and paying bills*", "*I think it's very clever, I wish I was more into computer games then I would have been more able...I would like to try it again*", "*I enjoyed it...a lot of people can get nervous speaking face-to-face but this way you can speak to an actual person though not necessarily in the flesh, for example a student asking for an overdraft...and there was*

*no queues.” and “It’s the way of the future isn’t it...you’ve got to keep up with all the other companies”.* A number of the comments provided in this section centred around Second Life appealing to younger users and less so to older generations. This may be a result in the discrepancies between the technological capabilities between the different generations as well as the amount of time spent online. Some of the older participants said that it was their lack of technological ability that made them feel that they may not use Second Life though they enjoyed the overall experience which suggests that with increased usage of such online environments older participants may become more comfortable using them for real world purposes. References to continual technological advancements were also made and suggesting that implementing a service within Second Life would project the case bank as being a forward thinking company. Interesting points were made about the benefit of building relationships with customers and how having a presence within Second Life could bring banking to a younger generation who are spending an increasing amount of time online. The presence of the financial agent also played an important role as it increased participants’ sense of trust within an environment that they were not particularly accustomed to, especially when dealing with financial issues or information. Customers mention of the use of the avatar making them more likely to seek financial help or advice and reducing the feeling of nervousness is also an area of interest as it could serve to strengthen the bank’s relationship with its customers if they felt this service made financial advisors and indeed the bank more approachable.

## **5.9 Discussion and Conclusions**

This study details the results of the third experiment in a project involving a series of three large-scale usability experiments focusing on interaction, collaboration and

learning respectively within the on-line virtual world of Second Life. The first experiment, the Interaction Experiment, showed that customers prefer interacting with humanoid avatars when utilising the virtual world of Second Life to carry out tasks relating to financial enquiries. It also showed that the level of anthropomorphism (displayed in financial agent avatars) affects people's social judgements of their interaction partners as well as the levels of perceived usability and social presence experienced. The second experiment, The Collaboration Experiment, assessed the attitudes of customers of the case bank towards collaborating with one another to edit the appearance of a financial agent avatar and choose the features of a credit card within the virtual bank branch in Second Life. The results from this experiment showed that customers prefer communicating using voice (VoIP) rather than instant text messaging when collaborating within the virtual world of Second Life to carry out financial tasks. The communication medium affects people's attitudes towards their collaboration partner (and financial agent) as well as the levels of perceived usability and social presence experienced.

The third experiment, The Learning Experiment, assesses customer attitudes towards using the virtual bank branch to view and learn historical and current information relating to the case bank, with half of the participants viewing the information through text display and the other half viewing it through video stream. Customer's perceived level of 'social presence' was analysed along with the 'immersion', 'escapism', 'relationship' and 'achievement' factors derived from a five-factor model of user motivations in shared virtual environments (Yee, 2006). The 'manipulation' factor from this model incorporated in the previous experiment was not relative to the context of The Learning Experiment. An objective analysis of usability engineering

issues is also provided. The theory of social presence when applied to human-computer interaction provided the basis of this analysis.

The results show both the text display and video stream information delivery methods were rated above neutral, indicating a good design in terms of usability. This therefore shows a clear effect of delivery method on the usability of viewing information and learning within the virtual bank branch in Second Life. The two usability attributes where both versions of the design scored negatively were “concentration” and “prefer real person”. Participants felt that they had to concentrate hard when viewing the information in both conditions, though to a significantly greater extent when viewing through text display than video stream. This finding would have been expected however since the cohort of participants were not generally regular users of Second Life and also due to the new nature of the technology itself. Participants also felt that they would prefer to interact with a real person to a similar degree within both information display conditions. As discussed within the previous two experiments however it should be noted, that such a design as the one employed in the current research would not be designed to replace humans, but would instead be aimed at making banking options available to a wide market who are increasingly spending more and more time logging into and navigating within virtual environments (Hedley, 2006). The one social presence attribute where both versions of the design scored negatively, “using computer to control”, shows that participants within both information display conditions were very aware of using the computer to control their avatar throughout the experiment task. Relating to the need to concentrate hard when viewing the information as discussed above, the fact that the participants involved in this experiment were not regular users of Second Life may also explain their strong

sense of awareness when using the computer functions to control their avatar throughout the tasks.

The main result from the usability attribute analysis of viewing the information in each of the conditions is that overall, although both conditions were rated positively, participants preferred to view the information through video stream through voice ( $p < 0.05$ ). This finding can be supported by the assertion that streaming media such as video and audio can help learners understand complex concepts and procedures that are difficult to explain with simply text and graphics (Klass, 2003). This ability may be thought to be of particular importance in distance learning instruction in that many online courses still use primarily text-based materials to deliver instruction, and multimedia can add interactivity to these stagnant text-based materials (Micheli, 2002). Cognitivists also propose that the additional multi-media can help improve and augment the learning process of students as they see a concept in action.

Further analysis showed that there were no significant between-subject effects of age or gender on total usability levels. In general however, mean scores show that both age groups experienced higher levels of usability in the video stream condition than in the text display condition. More specifically however, the 18-34 year age group experienced higher levels of usability than the 35+ year age group in the text condition whilst the 35+ year age group experienced higher levels of usability than the 18-34 year age group in the video stream condition. Whilst both age groups preferred the video stream display method, the 18-34 year age group may have been more comfortable with the less interactive form of information display than the 35+ year age group who perhaps have lower levels of user experience in the use of

technology. This reflects the idea that older users may be less comfortable with technological learning tools than younger users (Garcia & Qin, 2007), with the older group preferring the immediacy of the information delivery within the video stream condition. It should be noted however that overall mean usability scores were positive for both age groups and there are a number of sociological issues that cannot be overlooked when making assertions about technological ability based on age and they therefore must not be interpreted generally. In terms of gender, although there were no significant overall differences in usability between male and female participants, in the text display condition males experienced lower levels of usability than females. Conversely, in those that experienced the video stream, males experienced higher levels of usability than females. Overall however, both genders experienced higher levels of usability when viewing the video stream than when viewing the text display.

Participants felt that viewing the information through video stream required less concentration ( $p < 0.05$ ), they were less flustered ( $p < 0.05$ ), they felt under less stress ( $p < 0.05$ ), found it less complicated ( $p < 0.05$ ) and felt less frustrated ( $p < 0.01$ ). They also felt more in control when viewing the information ( $p < 0.05$ ), more in control when interacting in the virtual world ( $p < 0.05$ ), that it was less time consuming ( $p < 0.05$ ) and that they understood the information presented to them during the task significantly more ( $p < 0.05$ ). Finally, they also felt that within the video stream condition the information supplied during the task was more reliable ( $p < 0.05$ ) and that the way the information was presented was more efficient ( $p < 0.05$ ).

There were a small number of significant between-subject effects of age and gender along the usability attributes. In terms of age, the 35+ year age group on the whole

would be happier to view the information again than the 18-34 year age group ( $p < 0.05$ ). This result may be surprising based on various other findings within The Learning Experiment, though it should be taken into account that the mean scores for usability along this attribute were positive for both age groups. This finding is encouraging as it suggests that the older age group would be interested in using Second Life for learning within a financial capacity. In terms of gender, female participants reported having to concentrate more when viewing the information than males ( $p < 0.05$ ). Whilst both male and female participants thought that the financial advisor was polite, females rated the financial advisor as being significantly more polite than male participants did ( $p < 0.01$ ). In order to investigate these gender differences in more detail, a larger cohort of participants would be necessary.

There were also significant between-subject effects for the information delivery method\*age and information delivery method\*gender interactions along the usability attributes. In terms of age, within the 35+ year age group participants would be significantly happier to view the information again through video stream than through text display ( $p < 0.05$ ). Participants in the 35+ year age group that experienced the video stream condition rated the financial advisor as being friendlier than those in the text display condition ( $p < 0.05$ ). Overall, within the text condition the 18-34 year age group liked interacting with the financial advisor to a greater extent than the 35+ year age group whilst in the video stream condition the 35+ year age group liked interacting with the financial advisor more so than the 18-34 year age group. In the text display condition, the 18-34 year age group would be happier to use the virtual world again than the 35+ year age group, whilst in the video stream condition the 35+ year age group would be happier to use the virtual world again than the 18-34 year

age group ( $p < 0.05$ ). Overall, the 18-34 year age group would be happier to use the virtual world again in the text condition whilst the 35+ year age group would be happier to use the virtual world again when viewing information through video stream. In terms of using voice to communicate, the 18-34 year age group preferred doing so within the text display condition whilst the 35+ year age group preferred doing so when viewing the information through video stream ( $p < 0.01$ ). The 18-34 year age group also felt that the financial advisor was more polite in the text display condition whilst the 35+ year age group felt that the financial advisor was more polite in the video stream condition ( $p < 0.01$ ). From these between-subjects interactions, it can be seen that along a number of attributes, the 18-34 year age group show a preference for the text display condition whilst the 35+ year age group prefer the video stream condition.

There was one significant between-subject effect for the information delivery method\*gender interaction along the usability attributes. Male participants within the video stream condition would be happier to view the information again than male participants within the text display condition ( $p < 0.01$ ). Conversely, female participants within the within the text condition would be happier to view the information again than the female participants that experienced the video stream condition. To investigate these gender differences in more detail, that is males preferring to view the information through video stream and females preferring to view the information through text, a larger cohort would be needed.

The results of the SVE Social Presence Perception Scale show that whilst overall levels of social presence were greater in the video stream condition than in the text



display condition, this difference narrowly misses being significant. There were also no overall between-subjects effects between the two information display methods in terms of age and gender. Overall, both age groups and genders experienced higher levels of social presence when viewing the information through video display than through text display. There was however a significant between-subjects effect for the information delivery method\* age interaction for overall levels of social presence ( $p < 0.05$ ). The 18-34 year age group reported higher levels of social presence in the text display condition than the 35+ year age group whilst the 35+ year age group reported higher levels of social presence in the video stream condition than the 18-34 year age group. Both age groups scored the two conditions above neutral which would indicate perceived levels of social presence from both age groups within both conditions though again, the 18-34 year age group displayed a preference for viewing the information through text display whilst the 35+ year age group preferred viewing the information through video stream. This finding, along with others within this study might suggest that younger participants prefer a more basic form of information display when using the virtual world of Second Life for learning purposes whilst older participants require a more engaging form of information display such as the video stream with narration and images included in The Learning Experiment. A number of comments included in the exit questionnaire regarding the benefits of the text display method referred to the element of control involved when viewing the information in this way. Controlling the speed at which they viewed the information could perhaps have appealed to younger users since it offers a more immediate form of information delivery, particularly within a financial setting where they may wish to receive information quickly and in a more concise manner than a pre-recorded video might offer. In terms of learning, younger participants may have been more accustomed to

viewing information in text format online than older users who perhaps might not utilise the internet for learning purposes as younger users may.

In the video stream condition, participants liked interacting in the virtual world to a greater extent ( $p < 0.05$ ) as well as significantly more in control when viewing the information ( $p < 0.01$ ). Participants reporting feeling more in control within the video stream may be viewed as surprising based on comments within the exit questionnaire that would suggest one of the benefits of the text display method was being able to go back to view information as well as being able to do so at their own pace. This finding would suggest that the impact of viewing the information through video stream had a positive overall effect on how in control participants felt throughout the task and is supported by research that suggests that social presence not only affects outcomes but also user satisfaction (Moore et al., 1996).

There were significant overall between-subject effects of gender and particularly age along the social presence attributes. In terms of gender, females generally felt like interacting with the financial advisor was a more personal experience than males did. It should be noted however that both genders did find the experience personal (rated above neutral) therefore to investigate this difference in more depth a larger cohort would be needed.

In terms of age, the 35+ year age group reported feeling significantly more alone within the virtual environment than the 18-34 year age group ( $p < 0.05$ ). The 35+ year age group also felt more so that they were interacting with an automated machine and less so that the financial advisor was being controlled by a human than the 18-34 year

age group ( $p < 0.05$ ). The 18-34 year age group also felt that the financial advisor was more responsive towards them ( $p < 0.01$ ) as well as being significantly more reliable ( $p < 0.05$ ) than the 35+ year age group did. Since these significant differences in the attitudes between the two age groups are centred on interaction with the financial advisor, this might suggest that younger age groups are more accepting of the technology, particularly as a medium for communication. Within the exit interview, a number of participants questioned whether or not the financial advisor they were interacting with in the test was a real person, the vast majority of these participants being in the 35+ year age group. Whilst usage of online social networking sites amongst older age groups may be increasing, it is more frequent amongst younger groups and this may be evident in the findings here where younger users were more aware that they were communicating with a real person and felt more socially present during these interactions.

There were also significant between-subject effects for the information delivery method\*age and information delivery method\*gender interactions along the social presence attributes. In terms of age, the 35+ year age group liked interacting within the virtual world to a greater extent than the 18-34 year age group within the video stream condition whilst the 18-34 year age group liked interacting within the virtual world more so than the 35+ year age group within the text display condition ( $p < 0.05$ ). Within the text display condition, the 18-34 year age group enjoyed the role playing aspect of interacting with the financial advisor more so than the 35+ year age group whilst in the video stream condition the 35+ year age group enjoyed the role playing aspect to a greater extent than the 18-34 year age group ( $p < 0.01$ ). Within the text display condition the 18-34 year age group felt significantly more in control than the

35+ year age group when viewing the information within the task ( $p < 0.05$ ) whilst the 35+ year age group felt more in control than the 18-34 year age group when viewing the information via video stream. The 18-34 year age group felt that it was more important to carry out the task to the best of their ability in the text display condition than the 35+ year age group whilst in the video stream condition, the 35+ year age group felt that it was more important than the 18-34 year age group ( $p < 0.05$ ). In the text display condition, the 18-34 year age group felt like they were interacting with a real person to a greater extent than the 35+ year age group whilst in the video stream condition, the 35+ year age group felt like they were interacting with a real person more so than the 18-34 year age group ( $p < 0.05$ ). The 18-34 year age group felt more uneasy interacting with the financial advisor than the 35+ year age group within the video stream condition, whilst in the text display condition, the 35+ year age group felt more uneasy than the 18-34 year age group ( $p < 0.05$ ). These findings suggest that there was a significant effect for the information delivery method\*age interaction with the 18-34 year age group experiencing higher levels of social presence than the 35+ year age group in the text display condition and the 35+ year experiencing higher levels of social presence than the 18-34 year age group within the video stream condition in a number of instances. It should be noted however, that overall levels of social presence were generally higher for both age groups within the video stream condition.

There was one significant between-subject effect for the information delivery method\*gender interaction along the social presence attributes. In the text display condition females felt that like were interacting with a real person to a greater extent than males whilst in the video stream condition males felt like they were interacting

with a real person to a greater extent than females. Since there was no overall effect for gender along this attribute however, a greater number of participants would be needed to investigate any gender differences in attitudes towards interacting with the financial agent.

Overall, levels of usability were significantly higher amongst participants who viewed the information through video stream. Whilst there was no significant difference in levels of perceived social presence between the two information delivery methods, overall levels were generally higher within the video stream condition. The differences in participants overall response scores was not significant, though scores were generally higher amongst participants in the video stream condition. These findings can be supported by the idea that multimedia can add interactivity to more stagnant text-based materials (Michelich, 2002). Cognitivists also propose that the additional multi-media can help improve and augment the learning process of students as they see a concept in action, as with the narration and images incorporated within the video stream in The Learning Experiment. Since the difference in scores was not significant however, this is reflective of previous studies that showed no differences in recall or retention in learners using a multi-media enhanced online training programme versus those using an exclusively text-based system (Luna and McKenzie, 1997; Wegner and Payne, 1994). The benefits of learning, as it were, through video may be seen in the assertion that multimedia learning can promote constructivist learning, that is, learning that occurs when learners seek to make sense of presented material by constructing a coherent mental representation (Mayer, 1999). When discussing the effectiveness of multimedia however, caution may be required since one criticism may be that the literature within this field has not attempted to quantify

the actual advantages of incorporating multimedia in an educational scenario (Lookatch, 1997). Various other studies have found no differences in test scores between participants that took courses that incorporated a) text-only, text with video clips and text with audio of the video clips (Schmeeckle, 2000); b) text-only, video-only, and text with video (Jones, 2002); c) text-only, text with video, and text with still graphic images (Cofield, 2001); or text only and hypermedia (Dillon & Gabbard, 1998). The results from these studies indicated that the use of audio, video, still graphic images and / or hypermedia do not strengthen or enhance learning at a deeper level of understanding. More specifically, this research indicated that the immediate retention of the material was the same regardless of whether or not multi-media were integrated.

Taking the above studies into account, in order to investigate the generally higher level of information recall amongst participants in the video stream condition found within the Learning Experiment, a larger sample of participants would be necessary. In general, the 18-34 year age group experienced higher levels of usability and social presence in the text display condition than the 35+ year age group whilst the 35+ year age group experienced higher levels of than the 18-34 year age group within the video stream condition. This might suggest that the younger age group prefer a more basic form of information display that they can view at their own pace and with more control whilst older users prefer a more multi-faceted form of information display. These findings are supported by studies that have been conducted with older learners that show that in many situations, visual textual explanations may be replaced by equivalent auditory explanations in order to enhance learning (Moreno and Mayer, 2000; Mayer, 2003). Overall however, both age groups experienced higher levels of

usability and social presence within the video stream condition as well as achieving generally higher levels of information recall which would suggest that video stream is a more effective method of delivering financial-based information within the virtual bank branch in Second Life.

### **5.10 Summary**

This chapter details the results of an experiment to assess customer attitudes towards using the virtual bank branch in Second Life to view and learn historical and current information relating to the case bank. In this experiment, half of the customers viewed the information through basic text presentation whilst the other half viewed the information through video stream (voice over and images). The SVE Social Presence Perception Scale was adapted to analyse customer's perceived level of social presence, incorporating the 'immersion', 'escapism', 'relationship' and 'achievement' factors derived from the five-factor model of user motivations in shared virtual environments. The 'manipulation' factor included in the previous experiment, The Collaboration Experiment, was not incorporated in this analysis since it was not applicable to the task scenario or hypotheses. An objective analysis of usability engineering issues was also provided. Customers preferred viewing financial based information through video stream than text display within the virtual bank branch in Second Life. The information delivery method affected peoples attitudes towards interacting within the virtual bank branch as well as usability and overall social presence experienced. Whilst usability levels were significantly higher in the video stream condition, the difference in levels of perceived social presence narrowly misses being significant. Whilst differences in overall response scores were not significant, scores were generally higher in the video stream conditions.

This experiment can go some way towards providing a metric to assess attitudes to perhaps one of the most important features of virtual worlds, education. With many educational institutions and businesses creating a virtual presence in environments such as Second Life it is necessary to develop a reliable metric to assess the way in which users would interact and learn effectively.



## Chapter 6

## Conclusions and Suggestions for Future Work

The research here has examined a new user interface through which a bank can provide a new and innovative service, as well as develop a metric by which the bank can provide customers with the most immersive experience possible when interacting within a persistent online virtual world. The contribution to knowledge extends from the research into customer attitudes towards interaction, collaboration and learning within Second Life and the evidence provided specifically within a financial context, to the development of the SVE Social Presence Perception Scale, a practical metric by which the bank can create the most effective virtual environment for customers. The research provides both objective analysis of usability and subjective analysis of social presence and user motivations when carrying out financial tasks in Second Life. These two key aspects are crucial when customers are interacting within a virtual world in this context and future usage of the virtual bank branch. This analysis provides a body of work that increases the knowledge of customer interactions in virtual worlds within the financial sector and measures customer attitudes.

Many sociological theories, as well as theories from other disciplines, are actively applied to HCI research, with contradicting results. In particular, the theory of social presence is one for which there are many conflicting views and definitions. Since research within virtual environments is still very much in its infancy, caution must be exerted when relating theories previously applied to real world environments and behaviours to those displayed in computer-mediated situations. Behaviours within virtual worlds is a growing area of interest for researchers and companies alike, and analysing these behaviours within their own right as well as incorporating existing theories surrounding them could provide an insight into how to provide the best

experience for users. Taking this into account, elements from a five-factor model of user motivations in virtual environments were also included in the metric developed here. In an attempt to test perceived levels of social presence within a financial setting, the first experiment, The Interaction Experiment, focused on customer's interactions with financial agent avatars within Second Life. This provided the basis for the study since the avatar itself is arguably one of the most important features within a virtual environment. When concentrating on improving customer service within a financial setting, it was necessary to assess attitudes towards the appearance of the avatar and the effect it has on the overall experience before progressing. A questionnaire was developed to assess customer's attitudes towards their interactions with these avatars in order to help create a more immersive experience. At this point in the study it began to emerge that customers were looking for an environment that reflected a real-world financial setting, even within such a setting as Second Life. From the results of this experiment a financial agent avatar design was produced that scored relatively highly in terms of its usability design and the overall levels of social presence it afforded. From this basis the second experiment, The Collaboration Experiment, utilised the most effective financial agent avatar design to assess customer attitudes towards collaborating with each other in Second Life. Assessing attitudes towards collaboration was of importance since this is one of the main attractions for many users of virtual environments and can allow people in geographically dispersed locations to work together via their avatars on shared group interests. Collaborative tasks were carried out through the two dominant modes of communication within Second Life, text messaging and voice (VoIP). Establishing the preferred mode of communication in a financial scenario was the aim of this second experiment. The SVE Social Presence Perception Scale was again developed

upon to show an overall preference in terms of usability and perceived social presence for the voice mode of communication. This experiment was of importance due to the relatively recent introduction of voice to Second Life to establish the most effective way for customers of the bank to communicate. This then led to the third experiment, The Learning Experiment, in which participants communicated through voice only to learn information about the case bank. Two different information delivery methods were tested with mixed and interesting results. The SVE Social Presence Perception Scale was again altered to take into account the nature of the experimental tasks. The results of these three experiments provide the bank with an outline of the most effective environment for customers to carry out various banking tasks within as well as a metric to assess levels of perceived social presence in interaction, collaboration and learning scenarios in Second Life.

The first empirical investigation, The Interaction Experiment, examined the attitudes of customers towards interacting with three different financial agent avatars within the virtual bank branch in Second Life to carry out a series of tasks relating to both real-world as well as 'in-world' Second Life financial enquiries. The participants involved in this study were not Second Life users therefore participants took part in an induction session prior to the experiment in which they were introduced to Second Life and its concepts, as well as receiving the Second Life Journal. Each participant encountered three avatars: an avatar in the form of an unanimated stack of coins, an animated avatar again in the form of a stack of coins, and a humanoid financial agent avatar in two scenarios (real-life and Second Life). The animated coin-stack possessed human-like features (eyes and a mouth) allowing for three levels of comparison in terms of the effect of anthropomorphism on participants perceptions of the avatars and

their resulting experience. Each of the financial agent avatars were controlled by a confederate researcher and responded to basic financial enquiries about an account balance and payments. Participants interacted with each financial agent avatar twice (real-life and Second Life contexts) to carry out a bundle of tasks. The Second Life task scenario was included to provide a stark contrast between customer attitudes towards using Second Life for real world purposes and for 'in-world' purposes. To date, there is currently no evidence of similar studies of this nature conducted in a virtual environment indicating that this field is in need of further research. This investigation embarked on two important avenues of research. Firstly the development of an optimal virtual bank branch design within Second Life relating specifically to the needs of the financial world, and secondly a metric by which the bank can assess levels of perceived social presence experienced by customers to allow them to feel more immersed in their interactions and in turn be more likely to use the virtual bank branch in the future. In this first experiment, the dominant themes from the theory of social presence were incorporated along with the 'immersion' and 'escapism' elements from the five factor model of user motivations. With large corporations and educational institutions displaying interest within Second Life, it is necessary to take the financial presence within the virtual world further and establish how Second Life can be best utilised by banks and for what means. Second Life as a user interface can offer a very personal service to customers since avatars are all controlled by other people where exchanges take place in real time. This investigation also took into account usability which is an important aspect of HCI.

The experimental results of The Interaction Experiment show that all three of the financial agent avatars were rated above neutral for usability, indicating a good

design. Analysis show that overall, participants preferred to interact with the humanoid financial agent avatar. This supports the hypothesis that the level of anthropomorphism (the extent to which an avatar resembles a human being) affects people's social judgements of their interaction partners. The greatest number of differences in terms of usability occurred between the humanoid and the unanimated avatar which would have been expected since these two avatars differed the most in terms of levels of anthropomorphism. One of the dominant findings from this first experiment, combined with participant feedback, suggests that within a financial context, participants felt a more realistic appearance of the financial agent avatar was preferable. When dealing with finances, real-world 'norms' applied in the sense that handling money was deemed to be a serious issue in which the more animated appearance of the financial agent avatar was less appealing and lacked credibility. The same concept also applied to the virtual bank branch itself, with participants commenting that the surreal appearance made them view the scenario as having more of the characteristics of a game than of carrying out a real-world financial task. It should be continually taken into account when analysing the results of all three of the experiments included in this study however that the participants involved were not regular users of Second Life. As a result, they were not as accustomed to the environment and therefore may have held more real-world expectations of what they would consider appropriate or credible when using Second Life for real world purposes.

Of great importance within any financial enquiry or transaction, and increasingly in a novel environment such as Second Life, is how reliable customers believe the information they are receiving to be. Participants reported finding the information

supplied by the humanoid avatar to be the most reliable, whilst information given to them by both the animated and unanimated avatars was perceived as less so. This finding supports the hypothesis that androgynous avatars are perceived as less trustworthy than ones that are clearly either male or female. Interactions with the humanoid were also viewed as more efficient, engaging, satisfying and enjoyable than those with the animated and unanimated financial agent avatars. The humanoid avatar was also rated as being more polite than both the animated and unanimated avatars supporting the anthropomorphism hypothesis as well as the Computers as Social Actors paradigm.

The results of the SVE Social Presence Perception Scale in the Interaction Experiment show that the overall levels of perceived social presence were also greatest during interactions with the humanoid avatar. Participants' level of enjoyment was significantly higher during interactions with the humanoid avatar. Interestingly, participants reported to feeling significantly more alone within the virtual world during interactions with unanimated avatar than during interactions with the humanoid avatar. This would suggest that participants feel a greater level of social presence during interactions with the humanoid avatar that displayed more human-like behaviour as well as features than the unanimated avatar. This brings to attention one of the dominant themes of social presence, being that user's sense that there are other social entities co-situated within some interpersonal environment appear to be greatest in interactions with the humanoid avatar. Throughout interactions with the financial agent avatars, and particularly during interactions with the humanoid financial agent avatar, participants appeared to adhere to real-world 'norms' concerning spatial awareness in terms of the distance to which they positioned their

own avatars when carrying out enquiries. This again emphasises the idea that participants did experience a level of social presence during interactions.

Due to the nature of this study, participant age groups were taken into account throughout. Feedback from the Second Life Journal as well as the exit interview suggests that older participants experienced more difficulties, firstly setting up and installing Second Life in their home computers, as well as subsequently interacting within it. In many cases the 18-34 year age group experienced higher levels of both usability and social presence during interactions with all three of the financial agent avatars than the 35 and over age group. This would suggest an increased acceptance as well as higher levels of experience in the use of technology amongst the younger age group, although this assertion cannot be used generally and a larger number of participants would need to be involved in future studies to test this further.

Since there were no overall significant differences for the levels of usability and social presence experienced by customers between both the Second life and real-life task scenarios, this would suggest that Second Life could act as an effective User Interface Metaphor for the provision of real-world financial services.

The second empirical investigation, The Collaboration Experiment, utilised the preferable humanoid financial agent avatar design from The Interaction Experiment to compare two communication mediums (text messaging and voice - VoIP) within the virtual bank branch in Second Life. Each participant encountered two communication mediums as well as two genders of financial agent avatar. In each encounter participants collaborated with their partner, another customer of the bank logged into



Second Life, to alter the appearance of a financial agent avatar and then choose the features of a credit card for an organisation “to which they both belonged”. It was important to ensure that participants had not previously met or interacted with one another prior to their collaboration to ensure as much as possible an accurate Second Life environment where people in different geographical locations who have never met interact. Having not met in person previously was also important to allow participants to focus on the appearance of the avatars themselves with an aim to increasing the immersive experience of the collaboration and to avoid potentially influencing opinions of their partners. Male and female financial agent avatars were again controlled by confederate researchers who responded (through voice or text as relevant) to enquiries about a range of possible credit card options. The virtual bank branch was also modified to take into account customer preferences, in that even although Second Life contains many surreal features, when dealing with finances, participants on the whole stated a preference for a more “realistic” bank branch. The case bank’s branding was also incorporated within the virtual bank branch to build trust with customers in terms of utilising Second Life for financial means. The SVE Social Presence Perception Scale was also further developed to include the ‘achievement’, ‘relationship’ and ‘manipulation’ factors from the five-factor model of user motivations as they were of particular relevance to the collaboration scenario.

The results showed that both the text messaging and voice modes of communication were rated above neutral for usability, indicating a good, usable design. Analysis shows overall, participants preferred to collaborate through voice (VoIP). These results are consistent with the social agency theory which suggests that social cues in

multimedia messages can encourage people to interpret human-computer interactions as more similar to human-human interactions.

Participants felt that collaborating with their partner through voice was less confusing, less frustrating, more efficient and less time consuming. They also understood the information given to them by the financial agent to a greater extent when collaborating through voice than text messaging and would also be happier to interact with the financial advisor again. They felt that their partner was more polite and friendly and were less intimidated by them in the voice condition. As a result, participants reported that they would be happier to use the virtual world again in the voice condition than in the text messaging condition.

In the voice condition, participants felt more so that they were actually part of the virtual world and felt that their conversations with their partner were more worthwhile as well as feeling that they had more in common with them. They also felt that their partner's opinions were more important as well as finding the experience of collaborating with them a more personal one. They felt that their partner was more competent when collaborating through voice as well as finding it more important to work with them to reach decisions. Participants felt like they were interacting with real people and less like an automated machine when collaborating through voice and more like the financial advisor was being controlled by a human. As a result, participants felt more personally involved in the financial task when collaborating through voice than through text messaging. These findings suggest that the increased number of social cues present when communicating through voice rather than text had

a significant effect upon participant's perceived level of social presence during collaborations with their partner.

The result of The Collaboration Experiment also suggest that participants place emphasis on time and efficiency when using the internet to carry out financial tasks and that the immediate responses and ability to discuss issues more quickly was of importance. Although this finding was not of particular relevance to the aims of the study, it will be noted in future experiment designs.

Overall, although both modes of communication were rated positively, voice was found to be the preferable mode of communication when collaborating on financial tasks within the virtual world of Second Life. The increased number of social cues that interaction through voice affords would appear to increase both usability and social presence experienced by customers. This finding supports previous research that suggests that the capacity that a medium has to transmit social information like facial expressions, or in this case tone of voice, affects people's notion of social presence. In general, the 18-34 year age group experienced higher levels of both usability and social presence during collaborations through both text messaging and voice than the 35+ year age group. This would suggest an increased acceptance as well as higher levels of experience in the use of technology amongst the younger age group. This finding supports research that shows 18-34 year olds (predominantly male) to be the most frequent users of computer games. Although in many cases, Second Life is not considered a 'game' as such due to its persistent and collaborative nature.

It should be noted that the one social presence attribute where both versions of the design scored negatively however was “using computer to control avatar” showing that participants were very aware of using their computer to control their avatar. This finding would have been expected however since the cohort of participants were not generally regular users of Second Life and also due to the new nature of the technology itself.

The final empirical experiment, The Learning Experiment, utilised the preferable mode of communication (voice) as determined in The Collaboration Experiment to compare two information display methods (basic text display and video stream) within a virtual bank branch in Second Life. Customer’s perceived level of ‘social presence’ was analysed along with the ‘immersion’, ‘escapism’, ‘relationship’ and ‘achievement’ factors derived from a five-factor model of user motivations in shared virtual environments. The ‘manipulation’ factor from this model incorporated in the previous experiment was not relative to the context of The Learning Experiment and was therefore excluded. An objective analysis of usability engineering issues was also provided. The aim of this experiment was to assess customer attitudes towards viewing and learning historical and current information relating to the case bank. In this between-subjects design, half of the participants viewed information through basic text presentation and the other half viewed the information through video stream (voice over and images). Each participant took part in the experiment individually to carry out one set of tasks within the virtual bank branch, during which they would also be interacting with a humanoid financial agent avatar. The financial agent avatar was again controlled by a confederate researcher who communicated with the participant through voice. The financial agent avatar was humanoid in appearance as

was found preferable in The Interaction Experiment and also used in The Collaboration Experiment. The set of tasks consisted of two stages in which participants will view both a 'history' and a 'present' presentation of information relating to the case bank. After each of the presentations the financial agent asked the participant three basic questions based on the information they have just viewed and their responses were recorded in order to test information recall levels within each condition.

The results show that both the text display and video stream information delivery methods were rated above neutral for usability, indicating a good, usable design. Analysis shows overall, participants preferred to view information through video stream. These results are consistent with the theory that multimedia can add interactivity to more stagnant text-based materials. They can also be supported by the assertion that streaming media such as video and audio can help learners understand complex concepts and procedures that are difficult to explain with simply text and graphics. This ability may be thought to be of particular importance in distance learning instruction in that many online courses still use primarily text-based materials to deliver instruction, and multimedia can add interactivity to these stagnant text-based materials. Cognitivists also propose that the additional multi-media can help improve and augment the learning process of students as they see a concept in action.

Participants felt that they had to concentrate hard when viewing the information in both conditions, though to a significantly greater extent when viewing through text display than video stream. This finding would have been expected however since the

cohort of participants were not generally regular users of Second Life and also due to the new nature of the technology itself.

The results of the Social Presence Perception Scale also show both information delivery methods as rated above neutral. Whilst overall levels of social presence were greater in the video stream condition than in the text display condition, this difference narrowly misses being significant.

The one social presence attribute where both versions of the design scored negatively, “using computer to control”, shows that participants within both information display conditions were very aware of using the computer to control their avatar throughout the experiment task. Relating to the need to concentrate hard when viewing the information as discussed above, the fact that the participants involved in this experiment were not regular users of Second Life may also explain their strong sense of awareness when using the computer functions to control their avatar throughout the tasks.

The differences in participants overall response scores was not significant, though scores were generally higher amongst participants in the video stream condition. Information recall only acted as an indicator of how effective each presentation method is in delivering information within Second Life with the main focus of this research being on customer attitudes towards learning within this environment and context. In order to investigate the generally higher level of information recall amongst participants in the video stream condition found within the Learning Experiment, a larger sample of participants would be necessary.

In general, the 18-34 year age group experienced higher levels of usability and social presence in the text display condition than the 35+ year age group whilst the 35+ year age group experienced higher levels of social presence than the 18-34 year age group within the video stream condition. This might suggest that the younger age group prefer a more basic form of information display that they can view at their own pace and with more control whilst older users prefer a more multi-faceted form of information display. These findings are supported by studies that have been conducted with older learners that show that in many situations, visual textual explanations may be replaced by equivalent auditory explanations in order to enhance learning. In a number of instances, the 35+ year age group experienced higher levels of usability and social presence than the 18-34 year age groups. This finding is encouraging as it suggests that the older age group would be interested in using Second Life for learning within a financial capacity. Overall however, both age groups experienced higher levels of usability and social presence within the video stream condition as well as achieving generally higher levels of information recall which would suggest that video stream is a more effective method of delivering financial-based information within the virtual bank branch in Second Life.

In this series of experiments, the one usability attribute that was scored negatively throughout study was “real person preference”, showing that overall participants would prefer to interact with a human. It should be noted however, that such designs as the ones employed in the current research would not be designed to replace humans, but would instead be aimed at making banking options available to a wide

market that are increasingly spending more and more time logging into and navigating within virtual environments.

This series of studies has resulted in the development of the SVE Social Presence perception scale. This could be considered to be an important contribution to research into virtual worlds since there is currently no widely used practical metric to assess user attitudes and levels of perceived social presence when interacting within Second Life and other virtual environments for real world purposes that also incorporates a measure of user motivations. Whilst other researchers might assess different forms of human behaviour or base their metric on an alternative definition of what constitutes social presence, the metric presented in this work could provide a basis for future studies within virtual environments. With usage of virtual environments continually increasing and many businesses and educational institutions observing them as providing exciting and novel opportunities to reach students and customers, a metric that can provide an insight into user attitudes towards interacting within them as well as what elements may encourage future usage may prove beneficial. This metric has been developed to incorporate, at various stages, all of the factors from the five-factor model of user motivations. Depending on the particular behaviour being measured however, this metric can be adapted for further research to be specific to a number of scenarios in virtual environments. This metric can also be used in assessments of other collaborative virtual environments as well as Second Life where various forms of human behaviour can be observed.

Future research would involve a larger cohort of participants in order to achieve a more statistically valid set of results. As mentioned throughout the discussion within



this chapter, this research involved customers of the case bank who were not regular Second Life users. The results of these experiments were encouraging in that attitudes towards using Second Life for real world financial tasks was generally very positive despite their lack of experience. Since the majority of the participants were continuously involved in the three experiments within the study, their experience and indeed interest grew throughout the process. Much of the qualitative data suggested that customers would view a business with a virtual presence as being innovative and forward thinking. With such environments still being very much in their infancy however, companies and educational institutions may still be uncertain as to what they can gain from a virtual presence within environments such as Second Life. Aside benefits related to advertising, the research presented here seeks to go some way to providing a basis for further research to establish a means by which companies can assess how Second Life can benefit them. Having assessed behaviours relating to interaction, collaboration and learning within a financial context, which could be deemed a particularly sensitive context when dealing with the serious nature attached by many to finances, the case bank can create the most effective, credible and aesthetically pleasing environment for their customers to interact within. Other companies and institutions may adapt the metric presented here to achieve the optimum environment for their demographic.

One particular suggestion to the case bank for further research would be to incorporate interaction, collaboration and learning into a single experiment in a forum scenario. This research could be conducted with employees of the case bank or customers. Employees are in many instances given work that has to be completed online at home. Second Life could provide an environment in which colleagues could

interact in a number of geographical locations via their avatars to work together to achieve end goals and solutions, therefore incorporating all three themes of the aforementioned experiments. Second Life can provide a more interactive, immersive and in many cases more enjoyable experience for employees than carrying out similar work via a 2D website. The presence of the avatar and being able to customize it can make the experience a more personal and enjoyable one and encourage colleagues to become more involved in the work. Likewise, a separate experiment could involve creating a forum for customers of the case bank where they could discuss financial issues and concerns with other customers within a less formal environment, and again via their avatar which may encourage increased interaction, as outlined in the theory of online disinhibition. Whilst the 'game-like' element of Second Life, although the majority of users do not view it as a game, may encourage people to be more relaxed and forthcoming in their interactions, it also has to be taken into account that with virtual environments still very much in their infancy, it may be some time before usage becomes common-place. As previously noted, such reservations were evident in the 1990's with the Internet, with many being apprehensive about its' widespread usage. This same concept may be apparent in attitudes towards virtual environments, though with a growing user base and the ever increasing blur between the real and the virtual, it may be of interest to companies to look at the various ways in which a presence within Second Life and such persistent online virtual environments may benefit their customer base, employees and them as a whole.

In summary the research reported provides evidence for the thesis that the persistent online virtual world of Second Life can act as a valid and effective user interface metaphor for the financial services sector.

The work presented throughout this book has contributed to the knowledge of virtual environments, in particular Second Life, and has attempted a practical metric by which a bank could effectively create an optimum virtual environment to provide a new and innovative service for its customers. The main conclusion that can be drawn from this research is that this field is still very much in its infancy and a growing body of research will allow for a more effective assessment of human behaviour within virtual environments. The results from this thesis along with the development of the SVE Social Presence Perception Scale have assisted to some degree in filling the gap in measuring attitudes of customers in these novel environments. Financial institutions and companies alike can use these results and turn them into practical tools to create a virtual environment for customers or staff to interact within that can project them to the forefront of technological innovation and add to a reputation as an ever developing and forward thinking company.

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# Appendix 1

## Second Life Journal

Participant ID: 101

As part of the introduction to our research within Second Life, we would like you to keep a Second Life Journal. Within this, you are able to record your opinions and observations on the assigned tasks, or any interactions within the environment in general, during these following 1 - 2 weeks before the experiment takes place.

This Journal is aimed at gathering general attitudes and opinions towards your usage of Second Life and is in no way a test of yourself.

The tasks contained within the Second Life Journal are designed to familiarise you with the environment of Second Life prior to the date of the experiment. Also included, is a list of instructions on installing Second Life on your home PC as well as guidelines on how to carry out the basic functions within this virtual world.

You will have already created your own **avatar** (virtual character) and been introduced to Second Life by a CCIR researcher in your induction session and can now move on to exploring the environment yourself.

Second Life avatar name:

Password:

### Useful Information

Telephone: 07772 818 928  
Email: [SLSupport@ccir.ed.ac.uk](mailto:SLSupport@ccir.ed.ac.uk)

## Installing Second Life on your home PC

### Step 1

Go to webpage [www.secondlife.com](http://www.secondlife.com)

### Step 2

At the right hand side of the Second Life home page, go to the 'Explore Second Life' section and click on 'Downloads'.

This will then take you to the 'Community: Downloads' page.

Under the 'Second Life Installer' section, select 'Download' next to:

**Windows 2000 / XP: 1.18.2.1 (33 MB)** if you are using Windows

Or

**Mac OS x: 1.18.2.1 (70 MB)** if you are using a Mac computer.

Following this, select 'Run' and follow the simple instructions to install this on your home PC.

### Step 3

When Second Life is installed on your computer, the Second Life logo will then appear on your desktop in the image of a hand.

Click on this logo and enter your username and password, previously noted in you Second Life Journal (and also in the email sent to your personal email address) to enter the virtual world of Second Life.

**\* If you experience any problems with installation contact:**

[SLSupport@ccir.ed.ac.uk](mailto:SLSupport@ccir.ed.ac.uk) or 07772 818 928

## **Keeping your Journal**

*Each time you login to Second Life, whether you are completing a specific task or generally exploring, please note it, along with any general comments in your Second Life Journal. See the examples below:*

<b>Date</b>	<b>Task / Activity</b>	<b>Observations / Comments</b>
<i>08/06/07</i>	<i>Flying</i>	<i>I found it straight forward</i>
<i>11/06/07</i>	<i>Having a conversation with another avatar</i>	<i>It was an enjoyable experience</i>
<i>13/06/07</i>	<i>Walking</i>	<i>I thought it was slow and frustrating, I would prefer to fly</i>

## Guidelines

Here are a few pointers to keep in mind for your Second Life Journal:



The activities contained within this Journal are aimed at familiarizing you with Second Life prior to the experiment. It is recommended that over the 1-2 week period after your induction session, that you explore Second Life on a minimum of three occasions. You may note down the activities / tasks as and when you perform them, or whenever you have the time.



If you are unsure about any aspects of using your Second Life Journal, please contact me:  
Telephone: 07772 818 928 (9am-5pm, Mon-Fri)  
Email: [SLSupport@ccir.ed.ac.uk](mailto:SLSupport@ccir.ed.ac.uk)



All details and information provided in your Second Life Journal will be kept in strict confidence and not shared with anyone outside CCIR.



**Never** write in your Second Life Journal any information that may relate to your personal bank account details and/or PIN/Password.

## Task List

\*To get the most from your experience within the experiment, the following tasks are recommended.

Task	
*Walk up and back down some steps	
*Fly up to a building and fly back down to your original position	
*Hold conversation with another avatar via text in open area	
*Hold conversation with another avatar via instant message (text also)	
*Sit down and stand back up again ( <i>click on seating area to bring up pie menu and select option</i> )	
Teleport to another location using the map	
Click on an object and save information card to your inventory	
Interact with an object ( <i>click on object to bring up pie menu and select option</i> )	

**For instructions on how to carry out the above tasks as well as recommended Second Life areas to visit, see pgs 13 & 14 of your Journal.**

Date	Task / Activity	Observations/ Comments

## About Second Life

Since the turn of the 21<sup>st</sup> Century, a number of social networking sites have evolved, offering a new generation of interactive tools through which Web users can communicate on a global scale. Such sites include MySpace, Facebook, Bebo and YouTube<sup>25</sup>. The popularity of these sites has resulted in a continual stream of media scrutiny, assessing both the positive and negative implications of such tools. They could perhaps also be credited with playing a role in reducing the element of ‘social stigma’ traditionally attached to online communities. Media representations have been prompted by a number of organisations and businesses that have entered this virtual world, including Harvard University, Stanford University, Adidas and Sony BMG. However, despite this wide-scale interest, there remains an array of sociological issues associated with virtual networking which merit study. Issues include parallels and differences between online and real world behaviour, relationship formation, community, gender, sexuality, in-world economies and avatar creation.

Second Life (SL) is an Internet-based virtual world, launched in 2003 by Linden Labs in San Francisco. It is only recently, however, that Second Life has come to international attention through a number of media representations in late 2006 and early 2007. Users, more commonly referred to as ‘residents’, are able to interact with one another through virtual representations known as avatars, providing an advanced level of a social network service combined with general aspects of a metaverse. Residents can explore, meet other residents, participate in individual and group activities and create and trade items and services from one another in a 3D virtual world. At present, a total of some seven million resident accounts have been created with trading in the region of some \$1.5 million per day. Second Life has its own virtual currency, the Linden Dollar (L\$), and is exchangeable for US dollars in a marketplace consisting of residents, Linden Lab and real-life companies.

A number of these Internet-based virtual worlds exist and continue to grow in popularity, of which the most prolific include Active Worlds<sup>26</sup>, There<sup>27</sup> and World of Warcraft<sup>28</sup>. These virtual environments are often referred to as Massively Multitplayer Online Games (MMOGs or MOGs) and provide a persistent 3D environment in which users can interact. What sets Second Life apart from a number of the other virtual worlds, however, is that there are no set goals or objectives which users are required to achieve (e.g. to move on to another level), as is often the case in environments such as World of Warcraft. Instead, the focus in Second Life appears to be predominantly on interaction, as well as in-world creation, which can be seen in the creation of virtual property in particular.

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<sup>25</sup> [www.myspace.com](http://www.myspace.com)  
[www.facebook.com](http://www.facebook.com)  
[www.bebo.com](http://www.bebo.com)  
[www.youtube.com](http://www.youtube.com)

<sup>26</sup> [www.activeworlds.com](http://www.activeworlds.com)

<sup>27</sup> [www.there.com](http://www.there.com)

<sup>28</sup> [www.worldofwarcraft.com](http://www.worldofwarcraft.com)

## Second Life Functions

Second Life's main screen features a top bar and bottom bar. The bottom bar features a row of buttons. The following is a summary of the functions of each from left to right:

<i><b>Function</b></i>	<i><b>Description</b></i>
IM	Click on this button to open the Instant Message panel. If you have unread IM's from other Second Life residents
Chat	Opens the Chat box for typing text, but pressing the enter key is much simpler and has the same effect
Friends	Opens a panel listing all the Second Life people who have agreed to be your friend and tells you which are currently online
Fly	The most convenient option for flying is to use the 'Page Up' and 'Page Down' keys along with the arrow keys on your keyboard to control and change the direction of flying. Alternatively, clicking on the Fly button lets you set to Fly mode, and clicking the stop option will cease this animation.
Walk	Use the arrow keys on your keyboard.
Snapshot	Opens the Snapshot Preview panel for taking snaps of the virtual world.
Build	Opens the Build panel, and it is only active if the land that you are on allows building (a sandbox area, your own land)
Mini-Map	Opens a mini-map in the upper right corner of the screen, useful if you are trying to find your way around.
Map	This opens a resizable, re-scaleable map of the Second Life world. It includes Search functions and also allows you to teleport your avatar to another location by double clicking on any spot.
Inventory	Opens the Inventory panel where you can store items as well as useful information cards picked up around Second Life.

\*Further to these functions, right clicking on almost anything within Second Life will bring up a pie menu. The menu's options are context sensitive and depend on the properties of what you clicked on.



## Popular areas within Second Life

- **Ahern** – Main welcome area at which new residents enter Second Life. More experienced Second Life users often visit this area to help new residents become more familiar with their surroundings and answer and questions.
- **Kuula** – New Citizens Plaza within Kuula is a good starting point for new residents also, where much information and free items can be found.
- **Isabel**
- **The Edge**
- **Spaceport**
- **The Future**
- **Starlight Isle**
- **Fairchang Island**
- **Couture Isle**
- **Abbotts**
- **Midnight City**

## Appendix 2

### Usability Questionnaire

<b>Participant ID:</b> <b>Date:</b>
--

*This questionnaire relates to the financial advisor you have just used interacted with.*

*Please tick the box which most closely represents how you feel about each of the following statements.*

1. I thought that interacting with the financial advisor was confusing.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. I had to concentrate hard when interacting with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. I was flustered when interacting with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. I felt under stress whilst interacting with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. I thought interacting within the virtual world was complicated.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. I felt frustrated when interacting with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. I felt in control when interacting within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. I thought the financial advisor was competent in supplying the necessary information.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. I felt that interacting with the financial advisor took too long.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. I found it difficult to interact within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. I thought the financial advisor communicated clearly.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. I understood the information the financial advisor gave me during the interaction.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. I would be happy to interact with the financial advisor again.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. The virtual world was suited to the financial task.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. I think the information supplied during the interaction was reliable.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. The financial advisor helped me feel engaged within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. I thought that the interaction with the financial advisor was efficient.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. I found the interaction with the financial advisor satisfying.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. I thought that the financial advisor was friendly.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. I didn't like using text to communicate with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. I would be happy to use the virtual world again.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. I enjoyed interacting with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. I thought the financial advisor was polite.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24. I felt intimidated by the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25. I would prefer to interact with a real person.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

26. The appearance of the financial advisor distracted me from carrying out my task.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Appendix 3

Participant ID:  
Date:

### SVE Social Presence Perception Scale

*This questionnaire relates to the financial advisor you have just used interacted with.*

*Please tick the box which most closely represents how you feel about each of the following statements.*

1. I felt as though I was actually part of the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. I disliked the feeling of interacting in the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. I enjoyed the role-playing aspect of carrying out the financial task.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. I enjoyed the role-playing aspect of interacting with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. I felt that my avatar had its own life story.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. I felt that my avatar had its own personality.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. I disliked the escapism element of the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Interacting within the virtual world let me forget some of the real-life problems I may have.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. Interacting within the virtual world let me relieve stress from my daily life.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. I felt that other people were with me within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. I felt that other avatars were present within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. I felt all alone within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. I felt like I was interacting with a real person.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. I felt like I was interacting with an automated machine.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. I felt that the financial advisor was being controlled by another human being.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. I thought the financial advisor's appearance was unrealistic.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. I thought the financial advisor's behaviour was realistic.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. I thought the virtual branch was realistic.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. I thought the financial advisor was visually unappealing.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



20. I thought the financial task was unrealistic.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. I thought this interaction with the financial advisor was impersonal.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. I felt uneasy interacting with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. I feel that the financial advisor was responsive to me.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24. I felt like I was interacting with an object rather than a person.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25. I felt present within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

26. I felt personally involved in the financial task.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

27. I thought that the financial advisor was intelligent.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

28. I thought that the financial advisor was informed.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

29. I thought that the information that the financial advisor gave me was unreliable.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# Appendix 4

## Exit Questionnaire

<b>Participant ID:</b> <b>Order:</b> <b>Date:</b>
---

**1. You interacted with three different financial advisors within Second Life today. (show screen shots)**

**a. Was there anything in particular that you liked about the humanoid financial advisor that you interacted with today?**

.....  
.....

**b. Was there anything about that version that you disliked, or thought could be improved?**

.....  
.....

**2.a. Was there anything in particular that you liked about the animated coin-stack financial advisor that you interacted with today?**

.....  
.....

**b. Was there anything about that version that you disliked, or thought could be improved?**

.....  
.....

**3.a. Was there anything in particular that you liked about the unanimated coin-stack financial advisor that you interacted with today?**

.....  
.....

**b. Was there anything about that version that you disliked, or thought could be improved?**

.....  
.....

**4. Did you feel that any one of the three versions of financial advisor provided a better service than the others, (in terms of speed of use, ease of use, or enjoyment of the service) if so why?**

.....  
.....

**5. Thinking about the appearance of the financial advisors you interacted with today, which did you prefer? (Show screen shots in order)**

- Humanoid**
- Animated Coin-stack**
- Unanimated Coin-stack**
- None**

**Why**.....

**6. Overall, can you rate (your preference for) the three financial advisors you interacted with today?**

**Place the magnets along the ruler scale between ‘Very Poor’ and ‘Excellent’.**

**Record the order and positions to the nearest 0.5cm**

<b>Version</b>	<b>Measurement (cm)</b>	<b>Order</b>
<b>1</b>		
<b>2</b>		
<b>3</b>		

**7. You experienced two types of payment enquiry scenarios; one relating to a real-world purchase and the other to a Second Life ‘in-world’ purchase.**

**a. What did you think about the real-world payment enquiry scenario? (If necessary, prompt participant on how relevant or useful they found it to be).**

.....  
 .....

**b. What did you think about the Second Life ‘in-world’ payment enquiry scenario?**

.....  
 .....

**8. You also experienced two types of balance enquiry scenarios; one relating to a real-world account and the other to a Second Life ‘in-world’ account.**

**a. What did you think about the real-world balance enquiry scenario?**

.....  
 .....

**b. What did you think about the Second Life ‘in-world’ balance enquiry scenario?**

.....  
 .....

**9. What did you think about the virtual bank branch in which you interacted?**

*(prompt participant to elaborate in appearance and ease of use etc.)*

.....  
.....

**10. What would you say your motivations for using a service like the one you experienced today would be? (Can offer the options if participant is struggling)**

Time saving  Wouldn't use them

Easier  Would use it only if I had to

Prefer Computers  Other (please state)

Like the Technology  .....

**11. For what purpose would you be most likely to use such a service (like the one you experienced today)?**

Checking Balance  Requesting Information

Ordering Chequebooks  Transferring money

Making Payments  Set-up, Change or Cancel Standing Order   
Or Direct Debits

Other   
.....

**12. Prior to completing this experiment, you were asked to complete a number of tasks within the Second Life Journal. Did you find this exercise helpful? Why?**

.....  
.....

**13. Do you think the Second Life is an effective tool for socializing? (encourage participant to elaborate)**

.....  
.....

**14. Do you feel that you could make good friends within Second Life? Why?**

.....  
.....

**15. Did you enjoy creating your own avatar within Second Life? Why?**

*(Encourage elaboration on which particular aspects they enjoyed)*

.....  
.....

**16. Do you feel that you created your avatar as a representation of yourself?**

*(Encourage elaboration on appearance, personality etc.)*

.....  
.....

**17. Did you feel like you could try out new roles and personalities through your Second Life avatar?**

.....  
.....

**18. Did you feel that elements of Second Life were realistic?**

.....  
.....

**19. Did you feel like you were part of a story within Second Life?**

.....  
.....

**20. Did you enjoy the escapism aspect of Second Life? Why?**

.....  
.....

**21. Do you think Second Life could act as a platform for learning and education?**

.....  
.....

**22. When exploring Second Life, did you prefer to do so alone, or did you focus more on interacting and collaborating with others? Why?**

.....  
.....

**23. Prior to your induction session, had you previously heard of or did you have your own account within Second Life?**

.....  
.....

**24. After your induction session, did you discuss or recommend Second Life to anyone?**

.....  
.....

**25. How often, on average would you say you logged into Second Life after your induction session and for what lengths of time?**

.....  
.....

**26. Do you think that you will be likely to use Second Life for your own personal use in the future?**

.....  
.....

**27. Finally, do you have any other comments you would like to add?**

.....  
.....

## Appendix 5

Name: **James Smith**

Security Number: **73 45 28**

### A

You have purchased a wide-screen television from Currys on Princes Street in Edinburgh at the cost of £1,800 on 30<sup>th</sup> August 2007.

Your real-world bank has its own virtual branch within Second Life. You want to find out if this money has been taken out of your real-world bank account.

Enter the virtual branch and talk to the financial advisor by using instant messaging to **check if the sum of £1,800 has been taken out of your real-world bank account.**

*Participant will have carried out the above enquiry through instant messaging.*  
**Confederate response A** *(through instant message option)*

Certainly, I can access that information for you.  
Can I take your real name please?  
And can I take the 1<sup>st</sup> and 3<sup>rd</sup> digit from your security number please?  
*(Once this information is received, proceed with enquiry information)*  
Yes, the sum of £1,800 was taken out of your real-world bank account on 2<sup>nd</sup> September.  
Is there anything else I can help you with today?  
*(Participant will proceed to task B)*

### B

On 2<sup>nd</sup> September 2007 you paid £300 into your real-world bank account.

Your real-world bank has its own virtual branch within Second Life. You want to find out the new balance of your real-world bank account.

Enter the virtual branch and talk to the financial advisor by using instant messaging to **check the new balance of your real-world bank account.**

*Participant will proceed with part B of the enquiry.*  
**Confederate response B** *(don't need name or security number)*

Certainly, I can access that information for you.  
The new balance of your real-world bank account is £1,852.  
Is there anything else I can help you with today?  
*(Thank participant for using the virtual bank branch).*



Security Number: **28 46 93**

## **A**

You have purchased a home for your avatar on 'Dreamland Island' in Second Life at the cost of L\$1,536 from 'Virtual Property Ltd.' on 28<sup>th</sup> August 2007.

You want to find out if this in-world money has been taken out of your virtual bank account.

Enter the virtual bank branch and talk to the financial advisor by using instant messaging to **check if the sum of L\$1,536 has been taken out of your virtual bank account.**

*Participant will have carried out the above enquiry through instant messaging.*

**Confederate response A** (*through instant message option*)

Certainly, I can access that information for you.  
*(do not ask for name)*  
And can I take the 1<sup>st</sup> and 6th digit from your security number please?  
*(Once this information is received, proceed with enquiry information)*  
Yes, the sum of L\$1,536 was taken out of your virtual bank account on 1<sup>st</sup> September.  
Is there anything else I can help you with today?  
*(Participant will proceed to task B)*

## **B**

On 2<sup>nd</sup> August 2007 you paid L\$263 into virtual bank account.

You now want to find out the new balance of your virtual bank account.

Enter the virtual branch and talk to the financial advisor by using instant messaging to **check the new balance of your virtual bank account.**

*Participant will proceed with part B of the enquiry.*

**Confederate response B** (*don't need security number again*)

Certainly, I can access that information for you.  
The new balance of your virtual bank account is L\$798.  
Is there anything else I can help you with today?  
*(Thank participant for using the virtual bank branch).*

## Appendix 6

### Confederate Script

**Collect version sheet and participant avatar name (to allow them access to CCIR area)** from researcher and check which **level** of the virtual bank branch the interaction is taking place.

Check **avatar order** and **log in** with corresponding avatar (see sheet with avatar names and passwords). **‘Teleport’ to corresponding level of virtual bank branch** (*all avatars will have been logged in to the correct level previously and will appear at the correct level automatically*).

Have **participant task sheets with confederate responses** at hand.

Station financial agent avatar at desk area

.....

***Participant enters virtual bank branch:***

*Financial agent avatar response:*

**Animated (A)** and **Humanoid (H)** financial agent avatars move closer to the participant to greet them on entry.

**Unanimated (U)** financial agent avatar remains in desk area when greeting.

“Hello, welcome to the virtual bank branch.”

“How can I help you today?”

Wait for participant response

Check **version order** collected from the researcher for order of tasks with corresponding confederate responses (R1 – R3, S1-S3)

***At the end of enquires A and B:***

**Animated (A)** and **Humanoid (H)** financial agent avatars accompany participant to the branch door.

**Unanimated (U)** financial agent avatar remains in desk area on their departure from the virtual bank branch.

.....

\*If participant deviates from the script politely instruct them you cannot access that information at present.

\*R1 – R3 = real-world financial enquiries.

S1 – S3 = Second Life financial enquiries.

\*Only ask for participants ‘real’ name in the real – world enquiries (R1-R3)

## **Appendix 7**

### ***Attribute Analysis: Usability Questionnaire (The Interaction Experiment)***

#### **Usability Attribute – “Confusion”**

##### **Second Life task**

There is a significant difference between the three financial agent avatars within the Second Life financial task context for the usability attribute “confusion” ( $p=0.003$ ). The humanoid financial agent avatar was rated the least confusing to interact with within this task context ( $M=5.33$ ), followed by the animated financial agent avatar ( $M=5.15$ ) with the unanimated financial agent avatar being the most confusing to interact with ( $M=4.79$ ).

There is also a significant within-subject effect for Confusion Second Life\*gender interaction ( $p=0.021$ ). Females rated the Second Life task interactions as less confusing with the humanoid financial agent avatar than males. Males on the other hand, experienced less confusion during interactions with the unanimated financial agent avatar than females within this financial task context.

There is also a significant within-subject effect for Confusion Second Life\*version interaction ( $p=0.035$ ) showing that the order of which participants were exposed to the financial agent avatars had a significant effect upon the levels of confusion experienced when carrying out the Second Life financial tasks.

There were no significant effects of age group on the usability attribute “confusion” within the Second Life financial task context.

### **Real-life task**

There is a significant difference between the three financial agent avatars within the real life financial task context for the usability attribute “confusion” ( $p=0.015$ ). The humanoid financial agent avatar was rated the least confusing to interact with within this task context ( $M=5.46$ ), followed by the animated financial agent avatar ( $M=4.92$ ) with the unanimated financial agent avatar being the most confusing to interact with ( $M=4.83$ ).

There were no significant effects of age group, gender or version order on the usability attribute “confusion” during the real-life task interactions.

### **Usability Attribute – “Concentration”**

#### **Second Life task**

There is a significant difference between the three financial agent avatars within the Second Life financial task context for the usability attribute “concentration” ( $p=0.013$ ). Participants reported having to use less concentration during interactions with the humanoid financial agent avatar within this task context ( $M=4.92$ ), followed by the animated financial agent avatar ( $M=4.77$ ) with the most concentration required during interactions with the unanimated financial agent avatar ( $M=4.60$ ).

There is also a significant effect for Concentration Second Life\*age interaction ( $p=0.038$ ). The 35+ year age group had to concentrate harder than the 18-34 year age group when carrying out Second Life financial tasks with all three versions of the financial agent avatar.

There is also a significant effect for Concentration Second Life\*version interaction ( $p=0.019$ ) showing that the order of which participants were exposed to the financial advisor avatars had a significant effect upon the levels of concentration participants felt they had to use when carrying out the Second Life financial tasks.

There were no significant effects of gender on the usability attribute “concentration” within the Second Life financial task context.

### **Real-life task**

There are no significant within-subject effects on the usability attribute “concentration” between the three financial agent avatars in the real-life financial task context. Participants in general however required the lowest levels of concentration when carrying out real-life financial tasks during interactions with the humanoid financial agent avatar ( $M=5.10$ ) followed by the animated financial agent avatar ( $M=4.96$ ) with the highest levels of concentration required when interacting with the unanimated financial agent avatar ( $M=4.60$ ) within this task context.

There were also no significant effects of age group, gender or version order on the usability attribute “concentration” within the real-life financial task context.

### **Usability Attribute – “Flustered”**

#### **Second Life task**

There are no significant within-subject effects on the usability attribute “flustered” between the three financial advisor avatars within the Second Life financial task context. Participants in general however were the least flustered during Second Life

financial task interactions with the humanoid financial agent avatar (M=5.33), followed by the animated financial agent avatar (M=5.15) and the most flustered interacting with the unanimated financial advisor avatar (M=5.00).

There were also no significant effects of age group, gender or version order on the usability attribute “flustered” within the Second Life financial task context.

### **Real-life task**

There is a significant difference between the three financial agent avatars within the real-life financial task context for the usability attribute “flustered” ( $p=0.007$ ). Participants were the least flustered during real life financial task interactions with the humanoid financial agent avatar (M=5.29), followed by the animated financial agent avatar (M=5.04) and the most flustered interacting with the unanimated financial agent avatar (M=4.88).

There is also a significant effect for Flustered Real Life\*version interaction ( $p=0.020$ ) showing that the order of which participants were exposed to the financial advisor avatars had a significant effect upon how flustered participants felt when carrying out the real-life financial tasks.

There were also no significant effects of age group or gender or on the usability attribute “flustered” within the real-life financial task context.

## **Usability Attribute – “Stress”**

### **Second Life task**

There are no significant within-subject effects on the usability attribute “stress” between the three financial agent avatars within the Second Life financial task context. Participants in general however reported experiencing less stress during Second Life financial task interactions with the humanoid financial agent avatar (M=5.46), followed by the animated financial agent avatar (M=5.23) and the most stress interacting with the unanimated financial agent avatar (M=5.06).

There were also no significant effects of age group, gender or version order on the usability attribute “stress” within the Second Life financial task context.

### **Real-life task**

There is a significant difference between the three financial agent avatars within the real-life financial task context for the usability attribute “stress” ( $p=0.002$ ). Participants reported experiencing the least amount of stress during real-life financial task interactions with the humanoid financial agent avatar (M=5.56), followed by the animated financial agent avatar (M=5.35) and the most flustered interacting with the unanimated financial agent avatar (M=4.94).

There is also a significant effect for Stress Real Life\*age interaction ( $p=0.028$ ). The 35+ year age group reported experiencing more stress during interactions with all three of the financial advisors than the 18-34 year age group when carrying out the real-life financial tasks.

A significant effect for Stress Real Life\*gender interaction was also evident ( $p=0.041$ ). Males experienced less stress during real-life task interactions with both the humanoid and unanimated financial agent avatars than female participants. Females on the other hand reported lower levels of stress during interactions with the animated financial advisor agent than male participants within this task context.

Finally, there was also a significant effect for Stress Real Life\*version interaction ( $p=0.043$ ) showing that the order of which participants were exposed to the financial agent avatars had a significant effect upon participants' reported stress levels when carrying out the real-life financial tasks.

### **Usability Attribute – “Complicated”**

#### **Second Life task**

There is a significant difference between the three financial agent avatars within the Second Life financial task context for the usability attribute “complicated” ( $p=0.046$ ). Participants did not find any of the interactions particularly complicated however they did find interactions with the unanimated financial agent avatar within this task context to be the most complicated ( $M=4.75$ ) compared with the animated ( $M=5.13$ ) and humanoid ( $M=4.96$ ) financial agent avatars.

There were no significant effects of age group, gender or version order on the usability attribute “complicated” within the Second Life financial task context.



### **Real-life task**

There is a significant within-subject effect on the usability attribute “complicated” between the three financial advisor avatars within the real-life financial task context ( $p=0.004$ ). Participants did not find any of the interactions particularly complicated within this task context, however they did find interactions with the unanimated financial agent avatar to be the most complicated ( $M=4.94$ ). They reported interactions with the humanoid financial agent avatar to be the least complicated within this task context ( $M=5.40$ ), closely followed by the animated financial agent avatar ( $M=5.02$ ).

There is also a significant effect for Complicated Real Life\*gender interaction ( $p=0.014$ ). Males reported interactions with both the humanoid and unanimated financial agent avatars to be less complicated within this task context than females. Females however reported carrying out real-life financial tasks with the animated financial agent avatar to be less complicated than males.

Finally there is also a significant effect for Complicated Real Life\*version interaction ( $p=0.20$ ) showing that the order of which participants were exposed to the financial agent avatars had a significant effect upon how complicated participants found the real-life financial task interactions to be.

### **Usability Attribute – “Frustrated”**

#### **Second Life task**

There is a significant within-subject effect on the usability attribute “frustrated” between the three financial agent avatars within the Second Life financial task context

( $p=0.038$ ). Interactions with the humanoid financial agent avatar were reported to be the least frustrating within this task context ( $M=5.83$ ), followed by the animated financial agent avatar ( $M=5.02$ ) and most frustrating with the unanimated financial agent avatar ( $M=4.90$ ).

There were no significant effects of age group, gender or version order on the usability attribute “frustrated” within the Second Life financial task context.

### **Real-life task**

There is a significant within-subject effect on the usability attribute “frustrated” between the three financial agent avatars within the real-life financial task context ( $p=0.032$ ). Although participants did not find interactions with any of the three financial agent avatars particularly frustrating, the highest levels of frustration were reported during interactions with the unanimated financial agent avatar ( $M=4.96$ ). The lowest levels of frustration within this task context were reported during interactions with the humanoid financial agent avatar ( $M=5.42$ ) followed by the animated financial agent avatar ( $M=5.23$ ).

There were no significant effects of age group, gender or version order on the usability attribute “frustrated” within the real-life financial task context.

### **Usability Attribute – “In Control”**

#### **Second Life task**

There are no significant within-subject effects on the usability attribute “in control” between the three financial agent avatars within the Second Life financial task

context. This attribute was concerned with assessing how in control participants felt within the virtual world itself and how this was affected by each of the financial avatar. In general, participants reported feeling more in control within the virtual world during interactions with the humanoid financial agent avatar (M=5.33), followed by the animated financial agent avatar (M=5.04) and the lowest levels of control within the virtual world were reported during interactions with the unanimated financial agent avatar (M=4.98).

There were no significant effects of age group, gender or version order on the usability attribute “in control” within the Second Life financial task context.

### **Real-life task**

There is a significant within-subject effect on the usability attribute “in control” between the three financial agent avatars within the real-life financial task context ( $p=0.015$ ). Within the real life task context, participants reported feeling most in control within the virtual world during interactions with the humanoid financial agent avatar (M=5.48) followed by the unanimated (M=5.00) then the animated financial agent avatar (M=4.81).

There were no significant effects of age group, gender or version order on the usability attribute “in control” within the real-life financial task context.

## **Usability Attribute – “Financial Advisor Competency”**

### **Second Life Task**

There are no significant within-subject effects on the usability attribute “financial advisor competency” between the three financial agent avatars within the Second Life financial task context. This attribute was concerned at looking at how competent participants felt each of the financial agent avatars were in supplying the necessary information during interactions. In general however, participants did not report any of the financial agent avatars to be incompetent, although of the three financial agent avatars the unanimated was rated to be the least competent (M=5.3) with the animated (M=5.46) and humanoid (M=5.40) financial agent avatars being rated as being more competent in supplying the necessary information during Second Life task interactions.

There were no significant effects of age group, gender or version order on the usability attribute “financial advisor competency” within the Second Life financial task context.

### **Real-life Task**

There are no significant within-subject effects on the usability attribute “financial advisor competency” between the three financial agent avatars within the real-life financial task context. In general however, participants did not report any of the financial agent avatars to be incompetent, however participants did feel that the most incompetent of the three within this task context was the unanimated financial agent avatar (M=5.42) compared to the humanoid (M=5.77) and animated (M=5.53) financial agent avatars.

There is however a significant effect for FA Competency Real Life\*gender interaction ( $p=0.022$ ). Females reported finding the humanoid and animated financial agent avatars more competent at supplying the necessary information during real-life task interactions than male participants. Male participants conversely reported the unanimated financial agent avatar as being the most competent at supplying the necessary information during real-life financial tasks whilst females rated it the least competent.

There were no significant effects of age group or version order on the usability attribute “financial advisor competency” within the real-life financial task context.

### **Usability Attribute – “Time Consuming”**

#### **Second Life Task**

There is a significant within-subject effect on the usability attribute “time consuming” between the three financial agent avatars within the Second Life financial task context ( $p=0.027$ ). Within this task context participants rated interactions with the animated financial agent avatar as taking the longest length of time ( $M=4.27$ ), followed by the unanimated financial agent avatar ( $M=4.73$ ), with interacting with the humanoid financial agent avatar being rated as the least time consuming ( $M=4.88$ ).

There were no significant effects of age group, gender or version order on the usability attribute “time consuming” within the Second Life financial task context.

### **Real-life task**

There are no significant within-subject effects on the usability attribute “time consuming” between the three financial agent avatars within the real-life financial task context. In general however, participants rated real-life task interactions with the unanimated financial agent avatar as being the most time consuming (M=4.38) compared to the humanoid (M=4.79) and animated (M=4.69) financial agent avatars with which interactions within this task context were rated as less time consuming.

There were no significant effects of age group, gender or version order on the usability attribute “time consuming” within the real-life financial task context.

### **Usability Attribute – “Virtual World Difficult”**

#### **Second Life task**

There are no significant within-subject effects on the usability attribute “virtual world difficult” between the three financial agent avatars within the Second Life financial task context. In general participants did not rate it difficult to interact within the virtual world when carrying out the Second Life financial tasks with any of the three financial agent avatars, however, interactions with the unanimated financial agent avatar were rated as causing the most difficulty interacting within the virtual world (M=4.75) and the least difficult was reported during interacting with the humanoid (M=5.02) followed by the animated (M=4.92) financial agent avatar.

There were no significant effects of age group, gender or version order on the usability attribute “virtual world difficult” within the Second Life financial task context.

### **Real-life task**

There is a significant within-subject effect on the usability attribute “virtual world difficult” between the three financial agent avatars within the real-life financial task context ( $p=0.003$ ). Within this task context, participants rated the unanimated financial agent avatar ( $M=4.71$ ) as causing the virtual world to be most difficult to interact within, with the humanoid ( $M=5.33$ ) followed by the animated ( $M=5.02$ ) financial agent avatars as causing the least difficulty.

There is also a significant effect for VW Difficult Real Life\*age interaction ( $p=0.005$ ). The 18-34 year age group reported the less difficulty interacting within the virtual world during interactions with all three financial agent avatars than the 35+ yr age group.

Finally, there is also a significant effect for VW Difficult Real Life\*version interaction ( $p=0.021$ ) showing that the order of which participants were exposed to the financial advisor avatars had a significant effect upon how difficult participants reported the virtual world was to interact in.

There were no significant effects of gender on the usability attribute “virtual world difficult” within the real-life financial task context.

### **Usability Attribute – “Clear Communication”**

#### **Second Life task**

There are no significant within-subject effects on the usability attribute “clear communication” between the three financial agent avatars within the Second Life

financial task context. In general however, participants rated the humanoid financial agent avatar as communicating the most clearly within this task context (M=5.71) followed by the unanimated financial agent avatar (M=5.60). Although the animated financial agent avatar was not rated as being particularly unclear in terms of communication within this task context, it was rated as being the least clear of the three financial agent avatars (M=5.44).

There were no significant effects of age group, gender or version order on the usability attribute “clear communication” within the Second Life financial task context.

### **Real-life task context**

There are no significant within-subject effects on the usability attribute “clear communication” between the three financial agent avatars within the real-life financial task context. In general however, participants rated the humanoid financial agent avatar as communicating the most clearly within this task context (M=5.90) followed by the animated financial agent avatar (M=5.67). Although the unanimated financial agent avatar was not rated as being particularly unclear in terms of communication within this task context, it was rated as being the least clear of the three financial agent avatars (M=5.50).

There were no significant effects of age group, gender or version order on the usability attribute “clear communication” within the real-life financial task context.



## **Usability Attribute – “Understanding Information”**

### **Second Life Task**

There are no significant within-subject effects on the usability attribute “understanding information” between the three financial agent avatars within the Second Life financial task context. In general however, participants rated their understanding of the information they were given during Second Life financial task interactions as being the greatest during interactions with the humanoid financial agent avatar (M=5.79), followed by the animated financial agent avatar (M=5.77). The lowest levels of understanding were reported during interactions with the unanimated financial agent avatar (M=5.52).

There were no significant effects of age group, gender or version order on the usability attribute “understanding information” within the Second Life financial task context.

### **Real-life task**

There is a significant within-subject effect on the usability attribute “understanding information” between the three financial agent avatars within the real-life financial task context ( $p=0.013$ ). Participants did not indicate difficulty in understanding the information given to them during interactions with any of the financial agent avatars, however, they rated levels of understanding of this information to be highest during interactions with the humanoid (M=5.9) followed by the animated (M=5.65) financial agent avatars. The lowest levels were reported during interactions with the unanimated financial agent avatar (M=5.58).

There were no significant effects of age group, gender or version order on the usability attribute “understanding information” within the real-life financial task context.

### **Usability Attribute – “Interaction with Financial Advisor”**

#### **Second Life task**

There is a significant within-subject effect on the usability attribute “interaction with financial advisor” between the three financial agent avatars within the Second Life financial task context ( $p=0.018$ ). This attribute assessed whether or not participants would be happy to interact with that particular financial agent avatar again. Participants rated the humanoid financial agent avatar as being the one they would be the happiest to interact with again ( $M=5.21$ ), followed by the animated financial agent avatar ( $M=5.02$ ). Within this task context, from the three financial agent avatars, participants rated the unanimated avatar as being the one they would be the least happy to interact with again ( $M=4.6$ ).

There is also a significant effect for Interaction with FA Second Life\*age interaction ( $p=0.029$ ). The 18-34 year age group rated more highly on the humanoid and unanimated avatars as the ones they would be happiest to interact with again than the 35+ year age group. The 35+ year age group in fact rated the animated financial agent avatar as being the avatar they would be happiest to interact with again whereas the 18-34 year age group rated this the lowest of the three.

There were no significant effects of gender or version order on the usability attribute “interaction with financial advisor” within the Second Life financial task context.

### **Real-life task**

There is a significant within-subject effect on the usability attribute “interaction with financial advisor” between the three financial agent avatars within the real-life financial task context ( $p=0.002$ ). Participants rated the humanoid financial agent avatar as being the one they would be the happiest to interact with again ( $M=5.4$ ), followed by the animated financial agent avatar ( $M=4.81$ ). Within this task context, from the three financial agent avatars, participants rated the unanimated avatar as being the one they would be the least happy to interact with again ( $M=4.71$ ).

There is also a significant effect for Interaction with FA Real Life\*age interaction ( $p=0.015$ ). The 18-34 year age group rated more highly that they would be happy to interact with all three of the financial agent avatars again than the 35+ year age group.

There is also a significant effect for Interaction with FA Real Life\*gender interaction ( $p=0.036$ ). Males and females rated similarly on being happy to interact with the humanoid financial agent avatar again within this task context, however there is a clear difference with males preferring to interact with the animated financial agent avatar again with females rating this as the avatar they would least like to interact with again.

Finally, there is also a significant effect for Interact with FA Real Life\*version interaction ( $p=0.012$ ) showing that the order of which participants were exposed to the financial agent avatars had a significant effect upon their attitudes towards which financial agent avatar they would be happiest to interact with in the future.

## **Usability Attribute – “Virtual World Suitable”**

### **Second Life task**

There are no significant within-subject effects on the usability attribute “virtual world suitable” between the three financial agent avatars within the Second Life financial task context. This attribute was assessing whether any of the three financial agent avatars influenced how suitable participants perceived the virtual world to be to the financial task. In general, participants rated the virtual world as being most suited to the Second Life financial task during interactions with the animated financial agent avatar (M=5.13) followed by interactions with the humanoid financial agent avatar (M=5.02). Although participants did not generally rate the virtual world as being unsuited to the financial task during interactions with any of the financial agent avatars, it was interactions with the unanimated financial agent avatar (M=5.00) that saw the virtual world as being the least suited to the financial task within this context.

There were no significant effects of age group, gender or version order on the usability attribute “virtual world suitable” within the Second Life financial task context.

### **Real-life task**

There are no significant within-subject effects on the usability attribute “virtual world suitable” between the three financial agent avatars within the real-life financial task context. In general, participants rated the virtual world as being most suited to the real-life financial task during interactions with the humanoid financial agent avatar (M=5.33) followed by interactions with the animated financial agent avatar (M=4.94). Although participants did not generally rate the virtual world as being unsuited to the

financial task during interactions with any of the financial agent avatars, it was interactions with the unanimated financial agent avatar ( $M=4.81$ ) that saw the virtual world as being the least suited to the financial task within this context.

There were no significant effects of age group, gender or version order on the usability attribute “virtual world suitable” within the real-life financial task context.

### **Usability Attribute – “Information Reliable”**

#### **Second Life task**

There is a significant within-subject effect on the usability attribute “information reliable” between the three financial agent avatars within the Second Life financial task context ( $p=0.039$ ). Participants rated information from both the humanoid financial agent avatar ( $M=5.44$ ) and the animated financial agent avatar ( $M=5.44$ ) as being equally reliable. Although the information given by the unanimated financial agent avatar within this task context was not rated as unreliable, it was rated as the least of the three ( $M=5.25$ ).

There is a significant effect for Info Reliable Second Life\*age interaction ( $p=0.008$ ). Both age groups rated information supplied by both the humanoid and animated financial agent avatars within the Second Life financial task context similarly highly, however the 18-34 year age group rated information supplied by the unanimated financial agent avatar highly also, whilst the 35+ year age group rated this the least reliable.

There is also a significant effect for Information Reliable Second Life\*gender interaction ( $p=0.009$ ). Females rated the information supplied by both the humanoid and unanimated financial agent avatars as more reliable within this task context than males whilst males rated information supplied by the animated financial agent avatar as more reliable than female participants.

Finally, there is also a significant effect for Information Reliable Second Life\*version interaction ( $p=0.038$ ) showing that the order of which participants were exposed to the financial agent avatars had a significant effect upon their overall attitudes towards how reliable participants perceived the information from each avatar to be.

### **Real-life task**

There is a significant within-subject effect on the usability attribute “information reliable” between the three financial agent avatars within the real-life financial task context ( $p=0.005$ ). Within the real life task context, participants rated the information supplied by the humanoid financial agent avatar as being the most reliable ( $M=5.71$ ), followed by that supplied by the animated financial agent avatar ( $M=5.1$ ). Although participants did not rate the information supplied by any of the avatars within this task context as being particularly unreliable, that supplied by the unanimated financial agent avatar was rated as the least reliable ( $M=4.92$ ) of the three avatars.

There were no significant effects of age group, gender or version order on the usability attribute “information reliable” within the real-life financial task context.

## **Usability Attribute – “Engaging”**

### **Second Life task**

There is a significant within-subject effect on the usability attribute “engaging” between the three financial agent avatars within the Second Life financial task context ( $p=0.033$ ). Within the Second Life task context, participants reported the humanoid financial agent avatar as helping them feel the most engaged in the virtual world ( $M=5.19$ ) followed by the animated financial agent avatar ( $M=4.75$ ). Participants rated the unanimated financial agent avatar as being the least helpful at making them feel engaged within the virtual world within this task context ( $M=4.06$ ).

There were no significant effects of age group, gender or version order on the usability attribute “engaging” within the Second Life financial task context.

### **Real-life task**

There is a significant within-subject effect on the usability attribute “engaging” between the three financial agent avatars within the real-life financial task context ( $p=0.004$ ). Within the real life task context, participants reported the humanoid financial agent avatar as helping them feel the most engaged in the virtual world ( $M=5.21$ ) followed by the animated financial agent avatar ( $M=4.96$ ). Participants rated the unanimated financial agent avatar as being the least helpful at making them feel engaged within the virtual world within this task context ( $M=4.10$ ).

There is also a significant effect for Engaging Real Life\*age interaction ( $p=0.025$ ). The 35+ year age group rated both the humanoid and animated financial agent avatars more highly in terms of helping them feel engaged within the virtual world when

carrying out real life financial tasks than the 18-34 year age group. Whilst both age groups rated the unanimated financial agent avatars as the one which made them feel the least engaged within the virtual world, the 18-34 year age group rated it slightly more highly on the scale than the 35+ year age group.

There were no significant effects of gender or version order on the usability attribute “engaging” within the real-life financial task context.

### **Usability Attribute – “Efficient”**

#### **Second Life task**

There is a significant within-subject effect on the usability attribute “efficient” between the three financial agent avatars within the Second Life financial task context ( $p=0.004$ ). Within the Second Life task context, participants rated interactions with the animated financial agent avatar as being the most efficient ( $M=5.56$ ) closely followed by those with the humanoid financial agent avatar ( $M=5.48$ ). Although participants did not rate interactions with the unanimated financial agent avatar as being inefficient, they rated it the lowest of the three avatars within this task context ( $M=5.06$ ).

There is also a significant effect for Efficient Second Life\*age interaction ( $p=0.019$ ). Both age groups rated interactions with the animated financial agent avatar as being the most efficient, closely followed by the humanoid financial agent avatar and the least efficient with the unanimated financial agent avatar within this task context. In the cases of all three advisors however, the 18-34 year age group rated interactions with all three of the financial agent avatars more highly than the 35 + year age group.



There were no significant effects of gender or version order on the usability attribute “efficient” within the Second Life financial task context.

### **Real-life task**

There is a significant within-subject effect on the usability attribute “efficient” between the three financial agent avatars within the real-life financial task context ( $p=0.013$ ). Within the real life financial task context, participants rated interactions with the humanoid financial agent avatar as being the most efficient ( $M=5.67$ ), followed by interactions with the animated financial agent avatar ( $M=5.25$ ) and least with the unanimated financial agent avatar ( $M=4.98$ ).

There were no significant effects of age group, gender or version order on the usability attribute “efficient” within the real-life financial task context.

### **Usability Attribute – “Satisfying”**

#### **Second Life task**

There is a significant within-subject effect on the usability attribute “satisfying” between the three financial agent avatars within the Second Life financial task context ( $p=0.039$ ). Participants rated interactions with the humanoid financial agent avatar as being the most satisfying within this task context ( $M=5.00$ ), followed by interactions with the animated financial agent avatar ( $M=4.67$ ). Participants were generally least satisfied during interactions with the unanimated financial agent avatar within the Second Life task context ( $M=4.4$ ).

There were no significant effects of age group, gender or version order on the usability attribute “satisfying” within the Second Life financial task context.

### **Real-life task**

There is a significant within-subject effect on the usability attribute “satisfying” between the three financial agent avatars within the real-life financial task context ( $p=0.003$ ). Participants rated interactions with the humanoid financial agent avatar as being the most satisfying within this task context ( $M=5.13$ ), followed by interactions with the animated financial agent avatar ( $M=4.6$ ). Participants were generally least satisfied during interactions with the unanimated financial agent avatar within the real-life task context ( $M=4.13$ ).

There is also a significant effect for Satisfying Real Life\*age interaction ( $p=0.011$ ). Both participant age groups rated the interactions with the humanoid financial agent avatar as the most satisfying and the least with the unanimated financial agent avatar. The 35+ year age group rated more highly on levels of satisfaction during interactions with the humanoid financial agent avatar than the 18-34 year age group however and conversely, the 18-34 year age group rated interactions with both the animated and unanimated financial agent avatars more highly than the 35+ year age group.

There were no significant effects of gender or version order on the usability attribute “satisfying” within the real-life financial task context.

## **Usability Attribute – “Friendly”**

### **Second Life task**

There is a significant within-subject effect on the usability attribute “friendly” between the three financial agent avatars within the Second Life financial task context ( $p=0.002$ ). Participants rated the humanoid financial agent avatar as being the most friendly within the Second life task context ( $M=5.65$ ), followed by the animated financial agent avatar ( $M=5.54$ ). The unanimated financial agent avatar was rated as the least friendly within this task context ( $M=4.98$ ).

There is also a significant effect for Friendly Second Life\*age interaction ( $p=0.006$ ). In terms of all three financial advisor avatars participants in the 18-34 year age group rated all three of the financial agent avatars more highly in terms of friendliness than the 35+ year age group.

Finally, there is also a significant effect for Friendly Second Life\*version interaction ( $p=0.037$ ) showing that the order of which participants were exposed to the financial agent avatars had a significant effect upon their overall attitudes towards how friendly the financial agent avatars were during Second Life task interactions.

There were no significant effects of gender on the usability attribute “friendly” within the Second Life financial task context.

### **Real-life task**

There are no significant within-subject effects on the usability attribute “friendly” between the three financial agent avatars within the real-life financial task context. In

general however, within the real-life task context participants rated the humanoid financial agent avatar as being the most friendly ( $M=5.65$ ) followed the animated financial agent avatar ( $M=5.54$ ). In general, participants rated the unanimated financial agent avatar as being the least friendly within the real-life task context ( $M=5.08$ ).

There were no significant effects of age group, gender or version order on the usability attribute “friendly” within the real-life financial task context.

### **Usability Attribute – “Disliked Text”**

#### **Second Life task**

There is a significant within-subject effect on the usability attribute “disliked text” between the three financial agent avatars within the Second Life financial task context ( $p=0.015$ ). Within this task context, participants disliked using (typed) text to communicate with the unanimated financial agent avatar the most ( $M=4.21$ ) compared to using text to communicate with the animated ( $M=4.54$ ) and humanoid ( $M=4.38$ ) financial agent avatars.

There is also a significant effect for Disliked Text Second Life\*age interaction ( $p=0.021$ ). The 35+ year age group disliked using text as the mode of communication more so during interaction with each of the three financial agent avatars within the Second Life task context than the 18-34 year age group who did not particularly dislike this mode of communication.

There is also a significant effect for Disliked Text Second Life\*gender interaction ( $p=0.020$ ). During Second Life task interactions with both the animated and unanimated financial agent avatars, females disliked using text to communicate to a greater extent than male participants. In terms of using text to communicate with the humanoid financial agent avatar, both sexes rated similarly and did not particularly dislike this mode of communication during these interactions.

Finally, there is also a significant effect for Disliked Text Second Life\*version interaction ( $p=0.020$ ) showing that the order of which participants were exposed to the financial agent avatars had a significant effect upon their overall attitudes towards the use of text to communicate with the financial agent avatars during Second Life task interactions.

### **Real-life task**

There are no significant within-subject effects on the usability attribute “disliked text” between the three financial agent avatars within the real-life financial task context. In general however, participants disliked using text as the mode of communication during interactions with the unanimated financial agent avatar ( $M=4.23$ ). Participants did not particularly dislike using text to communicate with the animated ( $M=4.5$ ) and humanoid ( $M=4.46$ ) financial agent avatars within the real-life task context.

There were no significant effects of age group, gender or version order on the usability attribute “disliked text” within the real-life financial task context.

## **Usability Attribute – “Interaction in Virtual World”**

### **Second Life task**

There are no significant within-subject effects on the usability attribute “interaction in virtual world” between the three financial agent avatars within the Second Life financial task context. In general however, participants more highly after interactions with the humanoid financial agent avatar within this task context that they would be happy to use the virtual world again (M=5.13) followed by the animated financial agent avatar (M=4.88). Participants reported being less happy to interact within the virtual world again after carrying out Second Life financial tasks with the unanimated financial agent avatar (M=4.54).

There were no significant effects of age group, gender or version order on the usability attribute “interaction in virtual world” within the Second Life financial task context.

### **Real-life task**

There are no significant within-subject effects on the usability attribute “interaction in virtual world” between the three financial agent avatars within the real-life financial task context. In general however, participants more highly after interactions with the humanoid financial agent avatar within this task context that they would be happy to use the virtual world again (M=5.15) followed by the animated financial agent avatar (M=5.13). Participants reported being less happy to interact within the virtual world again after carrying out Second Life financial tasks with the unanimated financial agent avatar (M=4.35).

There were no significant effects of age group, gender or version order on the usability attribute “interaction in virtual world” within the real-life financial task context.

### **Usability Attribute – “Enjoyment of Interaction”**

#### **Second Life task**

There is a significant within-subject effect on the usability attribute “enjoyment of interaction” between the three financial agent avatars within the Second Life financial task context ( $p=0.004$ ). Participants rated interactions with the humanoid financial agent avatar as being the most enjoyable in the Second Life task context ( $M=5.21$ ) followed by the animated financial agent avatar ( $M=4.79$ ). Interactions with the unanimated financial agent avatar were rated as the least enjoyable within this task context ( $M=4.25$ ).

There were no significant effects of age group, gender or version order on the usability attribute “enjoyment of interaction” within the Second Life financial task context.

#### **Real-life task**

There is a significant within-subject effect on the usability attribute “enjoyment of interaction” between the three financial agent avatars within the real-life financial task context ( $p=0.021$ ). Participants rated interactions with the humanoid financial agent avatar as being the most enjoyable in the real-life task context ( $M=5.19$ ) followed by the animated financial agent avatar ( $M=4.88$ ). Interactions with the unanimated

financial agent avatar were rated as the least enjoyable within this task context (M=4.4).

There were no significant effects of age group, gender or version order on the usability attribute “enjoyment of interaction” within the real-life financial task context.

### **Usability Attribute – “Financial Advisor Polite”**

#### **Second Life task**

There are no significant within-subject effects on the usability attribute “financial advisor polite” between the three financial agent avatars within the Second Life financial task context. In general however, participants rated the humanoid financial agent avatar as being the most polite (M=5.69) followed by the animated financial agent avatar (M=5.48) when carrying out Second Life financial tasks. Although participants did not rate any of the financial agent avatars as being particularly impolite, the unanimated financial agent avatar was rated as the least polite of the three (M=5.38).

There were no significant effects of age group, gender or version order on the usability attribute “financial advisor polite” within the Second Life financial task context.

#### **Real-life task**

There is a significant within-subject effect on the usability attribute “financial advisor polite” between the three financial agent avatars within the real life financial task



context ( $p=0.035$ ). Participants rated the humanoid financial agent avatar as being the most polite ( $M=5.9$ ) followed by the animated financial agent avatar ( $M=5.56$ ) when carrying out real-life financial tasks. Although participants did not rate any of the financial agent avatars as being particularly impolite, the unanimated financial agent avatar was rated as the least polite of the three ( $M=5.25$ ).

There were no significant effects of age group, gender or version order on the usability attribute “financial advisor polite” within the real-life financial task context.

### **Usability Attribute – “Intimidated by Financial Advisor”**

#### **Second Life task**

There are no significant within-subject effects on the usability attribute “intimidated by financial advisor” between the three financial agent avatars within the Second Life financial task. In general however, participants did not feel particularly intimidated during interactions with any of the three financial agent avatars. Participants reported feeling the least intimidated during interactions with the humanoid financial agent ( $M=5.48$ ) followed by the animated ( $M=5.46$ ) and unanimated ( $M=5.29$ ) financial agent avatars within this task context.

There is however a significant effect for Intimidated by FA Second Life\*age interaction ( $p=0.014$ ). Although neither of the age groups were particularly intimidated by any of the financial agent avatars, the 18-34 year age group were less intimidated by all the of the financial agent avatars than the 35+ year age group.

There is also a significant effect for Intimidated by FA Second Life\*gender interaction ( $p=0.044$ ). Of the three financial agent avatars, both males and females reported feeling most intimidated during interactions with the unanimated financial agent avatar. Females were more intimidated by the animated financial agent avatar than males within this task context whilst males reported feeling slightly more intimidated by the humanoid financial agent avatar than females.

Finally, there is also a significant effect for Intimidated by FA Second Life\*version interaction ( $p=0.019$ ) showing that the order of which participants were exposed to the financial agent avatars had a significant effect upon how intimidated they felt when carrying out Second Life financial tasks with the financial agent avatars.

### **Real-life task**

There is a significant within-subject effect on the usability attribute “intimidated by financial advisor” between the three financial agent avatars within the real-life financial task context ( $p=0.015$ ). Participants did not feel particularly intimidated during interactions with any of the three financial agent avatars. Participants reported feeling the least intimidated during interactions with the humanoid financial agent avatar ( $M=5.58$ ) followed by the unanimated ( $M=5.33$ ) and animated ( $M=5.08$ ) financial agent avatars within this task context.

There is also a significant effect for Intimidated by FA Real Life\*age interaction ( $p=0.028$ ). Although both age groups were not particularly intimidated by any of the financial agent avatars during real-life task interactions, the 35+ year age group reported feeling more intimidated than the 18-34 year age group during interactions

with all three of the financial agent avatars. There were no significant effects of gender or version order on the usability attribute “intimidated by financial advisor” within the real-life financial task context.

### **Usability Attribute – “Real Person Preference”**

#### **Second Life task**

There are no significant within-subject effects on the usability attribute “real person preference” between the three financial agent avatars within the Second Life financial task. In general however, after interactions with each of the three avatars participants reported that they would prefer to interact with a real person. Of the three avatars however, participants would most prefer to interact with the humanoid financial agent avatar ( $M=3.17$ ), followed by the animated financial agent avatar ( $M=3$ ) and least with the unanimated financial agent avatar ( $M=2.85$ ).

There were no significant effects of age group, gender or version order on the usability attribute “real person preference” within the Second Life financial task context.

#### **Real-life task**

There is a significant within-subject effect on the usability attribute “real person preference” between the three financial agent avatars within the real-life financial task context ( $p=0.036$ ). After interactions with each of the three avatars, participants reported that they would prefer to interact with a real person, to a lesser extent however than report during Second Life financial task interactions. Of the three avatars however, participants would most prefer to interact with the humanoid

financial agent avatar (M=3.44), followed by the animated financial agent avatar (M=3.35) and least with the unanimated financial agent avatar (M=2.92).

There were no significant effects of age group, gender or version order on the usability attribute “real person preference” within the real-life financial task context.

### **Usability Attribute – “Financial Advisor Appearance”**

#### **Second Life task**

There is a significant within-subject effect on the usability attribute “financial advisor appearance” between the three financial agent avatars within the Second Life financial task context ( $p=0.002$ ). Participants rated the appearance of the animated financial agent avatar as distracting them the most when carrying out Second Life financial tasks (M=3.94), followed by the unanimated financial agent avatar (M=4.29). Participants did not rate the appearance of the humanoid financial agent avatar as being particularly distracting (M=5.36) and was the least distracting of the three avatars within this task context.

There is also a significant effect for FA Appearance Second Life\*age interaction ( $p=0.029$ ). The 35+ year age group rated the appearance of the unanimated financial agent avatar as being more distracting than the 18-34 year age group. Both age groups rated the appearance of the humanoid financial agent avatar as being the least distracting. The 18-34 year age group also rated the appearance of the animated financial agent avatar as being slightly less distracting than the 35+ year age group.

There is also a significant effect for FA Appearance Second Life\*gender interaction ( $p=0.019$ ). Both males and females found the appearance of the humanoid financial agent avatar as being the least distracting of the three avatars, however males found it slight more distracting than females within this task context. When carrying out Second Life financial tasks, females found the appearance of the animated financial agent avatar more distracting than male participants.

There were no significant effects of version order on the usability attribute “financial advisor appearance” within the Second Life financial task context.

### **Real-life task**

There is a significant within-subject effect on the usability attribute “financial advisor appearance” between the three financial agent avatars within the real-life financial task context ( $p=0.000$ ). When carrying out the real-life financial tasks, participants did not report being particularly distracted by the appearance of any of the three financial agent avatars. Of the three financial agent avatars however, they were least distracted by the appearance of the humanoid financial agent avatar ( $M=5.58$ ) followed by the unanimated financial agent avatar ( $M=4.33$ ) and the most by the animated financial agent avatar ( $M=4.02$ ).

There is also a significant effect for FA Appearance Real Life\*age interaction ( $p=0.003$ ). The 35+ year age group rated the appearance of the unanimated financial agent avatar as being more distracting than the 18-34 year age group. Both age groups rated the appearance of the humanoid financial agent avatar as being the least

distracting. The 18-34 year age group also rated the appearance of the animated financial agent avatar as being slightly less distracting than the 35+ year age group.

There is also a significant effect for FA Appearance Real Life\*gender interaction ( $p=0.001$ ). Both males and females found the appearance of the humanoid financial agent avatar as being the least distracting of the three avatars, however males found it slight more distracting than females within this task context. When carrying out real-life financial tasks, females found the appearance of the animated financial agent avatar more distracting than male participants.

Finally, there is also a significant effect for FA Appearance Real Life\*version interaction ( $p=0.008$ ) showing that the order of which participants were exposed to the financial agent avatars had a significant effect upon their overall attitudes towards how distracting they found the appearance of each of the financial agent avatars to be when carrying out the real-life financial tasks

## **Appendix 8**

### ***Attribute Analysis: SVE Social Presence Perception Scale (The Interaction Experiment)***

#### **Social Presence Attribute – “part of the virtual world”**

##### **Second Life Task**

There were no significant within-subject effects of the social presence on the attribute “part of the virtual world”. In general however, when carrying out Second Life financial tasks, participants felt more as though they were actually part of the virtual world during interactions with the animated avatar (M=4.56) than in interactions with the humanoid (M=4.5) and unanimated (M=4.4) avatars.

There were no significant effects of age, gender or version order for the social presence attribute “part of the virtual world” within the Second Life task context.

##### **Real-life task**

There were no significant within-subject effects on the social presence attribute “part of the virtual world”. In general however, when carrying out real-life financial tasks, participants felt more as though they were actually part of the virtual world during interactions with the humanoid avatar (M=4.56) than in interactions with the animated (M=4.5) and unanimated (M=4.27) avatars.

There were no significant effects of age, gender or version order for the social presence attribute “part of the virtual world” within the real-life task context.

## **Social Presence Attribute – “disliked interacting in the virtual world”**

### **Second Life Task**

There is a significant within-subject effect of social presence on the attribute “disliked interacting in the virtual world” ( $p=0.011$ ). Participants did not particularly dislike the feeling of interacting in the virtual world, however, participants rated more positively on interacting when carrying out Second Life tasks with the humanoid avatar ( $M=4.96$ ), followed by the unanimated avatar ( $M=4.56$ ) and disliked the feeling of interacting most within the virtual world with the animated avatar ( $M=4.35$ ).

There was also a significant interaction effect of age group on the social presence attribute “disliked interacting in the virtual world” ( $p=0.024$ ). Overall, the 18-34 year age group liked the feeling of interacting within the virtual world the most during interactions with the humanoid avatar and to a greater extent than the 35+ yr age group. The 18-34 year age group disliked interacting within the virtual world the most during interactions with the unanimated avatar, whilst the 35+ year age group disliked interacting within the virtual world when carrying out Second Life tasks with the animated avatar.

There were no significant effects of gender or version order on the social presence attribute “part of the virtual world” within the Second Life task context.

### **Real-life task**

There is a significant within-subject effect of social presence on the attribute “disliked interacting in the virtual world” ( $p=0.006$ ). Participants did not particularly dislike the



feeling of interacting in the virtual world, however, participants rated more positively on interacting when carrying out real-life tasks with the humanoid avatar ( $M=4.75$ ), followed by the animated avatar ( $M=4.56$ ) and disliked the feeling of interacting most within the virtual world with the unanimated avatar ( $M=4.33$ ).

There was also a significant interaction effect of age group on the social presence attribute “disliked interacting in the virtual world” ( $p=0.025$ ). Both age groups enjoyed interacting within the virtual world the most during interactions with the human avatar within this task context however the 18-34 year age groups reported higher overall levels of enjoyment than the 35+ year age group. By contrast, the 18-34 year age group disliked interacting within the virtual world the most during interactions with the unanimated financial advisor avatar, whilst the 35+ year age group rated this more highly. The 18-34 year age group also reported higher levels of enjoyment of interaction within the virtual world when carrying out real-life tasks with the animated avatar than the 35+ year age group.

Finally, there is also a significant effect of version order on the social presence attribute “disliked interacting in the virtual world” ( $p=0.025$ ) showing that the order of which participants were exposed to the financial advisor avatars had a significant effect upon their level of enjoyment of the interaction when carrying out real-life financial tasks with the financial advisor avatars.

There were no significant effects of gender on the social presence attribute “disliked interacting in the virtual world” within the real-life task context.

## **Social Presence Attribute – “enjoyed role play of financial task”**

### **Second Life Task**

There were no significant within-subject effects on the social presence attribute “enjoyed role play of financial task”. In general however, when carrying out Second Life tasks, participants enjoyed the role playing aspect of doing so the most during interactions with both the humanoid (M=4.92) and animated (M=4.92) avatars. Enjoyment of the role-playing aspect of carrying out the Second Life task was less during interactions with the unanimated avatar (M=4.65).

There were no significant effects of age, gender or version order for the social presence attribute “enjoyed role play of financial task” within the Second Life task context.

### **Real-life task**

There were no significant within-subject effects on the social presence attribute “enjoyed role play of financial task”. In general however, when carrying out real-life tasks, participants enjoyed the role-playing aspect of doing so the most during interactions with the humanoid avatar (M=4.94), followed by the animated avatar (M=4.83). Enjoyment of the role-playing aspect of carrying out the real-life task was less during interactions with the unanimated avatar (M=4.54).

There were no significant effects of age, gender or version order for the social presence attribute “enjoyed role play of financial task” within the real-life task context.

## **Social Presence Attribute – “enjoyed role play of financial advisor”**

### **Second Life task**

There were no significant within-subject effects on the social presence attribute “enjoyed role play of financial advisor”. In general however, participants reported enjoying the role playing aspect of interacting with the financial agent avatar most highly when carrying out Second Life tasks with the humanoid avatar ( $M=4.92$ ), followed by the animated avatar ( $M=4.73$ ). The lowest levels of enjoyment of the role-playing aspect of interacting with the financial agent avatars were reported when carrying out Second Life tasks with the unanimated avatar ( $M=4.65$ ).

There were no significant effects of age, gender or version order for the social presence attribute “enjoyed role play of financial advisor” within the Second Life task context.

### **Real-life task**

There is a significant within-subject effect of social presence on the attribute “enjoyed role play of financial advisor” ( $p=0.012$ ). Participants enjoyed the role play aspect of interacting the most when carrying out real life tasks with the humanoid financial agent avatar ( $M=4.79$ ), followed by the animated financial agent avatar ( $M=4.73$ ). The lowest levels of enjoyment in terms of the role playing aspect of interacting with the financial agent avatars was experienced when carrying out real life tasks with the unanimated financial agent avatar ( $M=4.44$ ).

There was also a significant interaction effect of version order on the social presence attribute “enjoyed role play of financial advisor” ( $p=0.028$ ) showing that the order of which participants were exposed to the financial agent avatars had a significant effect upon their level of enjoyment of the role playing aspect of interacting with the avatars.

There were no significant effects of age or gender for the social presence attribute “enjoyed role play of financial advisor” within the real-life task context.

### **Social Presence Attribute – “avatar life story”**

#### **Second Life task**

There were no significant within-subject effects on the social presence attribute “avatar life story”. This attribute aimed to assess whether the any of the financial agent avatars could have an effect upon how participants viewed their own avatar that they had created in the induction stage of the experiment. In general, participants did not associate their avatars with having their own life stories, though would be more likely to do so during interactions with the humanoid ( $M=3.79$ ) and animated ( $M=3.79$ ) avatars than the unanimated avatar ( $M=3.56$ ).

There were no significant effects of age, gender or version order for the social presence attribute “avatar life story” within the Second Life task context.

#### **Real-life task**

There were no significant within-subject effects on the social presence attribute “avatar life story”. In general, participants did not associate their avatars with having

their own life stories, though would be more likely to do so during interactions with the humanoid (M=3.85) and animated (M=3.54) avatars than the unanimated avatar (M=3.52).

There was however a significant interaction effect of gender on the social presence attribute “avatar life story” ( $p=0.042$ ). During real-life task interactions with the humanoid avatar, female participants associated their avatar with having a life story, whilst male participants were much less likely to.

There were no significant effects of age or version order for the social presence attribute “avatar life story” within the real-life task context.

### **Social Presence Attribute – “avatar own personality”**

#### **Second Life task**

There were no significant within-subject effects on the social presence attribute “avatar own personality”. This attribute also aimed to assess whether the any of the financial advisors could have an effect upon how participants viewed their own avatar that they had created in the induction stage of the experiment. In general, participants were more likely to associate their own avatars with having a personality during interactions with the animated financial agent avatar (M=4.02), followed by the humanoid financial agent avatar (M=4) and least likely during interactions with the unanimated financial agent avatar (M=3.81).

There were no significant effects of age, gender or version order for the social presence attribute “avatar own personality” within the Second Life task context.

### **Real-life task**

There were no significant within-subject effects on the social presence attribute “avatar own personality”. In general however, when carrying out real life tasks, participants were more likely to associate their own avatars with having a personality during interactions with the humanoid financial agent avatar (M=4.04) and less likely to do so during interactions with both the animated (M=3.96) and unanimated (M=3.67) financial agent avatars.

There were no significant effects of age, gender or version order for the social presence attribute “avatar own personality” within the real-life task context.

### **Social Presence Attribute – “disliked escapism”**

#### **Second Life task**

There were no significant within-subject effects on the social presence attribute “disliked escapism”. This attribute was aimed at assessing whether participants liked or indeed disliked the escapism which interacting within a virtual world may bring. In general, participants enjoyed the escapism element of the virtual world to a greater extent during interactions with the humanoid avatar (M=4.69) than with the animated (M=4.48) and unanimated (M=4.48) avatars within this task context.

There were no significant effects of age, gender or version order for the social presence attribute “disliked escapism” within the Second Life task context.

### **Real-life task**

There is a significant within-subject effect of social presence on the attribute “disliked escapism” ( $p=0.003$ ). Participants did not particularly dislike the escapism element of the virtual world when carrying out real-life tasks, however, they were more likely to enjoy this element during interactions with the humanoid avatar ( $M=4.81$ ), followed by the animated avatar ( $M=4.67$ ) whilst they were more likely to dislike the escapism element of the virtual world during interactions with the unanimated avatar ( $M=4.23$ ).

There was also a significant interaction effect of gender on the social presence attribute “disliked escapism” ( $p=0.009$ ). Both males and females enjoyed the escapism element of the virtual world the most during interactions with the humanoid avatar followed by the animated avatars. Both sexes reported enjoying the escapism element of the virtual world the least during interactions with the unanimated avatar within this task context; however, males disliked the escapism element to a much greater extent than females during interactions with this particular avatar.

There was also a significant interaction effect of version order on the social presence attribute “disliked escapism” ( $p=0.017$ ) showing that the order of which participants were exposed to the financial agent avatars had a significant effect upon their level of enjoyment of the escapism element of the virtual world when carrying out real-life tasks with the avatars.

There were no significant effects of age for the social presence attribute “disliked escapism” within the real-life task context.

## **Social Presence Attribute – “real-life problems”**

### **Second Life task**

There were no significant within-subject effects on the social presence attribute “real life problems”. In general however, within the Second Life task context, participants did not feel that interacting with the humanoid (M=3.13), animated (M=3) or unanimated (M=2.88) avatars within the virtual world let them forget about some of the real life problems they may have had.

There were no significant effects of age, gender or version order for the social presence attribute “real life problems” within the Second Life task context.

### **Real-life task context**

There were no significant within-subject effects on the social presence attribute “real-life problems”. In general however, within the real-life task context, participants did not feel that interacting with the humanoid (M=3.15), animated (M=3.00) or unanimated (M=2.94) avatars within the virtual world let them forget about some of the real-life problems they may have had.

There were no significant effects of age, gender or version order for the social presence attribute “real-life problems” within the real-life task context.

## **Social Presence Attribute – “relieve stress”**

### **Second Life task**

There were no significant within-subject effects on the social presence attribute “relieve stress”. In general however, within the Second Life task context, participants



did not feel that interacting with the humanoid (M=3.19), animated (M=2.92) or unanimated (M=2.94) avatars within the virtual world let them relieve stress from their daily lives.

There were no significant effects of age, gender or version order for the social presence attribute “relieve stress” within the Second Life task context.

### **Real-life task**

There were no significant within-subject effects on the social presence attribute “relieve stress”. In general however, within the real-life task context, participants did not feel that interacting with the humanoid (M=3.08), animated (M=3.27) or unanimated (M=3.10) avatars within the virtual world let them relieve stress from their daily lives.

There were no significant effects of age, gender or version order for the social presence attribute “relieve stress” within the real-life task context.

### **Social Presence Attribute – “other people present”**

#### **Second Life task**

There is a significant within-subject effect of social presence on the attribute “other people present” ( $p=0.034$ ). Participants were more likely to feel that other people were with them within the virtual world during interactions with the humanoid avatar (M=3.38). Participants were less likely to feel that other people were with them within the virtual world during interactions with the animated (M=3.38) and unanimated (M=3.20) avatars within this task context.

There were no significant effects of age, gender or version order for the social presence attribute “other people present” within the Second Life task context.

### **Real-life task**

There is a highly significant within-subject effect of social presence on the attribute “other people present” ( $p=0.000$ ). Participants were more likely to feel that other people were with them within the virtual world during interactions with the humanoid avatar ( $M=4.00$ ). Participants were less likely to feel that other people were with them within the virtual world during interactions with the animated ( $M=3.38$ ) and unanimated ( $M=3.23$ ) avatars within this task context.

There was also a significant interaction effect of gender on the social presence attribute “other people present” ( $p=0.005$ ). Both males and females were more likely to feel that other people were present with them within the virtual world during interactions with the humanoid avatar. Males were more likely to feel that other people were present with them within the virtual world than females during interactions with both the animated and unanimated avatars.

There was also a significant interaction effect of version order on the social presence attribute “other people present” ( $p=0.022$ ) showing that the order of which participants were exposed to the financial agent avatars had a significant effect upon how likely they were to feel that other people were present with them within the virtual world when carrying out real-life tasks with the avatars.

There were no significant effects of age for the social presence attribute “other people present” within the real-life task context.

### **Social Presence Attribute – “other avatars present”**

#### **Second Life task**

There is a significant within-subject effect of social presence on the attribute “other avatars present” ( $p=0.047$ ). Participants were more likely to feel that other avatars were present within the virtual world during interactions with the unanimated avatar ( $M=4.69$ ). Participants were less likely to feel that other avatars were with them within the virtual world during interactions with the animated ( $M=4.44$ ) and humanoid ( $M=3.90$ ) avatars within this task context.

There were no significant effects of age, gender or version order for the social presence attribute “other avatars present” within the Second Life task context.

#### **Real-life task**

There is a significant within-subject effect of social presence on the attribute “other people present” ( $p=0.010$ ). Participants were more likely to feel that other avatars were present within the virtual world during interactions with the unanimated avatar ( $M=4.75$ ). Participants were less likely to feel that other people were with them within the virtual world during interactions with the animated ( $M=4.44$ ) and humanoid ( $M=3.77$ ) avatars within this task context.

There were no significant effects of age, gender or version order for the social presence attribute “other avatars present” within the real-life task context.

## **Social Presence Attribute – “all alone within virtual world”**

### **Second Life task**

There is a significant within-subject effect of social presence on the attribute “all alone within virtual world” ( $p=0.025$ ). Participants felt least alone within the virtual world during interactions with the humanoid avatar within this task context ( $M=4.33$ ). This was followed by the animated avatar ( $M=4.25$ ), whilst participants felt most alone within the virtual world when carrying out Second Life tasks with the unanimated avatar ( $M=3.85$ ).

There were no significant effects of age, gender or version order for the social presence attribute “all alone within virtual world” within the Second Life task context.

### **Real-life task**

There is a highly significant within-subject effect of social presence on the attribute “all alone within virtual world” ( $p=0.001$ ). Participants felt least alone within the virtual world during interactions with the humanoid avatar within this task context ( $M=4.60$ ). This was then followed by the animated avatar ( $M=4.25$ ), whilst participants felt most alone within the virtual world when carrying out real-life tasks with the unanimated avatar ( $M=3.79$ ).

There was also a significant interaction effect of age group on the social presence attribute “all alone within virtual world” ( $p=0.006$ ). The 35 + year age group felt more alone within the virtual world than the 18-34 year age group during interactions with all three of the avatars. Both age groups felt least alone during interactions with the

humanoid avatar and most with the unanimated avatar. In terms of the animated avatar, there was the largest difference between the two age groups in that the 35 + year age group reported feeling extremely alone within the virtual world during these interactions, whereas the 18-34 year age group rated interactions more highly.

There was also a significant interaction effect of gender on the social presence attribute “all alone within virtual world” ( $p=0.022$ ). Both sexes felt least alone during interactions with the humanoid avatar, followed by the animated avatar and most during interactions with the unanimated avatar within this task context. Males however, felt more alone during interactions with both the humanoid and animated avatars than female participants. Females on the other hand, felt more alone during interactions with the unanimated avatars than males.

There was also a significant interaction effect of version order on the social presence attribute “all alone within virtual world” ( $p=0.015$ ) showing that the order of which participants were exposed to the financial advisor avatars had a significant effect upon how alone they felt within the virtual world when carrying out real-life tasks with the avatars.

### **Social Presence Attribute – “felt like a real person”**

#### **Second Life task**

There is a significant within-subject effect of social presence on the attribute “felt like a real person” ( $p=0.049$ ). Participants felt most as though they were interacting with a real person when carrying out Second Life tasks with the humanoid avatar ( $M=3.98$ ). Within this task context, participants did not feel as though they were interacting with

a real person when carrying out Second Life tasks with the unanimated ( $M=3.33$ ) or animated ( $M=3.06$ ) avatars.

There were no significant effects of age, gender or version order for the social presence attribute “felt like a real person” within the Second Life task context.

### **Real-life task**

There is a highly significant within-subject effect of social presence on the attribute “felt like a real person” ( $p=0.001$ ). Participants felt more as though they were interacting with a real person when carrying out real-life tasks with the humanoid avatar ( $M=4.33$ ). Participants reported that it did not feel as though they were interacting with a real person during interactions with both the animated ( $M=3.15$ ) and unanimated ( $M=3.17$ ) avatars.

There was also a significant interaction effect of gender on the social presence attribute “felt like a real person” ( $p=0.027$ ). Although both sexes felt most as though they were interacting with a real person when carrying out real-life tasks with the humanoid avatar, females rated more positively overall than males on this interaction. Males felt more as though they were interacting with a real person during interactions with the animated avatar than the unanimated avatar within this task context. Conversely, females felt more as though they were interacting with a real person during interactions with the unanimated avatar than the animated avatar within this task context.

There were no significant effects of age or version order for the social presence attribute “felt like a real person” within the real-life task context.

### **Social Presence Attribute – “interacting with automated machine”**

#### **Second Life task**

There is a significant within-subject effect of social presence on the attribute “interacting with automated machine” ( $p=0.040$ ). Participants felt least like they were interacting with an automated machine during interactions with the humanoid avatar within this task context ( $M=4.13$ ). Participants felt as though they were interacting with an automated machine when interacting with both the unanimated ( $M=3.17$ ) and animated ( $M=3.15$ ) avatars within this task context.

There were no significant effects of age, gender or version order for the social presence attribute “interacting with automated machine” within the Second Life task context.

#### **Real-life task**

There is a significant within-subject effect of social presence on the attribute “interacting with automated machine” ( $p=0.017$ ). Participants felt least like they were interacting with an automated machine during interactions with the humanoid avatar within this task context ( $M=4.40$ ). Participants felt as though they were interacting with an automated machine when interacting with both the animated ( $M=3.29$ ) and unanimated ( $M=3.02$ ) avatars within this task context.

There were no significant effects of age, gender or version order for the social presence attribute “interacting with automated machine” within the real-life task context.

### **Social Presence Attribute – “controlled by a human-being”**

#### **Second Life task**

There were no significant within-subject effects on the social presence attribute “controlled by a human being”. When carrying out Second Life tasks, participants felt of the three financial agent avatars, that the unanimated avatar was being controlled by another human-being (M=4.02). Participants did not think that the animated (M=3.79) or humanoid (M=3.73) avatars were being controlled by another human being within this task context.

There were no significant effects of age, gender or version order for the social presence attribute “controlled but a human-being” within the Second Life task context.

#### **Real-life task**

There were no significant within-subject effects on the social presence attribute “controlled by a human being”. When carrying out real-life tasks, participants felt of the three financial agent avatars, that the unanimated avatar was being controlled by another human-being (M=4.00). Participants did not think that the animated (M=3.67) or humanoid (M=3.58) avatars were being controlled by another human being within this task context.



There were no significant effects of age, gender or version order for the social presence attribute “controlled but a human-being” within the real-life task context.

### **Social Presence Attribute – “financial advisor appearance unrealistic”**

#### **Second Life task**

There is a highly significant within-subject effect of social presence on the attribute “financial advisor appearance unrealistic” ( $p=0.000$ ). Participants found the appearance of the humanoid avatar to be realistic ( $M=5.00$ ). Participants found the appearance of the unanimated avatar to be very unrealistic ( $M=2.46$ ), thought it was the appearance of the animated avatar that was rated overall as the most unrealistic in terms of appearance within this task context ( $M=2.35$ ).

There were no significant effects of age, gender or version order for the social presence attribute “financial advisor appearance unrealistic” within the Second Life task context.

#### **Real-life task**

There is a highly significant within-subject effect of social presence on the attribute “financial advisor appearance unrealistic” ( $p=0.000$ ). Participants found the appearance of the humanoid avatar to be realistic ( $M=5.33$ ). Participants found the appearance of the animated avatar to be very unrealistic ( $M=2.58$ ), thought it was the appearance of the unanimated avatar that was rated overall as the most unrealistic in terms of appearance ( $M=2.60$ ).

There were no significant effects of age, gender or version order for the social presence attribute “financial advisor appearance unrealistic” within the real-life task context.

### **Social Presence Attribute – “financial advisor behaviour realistic”**

#### **Second Life task**

There is a significant within-subject effect of social presence on the attribute “financial advisor behaviour realistic” ( $p=0.025$ ). Within the Second Life task context, participants thought that the humanoid financial agent’s behaviour was the most realistic ( $M=4.85$ ). Participants did not find the behaviour of the unanimated avatar to be particularly realistic ( $M=3.96$ ) and it was the behaviour of the animated avatar that was rated as the most unrealistic of the three avatars within this task context ( $M=3.73$ ).

There were no significant effects of age, gender or version order for the social presence attribute “financial advisor behaviour realistic” within the Second Life task context.

#### **Real-life task**

There is a significant within-subject effect of social presence on the attribute “financial advisor behaviour realistic” ( $p=0.014$ ). Within the real-life task context, participants thought that the humanoid financial agent’s behaviour was the most realistic ( $M=4.75$ ). Participants did not find the behaviour of the unanimated avatar to be particularly realistic ( $M=4.25$ ) and it was the behaviour of the animated avatar that

was rated as the most unrealistic of the three avatars within this task context (M=3.92).

There were no significant effects of age, gender or version order for the social presence attribute “financial advisor behaviour realistic” within the real-life task context.

### **Social Presence Attribute – “virtual branch realistic”**

#### **Second Life task**

There were no significant within-subject effects of social presence on the attribute “virtual branch realistic”. In general however, despite the design of the virtual branch remaining constant throughout the experiment, participants thought that the virtual branch was more realistic during interactions with the humanoid avatar within this task context (M=4.35). Participants thought that the virtual branch was less realistic during Second Life task interactions with the animated avatar (M=4.04), and least realistic during interactions with the unanimated avatar (M=3.83).

There were no significant effects of age, gender or version order for the social presence attribute “virtual branch realistic” within the Second Life task context.

#### **Real-life task**

There is a significant within-subject effect of social presence on the attribute “virtual branch realistic” ( $p=0.046$ ). Although the design of the virtual branch remained constant throughout the experiment, participants thought that the virtual branch was more realistic during interactions with the humanoid avatar within this task context (M=4.50). Participants thought that the virtual branch was less realistic during Second

Life task interactions with the animated avatar ( $M=4.13$ ), and least realistic during interactions with the unanimated avatar ( $M=3.94$ ).

There were no significant effects of age, gender or version order for the social presence attribute “virtual branch realistic” within the real-life task context.

### **Social Presence Attribute – “financial advisor visually unappealing”**

#### **Second Life task**

There is a significant within-subject effect of social presence on the attribute “financial advisor visually unappealing” ( $p=0.005$ ). Overall, participants found the humanoid avatar to be most visually appealing ( $M=4.96$ ) followed by the animated avatar ( $M=3.48$ ), with the unanimated avatar being rated as the most visually unappealing within this task context ( $M=3.19$ ).

There were no significant effects of age, gender or version order for the social presence attribute “financial advisor visually unappealing” within the Second Life task context.

#### **Real-life task**

There is a significant within-subject effect of social presence on the attribute “financial advisor visually unappealing” ( $p=0.017$ ). Overall, participants found the humanoid avatar to be most visually appealing ( $M=4.88$ ) followed by the animated avatar ( $M=3.17$ ), with the unanimated avatar being rated as the most visually unappealing within this task context ( $M=3.02$ ).

There were no significant effects of age, gender or version order for the social presence attribute “financial advisor visually unappealing” within the real-life task context.

### **Social Presence Attribute – “financial task unrealistic”**

#### **Second Life task**

There is a significant within-subject effect of social presence on the attribute “financial task unrealistic” ( $p=0.036$ ). Participants did not find any of the financial tasks particularly unrealistic, though they did find the financial tasks most realistic during interactions with the humanoid avatar ( $M=5.15$ ), followed by the animated avatar ( $M=4.92$ ) and least of all with the unanimated avatar ( $M=4.44$ ).

There were no significant effects of age, gender or version order for the social presence attribute “financial task unrealistic” within the Second Life task context.

#### **Real-life task**

There is a significant within-subject effect of social presence on the attribute “financial task unrealistic” ( $p=0.049$ ). Participants did not find any of the financial tasks particularly unrealistic, though they did find the financial tasks most realistic during interactions with the humanoid avatar ( $M=5.38$ ), followed by the animated avatar ( $M=5.25$ ) and least of all with the unanimated avatar ( $M=4.73$ ).

There were no significant effects of age, gender or version order for the social presence attribute “financial task unrealistic” within the real-life task context.

## **Social Presence Attribute – “interaction impersonal”**

### **Second Life task**

There is a significant within-subject effect of social presence on the attribute “interaction impersonal” ( $p=0.029$ ). Participants found interactions with the humanoid avatar to be the most personal ( $M=4.33$ ) whilst interactions with both the animated ( $M=3.83$ ) and unanimated ( $M=3.46$ ) avatars were thought to be impersonal within this task context.

There were no significant effects of age, gender or version order for the social presence attribute “interaction impersonal” within the Second Life task context.

### **Real-life task**

There is a significant within-subject effect of social presence on the attribute “interaction impersonal” ( $p=0.004$ ). Participants found interactions with the humanoid avatar to be the most personal ( $M=4.54$ ) whilst interactions with both the animated ( $M=3.85$ ) and unanimated ( $M=3.52$ ) avatars were thought to be impersonal within this task context.

There were no significant effects of age, gender or version order for the social presence attribute “interaction impersonal” within the real-life task context.

## **Social Presence Attribute – “uneasy interacting”**

### **Second Life task**

There were no significant within-subject effects of social presence on the attribute “uneasy interacting”. In general however, participants did not feel uneasy interacting

with any of the three financial agent avatars within this task context. Of the interactions with each of the avatars within this task context however, participants reported feeling most uneasy during interactions with the unanimated avatar (M=4.65) followed by the animated avatar (M=4.88) whilst they felt the most comfortable during interactions with the humanoid avatar (M=5.04).

There were no significant effects of age, gender or version order for the social presence attribute “uneasy interacting” within the Second Life task context.

### **Real-life task**

There were no significant within-subject effects of social presence on the attribute “uneasy interacting”. In general however, as with the real-life task context, participants did not feel uneasy interacting with any of the three financial agent avatars within this real life task context. Of the interactions with each of the avatars within this task context however, participants reported feeling most uneasy during interactions with the unanimated avatar (M=4.65) followed by the animated avatar (M=4.71) whilst they felt the most comfortable during interactions with the humanoid avatar (M=5.15).

There were no significant effects of age, gender or version order for the social presence attribute “uneasy interacting” within the real-life task context.

## **Social Presence Attribute – “financial advisor responsive”**

### **Second Life task**

There were no significant within-subject effects of social presence on the attribute “financial advisor responsive”. In general however, participants responded positively to this attribute and felt that all three of the financial agent avatars responded positively towards them during Second Life task interactions. Participants felt that the humanoid financial agent avatar was the most responsive towards them (M=5.43), followed by the animated avatar (M=5.25) with the unanimated avatar being least responsive of the three (M=5.08).

There were no significant effects of age, gender or version order for the social presence attribute “financial advisor responsive” within the Second Life task context.

### **Real-life task**

There were no significant within-subject effects of social presence on the attribute “financial advisor responsive”. In general, participants again responded positively to this attribute and felt that all three of the financial agent avatars responded positively towards them during real-life task interactions. Participants felt that the animated financial agent avatar was the most responsive towards them (M=5.46), followed by the humanoid avatar (M=5.31) with the unanimated avatar being least responsive of the three (M=5.25).

There were no significant effects of age, gender or version order for the social presence attribute “financial advisor responsive” within the real-life task context.



## **Social Presence Attribute – “interacting with an object”**

### **Second Life task**

There is a significant within-subject effect of social presence on the attribute “interacting with an object” ( $p=0.006$ ). Within the Second Life task context, participants generally reported feeling least as though they were interacting with an object as opposed to a person during interactions with the humanoid avatar ( $M=3.79$ ). Participants most felt as though they were interacting with an object as opposed to a person during interactions with the animated ( $M=3.04$ ) and unanimated ( $M=2.75$ ) avatars within this task context.

There were no significant effects of age, gender or version order for the social presence attribute “interacting with an object” within the Second Life task context.

### **Real-life task**

There is a significant within-subject effect of social presence on the attribute “interacting with an object” ( $p=0.022$ ). Participants felt most like they were interacting with a person during interactions with the humanoid avatar ( $M=4.15$ ). During real life task interactions with both the animated ( $M=2.90$ ) and unanimated ( $M=2.77$ ) avatars, reported feeling like they were interacting with objects rather than people.

There were no significant effects of age, gender or version order for the social presence attribute “interacting with an object” within the real-life task context.

### **Social Presence Attribute – “present within virtual world”**

#### **Second Life task**

There were no significant within-subject effects of social presence on the attribute “financial advisor responsive”. In general however, participants reported experiencing the greatest sense of presence within the virtual world during interactions with the humanoid avatar (M=4.75) followed by the animated avatar (M=4.63) and felt the lowest levels of presence during interactions with the unanimated avatar (M=4.58).

There were no significant effects of age, gender or version order for the social presence attribute “present within virtual world” within the Second Life task context.

#### **Real-life task**

There is a significant within-subject effect of social presence on the attribute “present within virtual world” ( $p=0.012$ ). Participants reported experiencing the greatest sense of presence within the virtual world during interactions with the humanoid avatar (M=4.75) followed by the animated avatar (M=4.58) and felt the lowest levels of presence during interactions with the unanimated avatar (M=4.35).

There were no significant effects of age, gender or version order for the social presence attribute “present within virtual world” within the real-life task context.

### **Social Presence Attribute – “personally involved in financial task”**

#### **Second Life task**

There were no significant within-subject effects of social presence on the attribute “personally involved in financial task”. In general however, within the Second Life

task context, participants felt the most personally involved in the financial tasks during interactions with both the humanoid (M=4.71) and animated (M=4.71) avatars, and felt least involved during interactions with the unanimated avatar (M=4.67).

There were no significant effects of age, gender or version order for the social presence attribute “personally involved in financial task” within the Second Life task context.

### **Real-life task**

There were no significant within-subject effects of social presence on the attribute “personally involved in financial task”. In general however, within the real-life task context, participants felt the most personally involved in the financial tasks during interactions with the humanoid avatar (M=5.13) followed by the animated avatar (M=4.83). Participants felt least personally involved in the financial task during interactions with the unanimated avatar (M=4.69).

There were no significant effects of age, gender or version order for the social presence attribute “personally involved in financial task” within the real-life task context.

### **Social Presence Attribute – “financial advisor intelligent”**

#### **Second Life task**

There were no significant within-subject effects of social presence on the attribute “financial advisor intelligent”. In general, participants did not find any of the financial agent avatars to be unintelligent, however they felt that the humanoid avatar was most

intelligent (M=4.75), followed by the animated avatar (M=4.50), with the unanimated avatar being rated as the least intelligent of the three (M=4.33).

There were no significant effects of age, gender or version order for the social presence attribute “financial advisor intelligent” within the Second Life task context.

### **Real-life task**

There is a significant within-subject effect of social presence on the attribute “financial advisor intelligent” ( $p=0.011$ ). Overall, participants did not find any of the three financial agent avatars to be particularly unintelligent within the real-life task context. Participants found the humanoid avatar to be the most intelligent (M=4.96) followed by the unanimated avatar (M=4.50) with the animated avatar being rated as the least intelligent (M=4.44).

There were no significant effects of age, gender or version order for the social presence attribute “financial advisor intelligent” within the real-life task context.

### **Social Presence Attribute – “financial advisor informed”**

#### **Second Life task**

There were no significant within-subject effects of social presence on the attribute “financial advisor informed”. Within the Second Life task context, participants generally found the animated avatar to be the most informed (M=5.31) followed by the unanimated avatar (M=5.17). Contrary to expected results; participants rated the humanoid avatar as the least informed within this task context (M=5.1).

There were no significant effects of age, gender or version order for the social presence attribute “financial advisor informed” within the Second Life task context.

### **Real-life task context**

There were no significant within-subject effects of social presence on the attribute “financial advisor informed”. Within the real-life task context, participants generally found all three of the financial agent avatars to be informed. Participants found the animated avatar to be the most informed (M=5.29) and this was closely followed by the humanoid avatar (M=5.25). The least informed of the financial agent avatars within the real-life task context was though by participants to be the unanimated avatar (M=5.19).

There were no significant effects of age, gender or version order for the social presence attribute “financial advisor informed” within the real-life task context.

### **Social Presence Attribute – “information unreliable”**

#### **Second Life task**

There were no significant within-subject effects of social presence on the attribute “information unreliable”. In general participants did not find the information given to them by any of the three financial agent avatars during Second Life tasks to be unreliable. They generally felt that information given by the animated avatar within this task context to be the most reliable (M=5.27) followed by that given to them by the unanimated avatar (M=5.17). Information given to participants within this task context by the humanoid avatar was reported to be the least reliable (M=5.13).

There were no significant effects of age, gender or version order for the social presence attribute “information unreliable” within the Second Life task context.

### **Real-life task**

There were no significant within-subject effects of social presence on the attribute “information unreliable”. In general participants did not find the information given to them by any of the three financial agent avatars during real-life tasks to be unreliable. Participants felt that information given to them by the humanoid avatar within the real-life task context to be the most reliable (M=5.48) followed by information given to them by the animated avatar (M=5.33). Information given to participants within this task context by the unanimated avatar was reported to be the least reliable (M=5.02).

There were no significant effects of age, gender or version order for the social presence attribute “information unreliable” within the real-life task context.

## Appendix 9

**YOU AND YOUR PARTNER ARE THE CREATORS OF THE EDINBURGH SPORTS ONLINE FORUM. TODAY YOU ARE MEETING INSIDE THE VIRTUAL BANK BRANCH IN SECOND LIFE TO CARRY OUT THE FOLLOWING TASK:**

### TASK A

Collaborate with the other customer, your partner, to decide on the appearance of the financial advisor.

<b>Feature</b>	<b>Sub-categories</b>
<b>Shirt</b>	<b>Colour</b>
<b>Trouser</b>	<b>Colour</b>
<b>Skirt</b>	<b>Length</b> <b>Colour</b>
<b>Hair</b>	<b>Style</b> <b>Colour</b>
<b>Shoes</b>	<b>Platform</b> <b>Heel</b> <b>Colour</b>

**When you have completed your discussion, press the 'Activate' button.**

**YOU AND YOUR PARTNER ARE THE CREATORS OF THE EDINBURGH SPORTS ONLINE FORUM. TODAY YOU ARE MEETING INSIDE THE VIRTUAL BANK BRANCH IN SECOND LIFE TO CARRY OUT THE FOLLOWING TASK:**

## **TASK B**

Collaborate with the other customer, your partner, to select the best credit card for the Edinburgh Sports online forum.

<b>Credit Card Feature</b>	<b>Edinburgh Sports online forum requirements</b>
<b>Online Services</b>	The forum is going to be organising a charity event, taking place in two months time. Forum staff will be responsible for booking an appropriate venue online.
<b>Airmile Bonuses</b>	Levels of expenditure by the forum will be highest within the first 5 months of receiving the credit card with the forum creators travelling abroad to attend upcoming sports conferences.
<b>Fuel Rewards</b>	Car travel will be extensive amongst forum staff with many commuting during weekdays.
<b>Introductory Purchase Offer</b>	Levels of expenditure by the forum will be highest within the first 5 months.
<b>Cash Back Benefits</b>	The forum's main expenditure this year will be on travel and organising the charity event.
<b>Maximum cash withdrawal from ATM per day</b>	With forum staff travelling abroad for conferences, access to cash in other countries would be useful.
<b>Insurance Advantages</b>	The majority of the forum's purchases will be bought online.
<b>Added Benefits</b>	Travel by both car and plane will be frequent amongst forum staff members.



## Appendix 10

### Confederate Script: The Collaboration Experiment

Collect **version sheet** from researcher and check:

- a. **Gender of financial agent avatar**, i.e. male then female **or** female then male.
- b. **Order of the medium**, i.e. text then voice **or** voice then text

**Log in** to Second Life with the corresponding avatar; see ‘avatar names and passwords’ sheet. Position the avatar in the ‘altering appearance stance’ on the platform inside the virtual bank branch to await the arrival of the participants.

Make sure the financial agent avatar’s appearance is set to default – go into editing appearance stance and select ‘randomise’.

Have word document with financial agent responses open on your computer to cut and paste into the ‘chat bar’. You should pay attention to participant responses however as some may not be as expected.

.....

When participants enter the virtual bank branch, they will move their avatars to the ‘advisor appearance’ area and begin their discussion on how they would like a financial agent avatar to look within Second Life. They will have a **list of features** that they can alter – you will also have this in front of you. As they move through each of the features, you should alter the avatar as much to their description as possible, taking into account its gender.

When they have finished their discussion, they will then press the ‘**Activate**’ button to make the financial agent avatar ‘functional’.

At this point, you should then **select ‘close’** on the bottom right hand corner of the appearance box to take your avatar out of the ‘appearance editing’ stance.

*Once edited, you should now walk down the steps and greet the participants:*

*“Welcome to Lloyds TSB, how can I help you?”*

Wait for response – participants should indicate they are looking for a credit card for their online forum group.

*“Certainly, if you would like to follow me over to the credit card selection area”.*

.....

Have **Credit Card Features Commands** sheet in front of you:

Once participants have positioned their avatars so as they can both view the screen, you will then **introduce the selection process**.

*“Based on your forum’s needs, decide which of the three is best option and let me know.”*

*“Firstly, is Online Services” wait for participants’ response about their choice decision.*

*“We now have Airmile Bonuses”*

*“We now have Fuel Rewards”*

and so on for;

*“...Introductory Purchase Offer”*

*“...Cash Back Benefits”*

*“...Maximum cash withdrawal from ATM per day”*

*“...Insurance Advantages”*

*“...Added Benefits”*

As the selection process moves along, if participants are moving too quickly, you should **encourage them to re-evaluate**, i.e.

*“Are you both happy with that?”*

*“Are you sure you have both discussed this enough?”*

.....

When participants have collaborated to make a decision on each of the features, they will then **choose a charity**:

*“You and your partner can now decide on a charity to receive a donation on your behalf and let me know.”*

**Again, enter each of the text sections above in three parts – 5 seconds between each.**

Once chosen:

*“Thanks. You should now agree on the image that will appear on your credit card.”*

*“What is the name of your organisation?”*

Once participants have told you the **name of the organisation**:

*“Ok, here is a selection of six images for you to choose from.”*

*“If you would like to see any of the images more closely just let me know.”*

*“You can go back to the main selection board at any time.”*

Theatre forum – bring up the selection of the **six theatre images**

**OR**

Sports forum – bring up the selection of the **six sports images**

When participants have chosen the image they want, bring it back up on the screen.

*“Are you happy with your final selection?”*

Wait for response. Make any necessary changes if asked and if happy with their selection:

*“Thanks, that’s us finished.”*

*“Your credit card will be with you in the next few days.”*

*“If you’re ready to leave the branch, press the blue button to the left of the door. Bye”*

**\*\*At the end of the interaction, put screen back to the original Lloyds TSB display – see feature commands sheet.**

.....

# Appendix 11

## Usability Questionnaire

Participant ID:  
Date:

*This questionnaire relates to the collaboration you have just taken part in.*

*Please tick the box which most closely represents how you feel about each of the following statements.*

1. I thought that collaborating with my partner was confusing.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. I had to concentrate hard when collaborating with my partner.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. I was flustered when collaborating with my partner.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. I felt under stress whilst collaborating with my partner.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. I thought collaborating within the virtual world was complicated.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. I felt frustrated when collaborating with my partner.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. I felt in control when collaborating with my partner.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. I thought the financial advisor was competent in supplying the necessary information.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. I felt that collaborating with my partner took too long.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. I found it difficult to collaborate within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. I thought that my partner communicated clearly.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. I understood the information the financial advisor gave me during the interaction.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. I would be happy to collaborate with my partner again.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. The virtual world was suited to the financial task.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. I think the information supplied during the collaboration was reliable.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. My partner helped me feel engaged within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. I thought that the collaboration with my partner was efficient.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. I found the collaboration with my partner satisfying.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. I thought that my partner was friendly.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. I thought the financial advisor was friendly.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. I disliked communicating with my partner.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. I would be happy to use the virtual world again.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. I disliked collaborating with my partner.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24. I disliked interacting with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25. I thought my partner was polite.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

26. I felt intimidated by my partner.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

27. I would prefer to interact with a real person.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Appendix 12

Participant ID:  
Date:

### SVE Social Presence Perception Scale

*This questionnaire again relates to the collaboration you have just taken part in.*

*Please tick the box which most closely represents how you feel about each of the following statements.*

1. I felt as though I was actually part of the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. I disliked collaborating in the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. I enjoyed the role-playing aspect of carrying out the financial task.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. I enjoyed the role-playing aspect of collaborating with my partner.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. I disliked the role playing aspect of interacting with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



6. I disliked the escapism element of the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Whilst collaborating within this environment I was very easily distracted.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. I was very aware of using the computer to control my avatar.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. I felt that my conversations with my partner were worthwhile.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. I felt that I had nothing in common with my partner.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. I felt that my partner's opinion were important.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. I felt like I dominated the collaboration.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. I felt that I contributed more to the task than my partner.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. I felt that my partner listened to my opinions.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. I felt that I listened to my partner's opinions before making decisions.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. I felt that my opinion had a great deal of effect on my partner's decisions.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. I felt that my partner's opinion had no effect at all upon my final decisions.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. I felt in control when collaborating with my partner.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. I felt it was very important to carry out the tasks to the best of my ability.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. I felt it was very important to work with my partner to reach decisions.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. I felt that other people were with me within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. I felt that other avatars were present within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. I felt all alone within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24. I felt like I was interacting with real people.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25. I felt like I was interacting with an automated machine.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

26. I felt that the financial advisor avatar was being controlled by another human being.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

27. I felt that my partner's avatar was being controlled by another human being.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

28. I thought that the financial advisor's behaviour was unrealistic.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

29. I thought that my partner's behaviour was realistic.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

30. I thought that the virtual bank branch was unrealistic.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

31. I thought that the financial task was unrealistic.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

32. I felt that interacting with my partner was impersonal.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

33. I felt uneasy collaborating with my partner.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

34. I felt that my partner was responsive towards me.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

35. I felt that the financial advisor was responsive towards me.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

36. I felt present within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

37. I felt personally involved in the financial task.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

38. I thought that my partner was competent.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

39. I thought that the financial advisor was informed.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

40. I thought that the financial advisor was unreliable.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# Appendix 13

## Exit Questionnaire

<b>Participant ID:</b> <b>Order:</b> <b>Date:</b>
---

**1. You collaborated in two different ways within Second Life today, once through text and once through voice.**

**a. Was there anything in particular that you liked about collaborating using text?**

.....  
.....

**b. Was there anything about using text to collaborate that you disliked, or thought could be improved?**

.....  
.....

**2.a. Was there anything in particular that you liked about collaborating using voice?**

.....  
.....

**b. Was there anything about using voice to collaborate that you disliked, or thought could be improved?**

.....  
.....

**3. How did you feel about collaborating with your partner?**

.....  
.....

**4. How did you feel about interacting with the financial advisor?** *(prompt on feeling towards reporting final decisions to the advisor).*

.....  
.....

**5. You interacted with a male and a female financial advisor today.**

**a. What did you think about the appearance of the male financial advisor avatar?** *(i.e. changing the appearance, was it what they expected).*

.....  
.....

**b. What did you think about the appearance of the female financial advisor avatar?** *(i.e. changing the appearance, was it what they expected).*

.....  
.....

**c. Did you feel that any one of the two financial advisors provided a better service than the others, (in terms of speed of use, ease of use, or enjoyment of the service) if so why?**

.....  
.....

**6. a. How secure did you feel your conversation was when communicating with your partner through text?**

.....  
.....

**b. How secure did you feel your conversation was when communicating through voice?**

.....  
.....

**7. How secure do you think you would feel using Second Life for your own personal banking needs?**

**a. Using text**

.....  
.....

**b. Using voice**

.....  
.....

**8. What did you think about the virtual bank branch in which you interacted?**  
*(prompt participant to elaborate on appearance and ease of use, Lloyds branding etc.)*

.....  
.....

**9. What would you say your motivations for using a service like the one you experienced today would be?** *(Offer options if participant is struggling).*

.....  
.....

**10. Do you think the Second Life is an effective tool for holding conversations?**  
*(encourage participant to elaborate).*

.....  
.....

**11. Do you feel that you could make good friends within Second Life? Why?**

.....  
.....

**12. Do you think Second Life could act as a platform for learning and education?**

.....  
.....

**13. Prior to your induction session had you previously heard of or did you have your own account within Second Life?**

.....  
.....

**14. If Lloyds were to introduce a virtual bank branch within Second Life, do you think you would use it? (*encourage participant to elaborate*).**

.....  
.....

**15. Finally, do you have any other comments you would like to add?**

.....  
.....



## **Appendix 14**

### ***Analysis of Individual Usability Attributes (The Collaboration Experiment)***

#### **Usability Attribute – “confusion”**

There is a significant within-subject effect on the usability attribute “confusion” between the text and voice conditions ( $p=0.01$ ). Although participants did not consider collaborating with their partner to be particularly confusing in either of the conditions, the voice condition was rated the less confusing ( $M=5.30$ ) than the text condition ( $M=4.80$ ).

There were no significant within-subjects effects of age group, gender or order on the usability attribute “confusion”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “confusion”.

#### **Usability Attribute – “concentration”**

There are no significant within-subject effects on the usability attribute “concentration” between the text and voice conditions. Participants in general however reported that less concentration was required during collaborations with their partner through voice ( $M=4.64$ ) than through text ( $M=4.32$ ).

There were no significant within-subjects effects of age group, gender or order on the usability attribute “concentration”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “concentration”.

#### **Usability Attribute – “flustered”**

There are no significant within-subjects effects on the usability attribute “flustered” between the text and voice collaborative conditions. Participants in general however were slightly less flustered when collaborating with their partner in the voice condition (M=4.73) than in the text condition (M=4.67).

There is a significant within-subjects effect for the flustered\*age interaction ( $p=0.011$ ). The 18-34 year age group were less flustered collaborating through text (M=5.13) than through voice (M=4.69). Conversely, the 35+ year age group were more flustered collaborating through text (M=4.24) than through voice (M=4.69).

There is also a significant within-subjects effect for the flustered\*gender interaction ( $p=0.028$ ). Male participants were less flustered when collaborating through text (M=5.06) than voice (M=4.69) whereas females were less flustered during voice based collaborations (M=4.69) than through text (M=4.30).

There were no significant between-subjects effects of age group, gender or order on the usability attribute “flustered”.

#### **Usability Attribute – “stress”**

There are no significant within-subjects effects on the usability attribute “stress” between the text and voice collaborative conditions. Participants did not report being

particularly stressed when collaborating with their partners in the text (M=4.07) or voice (M=4.92) conditions.

There is a significant within-subjects effect for the stress\*gender interaction ( $p=0.049$ ). Males were experienced less stress when collaborating through text (M=5.1) than voice (M=4.66), whilst females experienced less stress in the voice condition (M=5.10) than in the text condition (M=4.82).

There were no significant within-subjects effects of age group or order on the usability attribute “stress”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “stress”.

#### **Usability Attribute – “complicated”**

There are no significant within-subjects effects on the usability attribute “complicated” between the text and voice collaborative conditions. Participants in general however did not report finding either of the collaboration conditions to be complicated, though the voice condition (M=5.00) was rated more positively than the text condition (M=4.70).

There were no significant within-subjects effects of age group, gender or order on the usability attribute “complicated”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “complicated”.

#### **Usability Attribute – “frustrated”**

There is a significant difference between the text and voice collaboration conditions for the usability attribute “frustrated” ( $p=0.001$ ). Participants felt more frustrated when collaborating with their partners through text ( $M=4.64$ ) than through voice ( $M=5.29$ ).

There were no significant within-subjects effects of age group, gender or order on the usability attribute “frustrated”.

There was however a significant between-subjects effect for age on the usability attribute “frustrated” ( $p=0.04$ ). Those in the 18-34 year age group were less frustrated when collaborating with their partner ( $M=5.25$ ) than the 35+ year age group ( $M=4.63$ ).

There were no significant between-subjects effects of gender or order on the usability attribute “complicated”.

#### **Usability Attribute – “in control”**

There are no significant within-subjects effects on the usability attribute “in control” between the text and voice collaborative conditions. Participants felt in control when collaborating within the virtual world in both the text ( $M=4.89$ ) and voice ( $M=4.94$ ) conditions.

There was a significant within-subjects effect for the in control\*order interaction ( $p=0.019$ ) showing that the order that participants were exposed to the modes of communication (as well as gender of the financial agent avatar) had a significant effect upon how in control participants felt when collaborating within the virtual world. There are four orders altogether, the first order being text with the female financial agent (TF) followed by voice with the male financial agent (VM). Participants who experienced this order felt slight more in control in the voice condition ( $M=4.50$ ) than in the text condition ( $M=4.38$ ). In the second order, TM followed by VF, participants again reported feeling more in control in the voice condition ( $M=5.48$ ) than in the text condition ( $M=4.94$ ). In the third order, VF followed by TM, participants instead reported feeling more in control in the text condition ( $M=5.25$ ) than in the voice condition ( $M=4.56$ ). In the final order, VM followed by TF, participants reported feeling slightly more in control in the voice condition ( $M=5.13$ ) than in the text condition ( $M=5.06$ ).

There were no significant within-subjects effects of age group or gender on the usability attribute “in control”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “in control”.

### **Usability Attribute – “competent”**

There are no significant within-subjects effects on the usability attribute “competent” between the text and voice collaborative conditions. Participants felt that the financial

advisors were competent in supplying the necessary information in both conditions, though slightly higher levels of competency were reported in the text condition ( $M=5.73$ ) than in the voice condition ( $M=5.68$ ).

There were no significant within-subjects effects of age group, gender or order on the usability attribute “competent”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “competent”.

#### **Usability Attribute – “time”**

There is a significant difference between the text and voice collaboration conditions for the usability attribute “time” ( $p=0.000$ ). Participants felt that collaborating with their partner through text ( $M=3.44$ ) took significant longer than collaborating with their partner through voice ( $M=5.30$ ).

There is a significant within-subjects effect for the time\*gender interaction ( $p=0.025$ ). Females felt that collaboration in the text condition took slightly longer than males did, whereas females rated the voice condition more highly than males.

There were no significant within-subjects effects of age group or order on the usability attribute “time”.

There is also a significant between-subjects effect of order on the usability attribute “time” ( $p=0.002$ ). Participants that experienced the order TM, VF ( $M=5.14$ ) felt that

collaborations with their partner took the least amount of time, followed by those who experienced the order TF, VM (M=4.53). Participants that experienced the order VF, TM (M=3.88) and VM, TF (M=3.88) felt that collaborations with their partner were more time consuming. In general then, participants who experienced the voice condition first (VF, TM and VM, TF) felt that collaborations with their partner took longer than those who experienced the text condition first (TF, VM and TM, VF).

There were no significant between-subjects effects of age group or gender on the usability attribute “time”.

#### **Usability Attribute – “difficult”**

There are no significant within-subjects effects on the usability attribute “difficult” between the text and voice collaborative conditions. Participants did not report finding it difficult to collaborate within the virtual world in either the text or the voice conditions, though in general, collaboration in the voice condition was reported to be less difficult (M=5.05) than that in the text condition (M=4.71).

There were no significant within-subject effects of age group, gender or order on the usability attribute “difficult”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “difficult”.

#### **Usability Attribute – “clear communication”**

There are no significant within-subjects effects on the usability attribute “clear communication” between the text and voice collaborative conditions. Participants felt

that their partners communicated clearly in both the text (M=5.79) and voice (M=5.89) collaboration conditions.

There were no significant within-subject effects of age group, gender or order on the usability attribute “clear communication”.

There were no significant between-subject effects of age group, gender or order on the usability attribute “clear communication”.

### **Usability Attribute – “information”**

There is a significant difference between the text and voice collaboration conditions for the usability attribute “information” ( $p=0.047$ ). Participants understood the information that the financial advisor gave them during their interactions in both conditions, however the voice condition was rated more highly (M=5.85) than the text condition (M=5.69).

There is a significant within-subjects effect for the information\*age interaction ( $p=0.047$ ). The 18-34 year age group understood the information given to them equally in both conditions (M=5.78) whilst the 35+ year age group found the information given to them easier to understand in the voice condition (M=5.91) than in the text condition (M=5.58), although both conditions were rated positively within this age group.

There were no significant within-subject effects of gender or order on the usability attribute “information”.



There were no significant between-subject effects of age group, gender or order on the usability attribute “information”.

#### **Usability Attribute – “future collaboration”**

There are no significant within-subjects effects on the usability attribute “future collaboration” between the text and voice collaborative conditions. Participants would be happy to collaborate with their partners again in both the text (M=5.35) and voice (M=5.47) conditions.

There were no significant within-subjects effects of age group, gender or order on the usability attribute “future collaboration”.

There was however a significant between-subjects effect for order on the usability attribute “future collaboration” ( $p=0.011$ ). Those who experienced the order VM, TF were more likely to be happy to collaborate with their partners again (M=5.84), followed by TM, VF (M=5.74), VF TM (M=5.40) and to a lesser extent in the order TF, VM (M=4.63).

There were no significant between-subjects effects of age group or gender on the usability attribute “future collaboration”.

#### **Usability Attribute – “financial task”**

There are no significant within-subjects effects on the usability attribute “financial task” between the text and voice collaborative conditions. Participants in general felt

that the virtual world was suited to the financial task that they carried out in both the text (M=5.17) and voice (M=5.44) conditions.

There were no significant within-subjects effects of age group, gender or order on the usability attribute “financial task”.

There was however a significant between-subjects effect for order on the usability attribute “financial task” ( $p=0.005$ ). Although none of the orders were rated negatively by any of the participant groups, those who experienced the order TM VF rated the highest on the virtual world being suited to the financial task (M=5.83), followed by VF TM (M=5.59), VM TF (M=5.38) then TF VM (M=4.41).

There were no significant between-subjects effects of age group or gender on the usability attribute “financial task”.

#### **Usability Attribute – “reliable”**

There are no significant within-subjects effects on the usability attribute “reliable” between the text and voice collaborative conditions. In general, participants felt that the information supplied during the collaboration was reliable in both the text (M=5.53) and voice (M=5.60) conditions.

There were no significant within-subjects effects of age group, gender or order on the usability attribute “reliable”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “reliable”.

#### **Usability Attribute – “engaged”**

There are no significant within-subjects effects on the usability attribute “engaged” between the text and voice collaborative conditions. Participants reported that their partners helped them feel engaged within the virtual world in both the text (M=4.92) and voice conditions (M=5.08), although slightly more so in the voice condition.

There were no significant within-subjects effects of age group, gender or order on the usability attribute “engaged”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “engaged”.

#### **Usability Attribute – “efficient”**

There is a significant difference between the text and voice collaboration conditions for the usability attribute “efficient” ( $p=0.003$ ). Participants felt that their collaboration with their partner was efficient in each of the conditions, although significantly more efficient in the voice condition (M=5.23) than the text condition (M=4.59).

There were no significant within-subjects effects of age group, gender or order on the usability attribute “efficient”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “efficient”. It is worth noting however that the effect of order narrowly missed being significant ( $p=0.05$ ).

#### **Usability Attribute – “satisfying”**

There is a significant difference between the text and voice collaboration conditions for the usability attribute “satisfying” ( $p=0.013$ ). Participants felt that their collaboration with their partner was satisfying in both conditions, although significantly more satisfying in the voice ( $M=5.08$ ) than the text ( $M=4.76$ ) condition.

There were no significant within-subjects effects of age group, gender or order on the usability attribute “satisfying”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “satisfying”.

#### **Usability Attribute – “partner friendly”**

There is a significant difference between the text and voice collaboration conditions for the usability attribute “partner friendly” ( $p=0.001$ ). Participants reported that they found their partners to be very friendly, although significantly more so when collaborating through voice ( $M=6.03$ ) than through text ( $M=5.68$ ).

There were no significant within-subjects effects of age group, gender or order on the usability attribute “partner friendly”.

There was a significant between-subjects effect for age on the usability attribute “partner friendly” ( $p=0.02$ ). The 18-34 year age group on the whole felt that their partners were more friendly ( $M=6.11$ ) than the 35+ year age group did ( $M=5.58$ ).

There were no significant between-subjects effects of gender or order on the usability attribute “partner friendly”. It is worth noting however that the effect of order narrowly missed being significant ( $p=0.058$ ).

#### **Usability Attribute – “financial advisor friendly”**

There are no significant within-subjects effects on the usability attribute “financial advisor friendly” between the text and voice collaborative conditions. In general, participants reported that the financial advisor was friendly, though slightly more so in the voice ( $M=5.83$ ) than the text ( $M=5.65$ ) condition.

There were no significant within-subjects effects of age group, gender or order on the usability attribute “financial advisor friendly”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “financial advisor friendly”.

#### **Usability Attribute – “communication”**

There are no significant within-subjects effects on the usability attribute “communication” between the text and voice collaborative conditions. In general, participants liked communicating with their partner in both the text and the voice conditions, though slightly more through voice ( $M=5.42$ ) than text ( $M=5.23$ ).

There were no significant within-subjects effects of age group, gender or order on the usability attribute “communication”.

There was however a significant between-subjects effect for order on the usability attribute “communication” ( $p=0.016$ ). All of the orders were rated positively, however participants liked communicating with their partner the most in the order TM, VF ( $M=5.83$ ), followed by VM, TF ( $M=5.53$ ), VF, TM ( $M=5.28$ ) and the least in the order TF, VM ( $M=4.59$ ).

There were no significant between-subjects effects of age group or gender on the usability attribute “communication”, although it is worth noting that the effect of age narrowly missed being significant ( $p=0.055$ ).

#### **Usability Attribute – “use of virtual world”**

There is a significant difference between the text and voice collaboration conditions for the usability attribute “use of virtual world” ( $p=0.000$ ). Participants would be happy to use the virtual world again in both the text and voice conditions, although significantly more so in the voice ( $M=5.32$ ) than in the text ( $M=4.77$ ) condition.

There were no significant within-subjects effects of age group, gender or order on the usability attribute “use of virtual world”.

There was however a significant between-subjects effect for order on the usability attribute “use of virtual world” ( $p=0.009$ ). All of the orders were rated positively,

however participants reported that they would be happiest to use the virtual world again in the order TM, VF (M=5.55), followed by VM, TF (M=5.47), VF, TM (M=5.09) and the least in the order TF, VM (M=4.06).

There were no significant between-subjects effects of age group or gender on the usability attribute “use of virtual world”.

#### **Usability Attribute – “collaboration”**

There are no significant within-subjects effects on the usability attribute “collaboration” between the text and voice collaborative conditions. In general, participants liked collaborating with their partner in both conditions, though slightly more through voice (M=5.30) than through text (M=5.08).

There were no significant within-subjects effects of age group, gender or order on the usability attribute “collaboration”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “collaboration”.

#### **Usability Attribute – “interacting”**

There is a significant difference between the text and voice collaboration conditions for the usability attribute “interacting” ( $p=0.014$ ). Participants significantly preferred interacting with the financial advisor through voice (M=5.30) rather than text (M=5.01), although both conditions were positively rated.

There were no significant within-subjects effects of age group, gender or order on the usability attribute “interacting”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “interacting”.

### **Usability Attribute – “polite”**

There is a significant difference between the text and voice collaboration conditions for the usability attribute “polite” ( $p=0.005$ ). Participants felt that their partner was polite in both collaboration conditions, though significantly more so when communicating through voice ( $M=6.01$ ) rather than text ( $M=5.73$ ).

There were no significant within-subjects effects of age group, gender or order on the usability attribute “polite”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “polite”.

### **Usability Attribute – “intimidated”**

There is a significant difference between the text and voice collaboration conditions for the usability attribute “intimidated” ( $p=0.018$ ). Although participants did not report being particularly intimidated by their partner in either of the collaboration conditions, they were less intimidated when collaborating through text ( $M=5.80$ ) than through voice ( $M=5.44$ ).



There is a significant within-subjects effect for the intimidated\*gender interaction ( $p=0.049$ ). Male participants were less intimidated when collaborating through text ( $M=5.91$ ) than females ( $M=5.69$ ). On the other hand however, females were less intimidated when collaborating through voice ( $M=5.64$ ) than males ( $M=5.25$ ).

There were no significant within-subjects effects of age group or order on the usability attribute “intimidated”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “intimidated”.

#### **Usability Attribute – “prefer real person”**

There is a significant difference between the text and voice collaboration conditions for the usability attribute “prefer real person” ( $p=0.007$ ). In both conditions, participants reported that they would prefer to interact with a real person, though to a greater extent in the text condition ( $M=2.69$ ) than in the voice condition ( $M=3.27$ ).

There were no significant within-subjects effects of age group, gender or order on the usability attribute “prefer real person”.

There were no significant between-subjects effects of age group, gender or order on the usability attribute “prefer real person”.

## **Appendix 15**

### ***Analysis of Individual Social Presence Attributes (The Collaboration Experiment)***

#### **Social Presence Attribute – “part of the virtual world”**

There is a significant within-subjects effect of social presence on the attribute “part of the virtual world” ( $p=0.032$ ). Participants felt as though they were actually part of the virtual world when collaborating through voice ( $M=4.90$ ) more so than when collaborating through text ( $M=4.64$ ).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “part of the virtual world”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “part of the virtual world”.

#### **Social Presence Attribute – “collaboration”**

There are no significant within-subjects effects on the social presence attribute “collaboration” between the text and voice collaborative conditions. In general however, participants did not particularly dislike collaborating in the virtual world in either of the conditions, although there was a slight preference for collaboration through voice ( $M=4.77$ ) rather than text ( $M=4.69$ ).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “collaboration”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “collaboration”.

#### **Social Presence Attribute – “role play of the financial task”**

There are no significant within-subjects effects on the social presence attribute “role play of the financial task” between the text and voice collaborative conditions. In general however, participants enjoyed the role playing aspect of carrying out the financial task in both the text (M=4.73) and voice (M=4.83) collaboration conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “role play of the financial task”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “role play of the financial task”.

#### **Social Presence Attribute – “role play partner”**

There are no significant within-subjects effects on the social presence attribute “role play partner” between the text and voice collaborative conditions. In general however, participants enjoyed the role playing aspect of collaborating with their partner in both the text (M=4.36) and voice (M=4.62) collaboration conditions.

There is a significant within-subjects effect for the role play partner\*age interaction ( $p=0.015$ ). The 18-34 year age group enjoyed the role playing aspect of collaborating with their partner more so in the text condition (M=4.69) than in the voice condition

(M=4.47). Conversely, the 35+year age group enjoyed the role playing aspect of collaborating with their partner more so in the voice condition (M=4.74) than in the text condition (M=4.05).

There were no significant within-subjects effects of gender or order on the social presence attribute “role play partner”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “role play partner”.

#### **Social Presence Attribute – “role play financial advisor”**

There are no significant within-subjects effects on the social presence attribute “role play financial advisor” between the text and voice collaborative conditions. In general however, participants enjoyed the role playing aspect of interacting with the financial advisor in both the text (M=4.59) and voice (M=4.65) collaboration conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “role play financial advisor”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “role play financial advisor”.

#### **Social Presence Attribute – “escapism virtual world”**

There are no significant within-subjects effects on the social presence attribute “escapism virtual world” between the text and voice collaborative conditions. In

general however, participants liked the escapism element of the virtual world in both the text (M=4.55) and voice (M=4.5) collaboration conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “escapism virtual world”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “escapism virtual world”.

#### **Social Presence Attribute – “distracted”**

There are no significant within-subjects effects on the social presence attribute “distracted” between the text and voice collaborative conditions. In general however, participants did not feel that they were easily distracted when collaborating within the virtual bank branch in either the text (M=5.05) or voice (M=5.24) conditions.

There is a significant within-subjects effect for the distracted\*order interaction ( $p=0.002$ ). Although participants did not report being particularly distracted during their collaboration in either of the condition, the highest levels of distraction for the text condition were experience in the order VM, TF (M=4.19), followed by TF, VM (M=4.94), VF, TM (M=5.44) and the lowest in order TM, VF (M=5.52). In the voice condition, the highest levels of distraction were reported in the orders TF, VM (M=5.13) and VF, TM (M=5.13) and to a slightly lesser extent in the orders TM, VF (M=5.29) and VM, TF (M=5.38).

There were no significant within-subjects effects of age group or gender on the social presence attribute “distracted”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “distracted”.

### **Social Presence Attribute – “computer to control”**

There are no significant within-subjects effects on the social presence attribute “computer to control” between the text and voice collaborative conditions. In general, participants reported that they were aware of using the computer to control their avatar in both the text (M=2.92) and voice (M=3.05) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “computer to control”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “computer to control”.

### **Social Presence Attribute – “conversations”**

There is a significant within-subjects effect of social presence on the attribute “conversations” ( $p=0.008$ ). Participants felt that their conversations with their partner were worthwhile during collaborations in both the text and voice conditions though significantly more so through voice (M=5.65) than voice (M=5.27).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “conversations”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “conversations”.

### **Social Presence Attribute – “nothing in common”**

There is a significant within-subjects effect of social presence on the attribute “nothing in common” ( $p=0.017$ ). Participants generally felt that they did have something in common with their partner during collaborations in both text and voice, though to a significantly greater extent when collaborating through voice ( $M=5.15$ ) than text ( $M=4.85$ ).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “nothing in common”.

There was however a significant between-subjects effect for order on the social presence attribute “nothing in common” ( $p=0.002$ ). Participants felt that they had the most in common with their partner in the order VM, TF ( $M=5.63$ ), followed by TM, VF ( $M=5.47$ ), VF, TM ( $M=4.84$ ) and the least in common in the order TF, VM ( $M=4.00$ ).

There were no significant between-subjects effects of age group or gender on the social presence attribute “nothing in common”.

### **Social Presence Attribute – “partner’s opinions”**

There is a significant within-subjects effect of social presence on the attribute “partner’s opinions” ( $p=0.033$ ). Participants felt that their partner’s opinions were important when collaborating through both text and voice, though they associated more importance in the voice condition ( $M=5.82$ ) than in the text condition ( $M=5.59$ ).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “partner’s opinions”.

There was however a significant between-subjects effect for order on the social presence attribute “partner’s opinions” ( $p=0.027$ ). Participants felt that their partner’s opinions were most important in the order VM, TF ( $M=5.97$ ), followed by TM, VF ( $M=5.91$ ), VF, TM ( $M=5.75$ ) and TF, VM ( $M=5.16$ ).

There were no significant between-subjects effects of age group or gender on the social presence attribute “partner’s opinions”.

### **Social Presence Attribute – “dominated”**

There are no significant within-subjects effects on the social presence attribute “dominated” between the text and voice collaborative conditions. In general participants didn’t strongly feel like they dominated the collaboration with their partner in either the text ( $M=4.71$ ) or voice ( $M=4.76$ ) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “dominated”.



There were no significant between-subjects effects of age group, gender or order on the social presence attribute “dominated”.

### **Social Presence Attribute – “contributed”**

There are no significant within-subjects effects on the social presence attribute “contributed” between the text and voice collaborative conditions. In general participants didn’t strongly feel that they contributed more to the task than their partner in either the text (M=4.52) or voice (M=4.67) conditions.

There is a significant within-subjects effect for the contributed\*gender interaction ( $p=0.008$ ). In the text condition the males felt that they contributed significantly more to the task than their partner (M=3.91) than in the voice condition (M=4.56). On the other hand, females felt that they contributed more to the task than their partner in the voice condition (M=4.77) than in the text condition (M=5.06).

There were no significant within-subjects effects of age group or order on the social presence attribute “contributed”.

There was also a significant between-subjects effect for gender on the social presence attribute “contributed” ( $p=0.038$ ). Females felt that they contributed more to the task than their partner (M=4.92) than males did (M=4.23).

There were no significant between-subjects effects of age group or order on the social presence attribute “contributed”.

### **Social Presence Attribute – “partner listened”**

There are no significant within-subjects effects on the social presence attribute “partner listened” between the text and voice collaborative conditions. In general however, participants felt that their partners listened to their opinion in both the text (M=5.61) and voice (M=5.71) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “partner listened”.

There was however a significant between-subjects effect for age on the social presence attribute “partner listened” ( $p=0.018$ ). Participants in the 18-34 year age group felt that their partner listened to their opinions (M=5.89) to a greater extent than the 35+ year age group did (M=5.42).

There were no significant between-subjects effects of gender or order on the social presence attribute “partner listened”.

### **Social Presence Attribute – “listened to partner”**

There are no significant within-subjects effects on the social presence attribute “listened to partner” between the text and voice collaborative conditions. In general, in both the text (M=5.64) and voice (M=5.60) conditions, participants felt that they listened to their partner’s opinions before making decisions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “listened to partner”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “listened to partner”.

### **Social Presence Attribute – “effect partner’s decisions”**

There are no significant within-subjects effects on the social presence attribute “effect partner’s decisions” between the text and voice collaborative conditions. In general, participants felt that their opinions had an effect on their partner’s decisions in both the text (M=5.15) and voice conditions (M=5.21).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “effect partner’s decisions”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “effect partner’s decisions”.

### **Social Presence Attribute – “partner no effect on decisions”**

There are no significant within-subjects effects on the social presence attribute “partner no effect on decisions” between the text and voice collaborative conditions. In general, participants felt that their partner’s opinions had an effect on their final decisions in both conditions, though slightly more so when collaborating through voice (M=5.94) than text (M=5.38).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “partner no effect on decisions”.

There was however a significant between-subjects effect for order on the social presence attribute “partner no effect on decisions” ( $p=0.022$ ). Participants felt that their partner’s opinions had the greatest effect on their final decisions in the order VM, TF (M=5.81), followed by TM, VF (M=5.51), VF, TM (M=5.47) and the least effect in TF, VM (M=4.81).

There were no significant between-subjects effects of age group or gender on the social presence attribute “partner no effect on decisions”.

#### **Social Presence Attribute – “in control”**

There are no significant within-subjects effects on the social presence attribute “in control” between the text and voice collaborative conditions. In general however, participants felt in control when collaborating with their partner through both text (M=5.18) and voice (M=5.17).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “in control”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “in control”.

### **Social Presence Attribute – “best of ability”**

There are no significant within-subjects effects on the social presence attribute “best of ability” between the text and voice collaborative conditions. In general, participants felt that it was important to carry out the tasks to the best of their ability in both the text (M=5.86) and voice (M=5.91) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “best of ability”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “best of ability”.

### **Social Presence Attribute – “work with partner”**

There is a significant within-subjects effect of social presence on the attribute “work with partner” ( $p=0.039$ ). Participants felt that it was important to work with their partner to reach decisions in both of the conditions, although more so when collaborating through voice (M=5.80) than through text (M=5.52).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “work with partner”.

There was however a significant between-subjects effect for order on the social presence attribute “work with partner” ( $p=0.001$ ). Participants felt that it was important to work with their partner to reach decisions in all of the orders, though the

order that was rated most highly was TM, VF (M=6.05) followed by VM, TF (M=5.94), VF, TM (M=5.81) and least of all in the order TF, VM (M=4.78).

There were no significant between-subjects effects of age group or gender on the social presence attribute “work with partner”.

### **Social Presence Attribute – “other people in the virtual world”**

There are no significant within-subjects effects on the social presence attribute “other people in the virtual world” between the text and voice collaborative conditions. In general, participants gave neutral responses and didn’t necessarily feel that there were other people with them in the virtual world in either the text (M=4.03) or voice (M=4.32) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “other people in the virtual world”.

There was however a significant between-subjects effect for age on the social presence attribute “other people in the virtual world” ( $p=0.013$ ). Whilst neither of the age group felt strongly, the 18-34 year age group were significantly more likely (M=4.59) than the 35+ year age group (M=3.74) to feel that other people were with them within the virtual world when collaborating.

There were no significant between-subjects effects of gender or order on the social presence attribute “other people in the virtual world”.

### **Social Presence Attribute – “other avatars in the virtual world”**

There are no significant within-subjects effects on the social presence attribute “other avatars in the virtual world” between the text and voice collaborative conditions. In general, participants felt that other avatars were present within the virtual world in both the text (M=4.64) and voice (M=4.69) conditions.

There is a significant within-subjects effect for the other avatars in VW\*order interaction ( $p=0.035$ ). Participants did not rate strongly on this attribute, however in the text condition they were more likely to feel that other avatars were present within the virtual world in the order TF, VM (M=4.88) followed by TM, VF (M=4.69), VM, TF (M=4.63) and the least likely in VF, TM (M=4.25). In the voice condition, participants felt that other avatars were with them within the virtual world in order VM, TF (M=5.25) followed by VF, TM (M=4.94), TF, VM (M=4.31) and the least likely in TM, VF (M=4.29).

There were no significant within-subjects effects of age group or gender on the social presence attribute “other avatars in the virtual world”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “other avatars in the virtual world”.

### **Social Presence Attribute – “alone”**

There are no significant within-subjects effects on the social presence attribute “alone” between the text and voice collaborative conditions. In general participants

did not feel that they were alone within the virtual world in either the text (M=5.29) or voice conditions (M=5.45).

There is a significant within-subjects effect for the alone\*order interaction ( $p=0.009$ ). In the text conditions, participants felt least alone in the order TM, VF (M=5.94) followed by VF, TM (M=5.44), VM, TF (M=5.25) and more so in the order TF, VM (M=4.44). In the voice condition, participants felt least alone in the order VF, TM (M=5.56) followed by TM, VF (M=5.5), TF, VM (M=5.38) and more so in the order VM, TF (M=5.31).

There were no significant within-subjects effects of age group or gender on the social presence attribute “alone”.

There was also a significant between-subjects effect for age on the social presence attribute “alone” ( $p=0.007$ ). Although neither of the age groups felt that they were all alone when collaborating within the virtual world, the 18-34 year age group felt significantly less alone (M=5.69) than the 35+ year age group (M=5.02).

There were no significant between-subjects effects of gender or order on the social presence attribute “alone”.

### **Social Presence Attribute – “interacting with real people”**

There is a significant within-subjects effect of social presence on the attribute “interacting with real people” ( $p=0.000$ ). Participants felt that they were interacting



with real people significantly more so when collaborating through voice (M=5.45) than through text (M=4.71).

There is a significant within-subjects effect for the interacting real people\*order interaction ( $p=0.037$ ). In the text condition, participants felt most strongly that they were interacting with a real person in the order TM, VF (M=5.29) followed by VM, TF (M=5.19), VF, TM (M=4.81) whilst they did not feel as though they were interacting with a real person in the order TF, VM (M=3.56). In the voice condition, participants felt most strongly that they were interacting with a real person in the order TM, VF (M=5.77) followed by VM, TF (M=5.5), VF, TM (M=5.44) and less so in order TF, VM (M=5.13). It should be noted however that all orders were rated positively in each of the orders.

There were no significant within-subjects effects of age group or gender on the social presence attribute “interacting with real people”.

There was a significant between-subjects effect for age on the social presence attribute “interacting with real people” ( $p=0.019$ ). The 18-34 year age group felt that they were interacting with real people to a significantly greater extent (M=5.41) than the 35+ year age group (M=4.77).

There was also a significant between-subjects effect for order on the social presence attribute “interacting with real people” ( $p=0.014$ ). Participants who experienced the order TM, VF (M=5.53) were the most likely to feel as though they were interacting with real people, followed those who experienced order VM, TF (M=5.34), VF, TM

(M=5.13). Participants that experienced the order TF, VM (M=4.34) were the least likely to feel as though they were interacting with real people when collaborating within the virtual bank branch.

There were no significant between-subjects effects of gender on the social presence attribute “interacting with real people”.

### **Social Presence Attribute – “interacting with an automated machine”**

There is a significant within-subjects effect of social presence on the attribute “interacting with an automated machine” ( $p=0.000$ ). Participants didn’t feel like they were interacting with an automated machine in either the text or voice conditions, though the voice condition (M=5.48) was rated more highly than the text condition (M=4.56).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “interacting with an automated machine”.

There was however a significant between-subjects effect for age on the social presence attribute “interacting with an automated machine” ( $p=0.021$ ). The 35+ year age group were significantly more likely (M=4.75) to feel like they were interacting with an automated machine than the 18-34 year age group (M=5.29).

There were no significant between-subjects effects of gender or order on the social presence attribute “interacting with an automated machine”.

### **Social Presence Attribute – “financial advisor controlled by a human”**

There is a significant within-subjects effect of social presence on the attribute “financial advisor controlled by a human” ( $p=0.023$ ). Participants felt that the financial advisor avatar was being controlled by another human to a greater extent in the voice condition ( $M=5.15$ ) than in the text condition ( $M=4.74$ ).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “financial advisor controlled by a human”.

There was however a significant between-subjects effect for age on the social presence attribute “financial advisor controlled by a human” ( $p=0.000$ ). The 18-34 year age group were significantly more likely ( $M=5.61$ ) than the 35+ year age group ( $M=4.30$ ) to feel that the financial advisor avatar was being controlled by another human being.

There were no significant between-subjects effects of gender or order on the social presence attribute “financial advisor controlled by a human”.

### **Social Presence Attribute – “partner’s avatar controlled by a human”**

There are no significant within-subjects effects on the social presence attribute “partner’s avatar controlled by a human” between the text and voice collaborative conditions. Participants generally felt that their partner’s avatar was controlled by another human being in both the text ( $M=5.17$ ) and voice ( $M=5.18$ ) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “partner’s avatar controlled by a human”.

There was however a significant between-subjects effect for age on the social presence attribute “partner’s avatar controlled by a human” ( $p=0.000$ ). The 18-34 year age group ( $M=5.79$ ) were significantly more likely to feel that their partner’s avatar was being controlled by another human being than the 35+ year age group ( $M=4.59$ ).

There were no significant between-subjects effects of gender or order on the social presence attribute “partner’s avatar controlled by a human”.

#### **Social Presence Attribute – “financial advisor’s behaviour realistic”**

There are no significant within-subjects effects on the social presence attribute “financial advisor’s behaviour realistic” between the text and voice collaborative conditions. In general, participants thought that the financial advisor’s behaviour was realistic in both the text ( $M=4.89$ ) and voice ( $M=5.09$ ) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “financial advisor’s behaviour realistic”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “financial advisor’s behaviour realistic”.

### **Social Presence Attribute – “partner’s behaviour realistic”**

There are no significant within-subjects effects on the social presence attribute “Partner’s behaviour realistic” between the text and voice collaborative conditions. In general, participants thought that their partner’s behaviour was realistic in both the text (M=5.24) and voice (M=5.53) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “Partner’s behaviour realistic”.

There was however a significant between-subjects effect for order on the social presence attribute “partner’s behaviour realistic” ( $p=0.004$ ). Participants that experienced the order TM, VF (M=6.00) felt most strongly that their partner’s behaviour was realistic, followed by those who experienced the orders VM, TF (M=5.56), VF, TM (M=5.06) and least strongly in the order TF, VM (M=4.88).

There were no significant between-subjects effects of age group or gender or on the social presence attribute “Partner’s behaviour realistic”.

### **Social Presence Attribute – “virtual bank branch unrealistic”**

There are no significant within-subjects effects on the social presence attribute “virtual bank branch unrealistic” between the text and voice collaborative conditions. In general, participants did not respond strongly to this item in either the text (M=4.66) or voice (M=4.67) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “virtual bank branch unrealistic”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “virtual bank branch unrealistic”.

#### **Social Presence Attribute – “financial task unrealistic”**

There are no significant within-subjects effects on the social presence attribute “financial task unrealistic” between the text and voice collaborative conditions. In general, participants felt that the financial task was relatively realistic in both the text (M=4.98) and voice (M=4.91) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “financial task unrealistic”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “financial task unrealistic”.

#### **Social Presence Attribute – “partner impersonal”**

There is a significant within-subjects effect of social presence on the attribute “Partner impersonal” ( $p=0.014$ ). Participants felt that interacting with their partner was a more personal experience when collaborating through voice (M=5.00) than through text (M=4.50).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “partner impersonal”.

There was however a significant between-subjects effect for gender on the social presence attribute “partner impersonal” ( $p=0.041$ ). Female participants generally felt that interacting with their partner was a more personal experience ( $M=5.04$ ) than male participants did ( $M=4.42$ ).

There were no significant between-subjects effects of age group or order on the social presence attribute “partner impersonal”.

#### **Social Presence Attribute – “uneasy collaborating with partner”**

There are no significant within-subjects effects on the social presence attribute “uneasy collaborating with partner” between the text and voice collaborative conditions. In general however, participants did not feel uneasy collaborating with their partner in either the text ( $M=5.09$ ) or voice ( $M=5.03$ ) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “uneasy collaborating with partner”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “uneasy collaborating with partner”.

### **Social Presence Attribute – “partner responsive”**

There are no significant within-subjects effects on the social presence attribute “partner responsive” between the text and voice collaborative conditions. In general however, participants felt that their partner was responsive towards them in both the text (M=5.55) and voice (M=5.69) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “partner responsive”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “partner responsive”.

### **Social Presence Attribute – “financial advisor responsive”**

There are no significant within-subjects effects on the social presence attribute “financial advisor responsive” between the text and voice collaborative conditions. In general however, participants felt that the financial advisor was responsive to them in both the text (M=5.52) and voice (M=5.56) conditions.

There is a significant within-subjects effect for the FA responsive\*age interaction ( $p=0.01$ ). In the text condition, the 35+ year age group felt that the financial advisor was more responsive towards them (M=5.63) than the 18-34 year age group (M=5.38). Conversely in the voice condition, the 18-34 year age group felt that the financial advisor was more responsive towards them (M=5.75) than the 35+ year age group (M=5.38).



There were no significant within-subjects effects of gender or order on the social presence attribute “financial advisor responsive”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “financial advisor responsive”.

### **Social Presence Attribute – “present in virtual world”**

There are no significant within-subjects effects on the social presence attribute “present in virtual world” between the text and voice collaborative conditions. In general, participants felt present within the virtual world in both the text (M=5.06) and voice (M=5.19) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “present in virtual world”.

There was however a significant between-subjects effect for order on the social presence attribute “present in virtual world” ( $p=0.048$ ). Participants that experienced the order VM, TF (M=5.47) felt most strongly present within the virtual world, followed by those with order TM, VF (M=5.32), VF, TM (M=5.19) and less so in the order TF, VM (M=4.5).

There were no significant between-subjects effects of age group or gender on the social presence attribute “present in virtual world”.

### **Social Presence Attribute – “personally involved in financial task”**

There is a significant within-subjects effect of social presence on the attribute “personally involved in financial task” ( $p=0.039$ ). Participants felt significantly more involved in the financial in the voice condition ( $M=5.79$ ) than they did in the text condition ( $M=5.56$ ).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “personally involved in financial task”.

There was however a significant between-subjects effect for order on the social presence attribute “personally involved in financial task” ( $p=0.021$ ). Participants felt most involved in the financial task when experiencing the order VM, TF ( $M=5.97$ ), followed by TM, VF ( $M=5.89$ ), VF, TM ( $M=5.72$ ) and less so in the order TF, VM ( $M=5.09$ ).

There were no significant between-subjects effects of age group or gender on the social presence attribute “personally involved in financial task”.

### **Social Presence Attribute – “partner competent”**

There is a significant within-subjects effect of social presence on the attribute “partner competent” ( $p=0.032$ ). Whilst participants thought that their partner was competent when collaborating in both conditions, they felt that their partner was significantly more competent within the voice condition ( $M=5.77$ ) than in the text condition ( $M=5.60$ ).

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “partner competent”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “partner competent”.

**Social Presence Attribute – “financial advisor informed”**

There are no significant within-subjects effects on the social presence attribute “financial advisor informed” between the text and voice collaborative conditions. Participants generally felt that the financial advisor was informed in both the text (M=5.64) and voice (M=5.62) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “financial advisor informed”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “financial advisor informed”.

**Social Presence Attribute – “financial advisor unreliable”**

There are no significant within-subjects effects on the social presence attribute “financial advisor unreliable” between the text and voice collaborative conditions. Participants generally felt that the financial advisor was reliable in both the text (M=5.65) and voice (M=5.65) conditions.

There were no significant within-subjects effects of age group, gender or order on the social presence attribute “financial advisor unreliable”.

There were no significant between-subjects effects of age group, gender or order on the social presence attribute “financial advisor unreliable”.

# Appendix 16

## Usability Questionnaire

<b>Participant ID:</b> <b>Date:</b>
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*This questionnaire relates to the learning task you have just taken part in.*

*Please tick the box which most closely represents how you feel about each of the following statements.*

1. I thought that viewing the information was confusing.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. I had to concentrate hard when viewing the information.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. I got flustered when viewing the information.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. I felt under stress when viewing the information.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. I thought viewing the information within the virtual world was complicated.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. I felt frustrated when viewing the information.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. I felt in control when viewing the information.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. I felt in control when interacting in the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. I felt that viewing the information took too long.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. I found it difficult to view the information within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. I thought that the information was presented clearly.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. I understood the information presented to me during the task.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. I would be happy to view information in this way again.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. The virtual world was suited to the task.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. I think the information supplied during the task was unreliable.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. The way the information was presented helped me feel engaged within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. I found the way the information was presented efficient.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. I found this way of viewing information satisfying.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. I thought the financial advisor was friendly.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. I disliked interacting with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. I would be happy to use the virtual world again.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. I disliked viewing the information.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. I liked using voice to communicate with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24. I thought the financial advisor was polite.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25. I felt intimidated by the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

26. I would prefer to interact with real people.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



## Appendix 17

Participant ID:  
Date:

### SVE Social Presence Perception Scale

*This questionnaire relates to the learning task you have just taken part in.*

*Please tick the box which most closely represents how you feel about each of the following statements.*

1. I felt as though I was actually part of the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. I disliked interacting in the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. I disliked viewing information in the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. I enjoyed the role playing aspect of carrying out the task.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. I disliked the role playing aspect of interacting with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. I liked the escapism element of the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Whilst viewing information within this environment I was very easily distracted.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Whilst interacting with the financial advisor I was very easily distracted.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. I was very aware of using the computer to control my avatar.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. I felt that the financial advisor was there to offer support if I needed it.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. I did not feel in control when interacting with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. I felt in control when viewing the information.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. I felt that I learned a lot in the task.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. It felt it was very important to carry out the task to the best of my ability.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. I felt that other people were with me within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. I felt that other avatars were present within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. I felt all alone within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. I felt like I was interacting with a real person.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. I felt like I was interacting with an automated machine.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. I felt that the financial advisor was being controlled by another human being.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. I thought the financial advisor's behaviour was realistic.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. I thought the virtual bank branch was unrealistic.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. I thought the task was unrealistic.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24. I felt that interacting with the financial advisor was impersonal.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25. I felt uneasy interacting with the financial advisor.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

26. I felt uneasy when viewing the information.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

27. I felt that the financial advisor was responsive towards me.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

28. I felt present within the virtual world.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

29. I felt personally involved in the task.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

30. I thought that the financial advisor was competent.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

31. I thought that the financial advisor was informed.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

32. I thought that the financial advisor was unreliable.

<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Neutral</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# Appendix 18

## Exit Questionnaire

<b>Participant ID:</b> <b>Order:</b> <b>Date:</b>
---

**1. You viewed information within Second Life today and were asked questions after each presentation.**

**a. Was there anything in particular that you liked about viewing information in this way?**

.....  
.....

**b. Was there anything about viewing information in this way that you disliked, or thought could be improved?**

.....  
.....

**2. Do you think that there is a way that information could be displayed more effectively in Second Life?**

.....  
.....

**3.a. Was there anything in particular that you liked about communicating using voice?**

.....  
.....

**b. Was there anything about using voice to communicate that you disliked, or thought could be improved?**

.....  
.....

**4. How did you feel about interacting with the financial advisor?** *(prompt on feeling towards reporting final decisions to the advisor).*

.....  
.....

**5. What did you think about the virtual bank branch in which you interacted?** *(prompt participant to elaborate on appearance and ease of use, Lloyds branding etc.)*

.....  
.....

**6. Do you think the Second Life is an effective tool for holding conversations?**  
*(encourage participant to elaborate)*

.....  
.....

**7. Do you think Second Life could act as a platform for learning and education?**

.....  
.....

**8. Finally, do you have any other comments you would like to add?**

.....  
.....

# Appendix 19

## Presentation Information

### *History*

#### *Lloyds Bank*

- Lloyds Bank was one of the oldest banks in the UK, tracing its establishment to Charles Lloyd of Wales in 1677.
- The name was changed to Taylors and Lloyds when John Taylor and Sampson Lloyd set up a private banking business in Birmingham 1765.
- In 1865 the partnership changed its status to a joint-stock company, naming itself Lloyds Banking Company Limited.
- Over the years, Lloyds bank extended through a series of mergers. By 1923 Lloyds Bank had made around 50 take-overs.
- On 1<sup>st</sup> August 1995, Cheltenham & Gloucester (C&G) joined the Lloyds Bank Group.

#### *TSB*

- In 1810, the Reverend Henry Duncan of Ruthwell, Dumfriesshire, set up a bank to help his poorest parishioners save for times of hardship. It was such a popular scheme that by 1818 there were 465 savings banks in Britain (including 182 in Scotland). The Trustee Savings Bank Association (TSBA) was established in 1887 to help the individual banks co-operate and to advise on matters of common concern.
- The Central Trustee Savings Bank was set up in 1973 to provide the savings banks with a banking and clearing service.
- There was considerable growth during the 1970s and 1980s as the range of services expanded and the number of depositors increased. To keep pace, another reorganisation was necessary and, in 1983, the remaining 16 savings banks gave up their individual identities to form TSB England and Wales, TSB Scotland, TSB Northern Ireland and TSB Channel Islands.
- TSB England and Wales became TSB Bank plc in 1989 and the newly named TSB Bank Scotland plc and TSB Bank Northern Ireland plc became its subsidiaries that year. In 1991 Allied Irish Bank bought TSB Bank Northern Ireland and in 1992 TSB Bank Channel Islands became a subsidiary of TSB Bank.



## *Lloyds TSB*

- The creating of Lloyds TSB was the beginning of a large-scale consolidation in the UK banking market.
- In 1995, the merger between the Trustee Savings Bank (TSB) and Lloyds Bank formed Lloyds TSB Group plc.
- In June 1999, TSB and Lloyds Bank Branches in England and Wales were re-branded Lloyds TSB. Branches in Scotland came under the new brand of Lloyds TSB Scotland.
- In 2000, the group acquired Scottish Widows, a mutual life-assurance company based in Edinburgh in a deal worth £7 billion. This made the group the second largest provider of life assurance and pensions in the UK after Prudential.

## **Present**

- In February 2007, the first ‘For the journey....’ television advertisement was aired, introducing a contemporary 3D animation by animator/director Marc Craste. The 60 second advert for this new campaign was accompanied by music by Australian Composer Elena Kats-Chernin. The featured piece of music, “Eliza’s Aria”, resulted in thousands of hits and general enquiries on the Lloyds TSB website as well as in Lloyds TSB branches nationwide.
- In September 2008, the BBC reported that HBOS was in takeover talks with Lloyds TSB. This was in response to a significant drop in HBOS’s share price. In November 2008, the new acquisition was agreed by the Lloyds TSB shareholders. A similar vote of HBOS shareholders in December 2008 resulted in overwhelming approval of the takeover.
- Lloyds TSB changed its name to Lloyds Banking Group upon completion of the takeover of HBOS in January 2009 and it was announced the registered office of the merged ‘superbank’ would be based north of the border.
- The Chairman of Lloyds Banking Group is Sir Victor Blank.
- As a result of the merger there are concerns that thousands of jobs may be lost with the Office of Fair Trading reporting that competition is likely to be reduced in certain areas.
- In October 2008, PM Gordon Brown announced a government plan where the treasury would infuse £37 billion of new capital into several major UK banks to avert a collapse of the financial sector. The banks included Royal Bank of Scotland Group plc, Lloyds TSB and HBOS Plc.

- After the 2008 bailouts of RBS, HBOS and Lloyds TSB and Lloyds TSB's January 2009 acquisition of HBOS, the Government was holding a 43% stake in Lloyds Banking Group. In March 2009 the Government announced that it would increase its stake to 65% after it became apparent that the HBOS acquisition had weakened Lloyds.
- Lloyds Banking Group was appointed the first Official Partner for the London Olympics in 2012.

## **Appendix 20**

### **Participant Questions**

#### ***History***

1. When the Trustee Savings Bank (TSB) and Lloyds Bank merged in 1995, what was the new name given to the merged Bank?
2. Re-branding was necessary when the Trustee Savings Bank (TSB) and Lloyds Bank formed Lloyds TSB Group plc in 1995. In 1999, TSB and Lloyds Bank Branches were re-branded Lloyds TSB. What was the new brand name given to the Branches in Scotland?
3. In 2000, which Edinburgh-based life-assurance company did Lloyds TSB acquire?

#### ***Present***

1. What was the name of the new Lloyds TSB advertising campaign launched in 2007?
2. What did Lloyds TSB change its name to after the takeover of HBOS in January of this year, 2009?
3. For which event have Lloyds Banking Group been appointed the first Official Partner?

## **Appendix 21**

### ***Analysis of Individual Usability Attributes (The Learning Experiment)***

#### **Usability Attribute – “confusion”**

There are no significant between-subject effects on the usability attribute “confusion” between the text display and video stream conditions. Overall, participants did not find viewing the information in either condition confusing however, those that experienced the video stream (M=5.47) were slightly less confused than those viewing information via text display (M=4.91).

There were no significant between-subjects effects of age group or gender on the usability attribute “confusion”.

#### **Usability Attribute – “concentration”**

There is a significant between-subject effect on the usability attribute “concentration” between the text display and video stream conditions ( $p=0.031$ ). Participants felt that they had to concentrate when viewing information in both conditions, though significantly more so when viewing information in the text display (M=3.09) than through video stream (M=3.94).

There was a significant between-subjects effect of gender on the usability attribute “concentration” ( $p=0.014$ ). Overall, females reported having to concentrate to a greater degree (M=3.03) than males (M=4).

There was no significant between-subjects effect of age on the usability attribute “concentration”.

#### **Usability Attribute – “flustered”**

There is a significant between-subject effect on the usability attribute “flustered” between the text display and video stream conditions ( $p=0.027$ ). Participants did not report feeling particularly flustered in either the text display or video stream conditions, however those who viewed the information through video stream ( $M=5.53$ ) felt significantly less flustered than those viewing information through the text display ( $M=4.72$ ).

There were no significant between-subjects effects of age group or gender on the usability attribute “flustered”.

#### **Usability Attribute – “stress”**

There is a significant between-subject effect on the usability attribute “stress” between the text display and video stream conditions ( $p=0.036$ ). Although participants did not report feeling particularly stressed when viewing the information in either of the conditions, those experiencing the video stream condition ( $M=5.41$ ) were significantly less stressed than those in the text display condition ( $M=4.53$ ).

There were no significant between-subjects effects of age group or gender on the usability attribute “stress”.

### **Usability Attribute – “complicated”**

There is a significant between-subject effect on the usability attribute “complicated” between the text display and video stream conditions ( $p=0.039$ ). Whilst participants in did not find viewing the information within the virtual world complicated in either of the conditions, participants that experienced the video stream condition ( $M=5.72$ ) felt that viewing the information was significantly less complicated than those in the text display condition ( $M=5.03$ ).

There were no significant between-subjects effects of age group or gender on the usability attribute “complicated”.

### **Usability Attribute – “frustrated”**

There is a significant between-subject effect on the usability attribute “frustrated” between the text display and video stream conditions ( $p=0.004$ ). Participants did not feel particularly frustrated in either of the information presentation conditions, however those within the video stream condition ( $M=5.78$ ) were significantly less frustrated when viewing the information than those within the text display condition.

There were no significant between-subjects effects of age group or gender on the usability attribute “frustrated”.

### **Usability Attribute – “in control information”**

There is a significant between-subject effect on the usability attribute “in control” between the text display and video stream conditions ( $p=0.018$ ). Participants viewing

the information via video stream ( $M=5.75$ ) felt significantly more in control than those viewing information through the text display ( $M=5.16$ ).

There were no significant between-subjects effects of age group or gender on the usability attribute “in control information”.

#### **Usability Attribute – “in control virtual world”**

There is a significant between-subject effect on the usability attribute “in control virtual world” between the text display and video stream conditions ( $p=0.045$ ). Participants within the video stream condition ( $M=5.47$ ) felt significantly more in control when interacting within the virtual world than those within the text display condition ( $M=4.84$ ).

There were no significant between-subjects effects of age group or gender on the usability attribute “in control virtual world”.

#### **Usability Attribute – “time”**

There is a significant between-subject effect on the usability attribute “time” between the text display and video stream conditions ( $p=0.018$ ). Participants within the text display condition ( $M=4.13$ ) felt that viewing the information took significantly longer than those in the video stream condition ( $M=5$ ).

There were no significant between-subjects effects of age group or gender on the usability attribute “time”.

### **Usability Attribute – “difficult”**

There are no significant between-subject effects on the usability attribute “difficult” between the text display and video stream conditions. Participants did not find it difficult to view information within the virtual world in either of the conditions, though in general, viewing information within the video stream condition was reported to be less difficult (M=5.75) than in the text display condition (M=5.41).

There were no significant between-subjects effects of age group or gender on the usability attribute “difficult”.

### **Usability Attribute – “clear presentation”**

There are no significant between-subject effects on the usability attribute “clear presentation” between the text display and video stream conditions. Participants in both of the conditions generally felt that the information was presented very clearly, though slightly more so in the video stream condition (M=5.94) than in the text display condition (M=5.69).

There were no significant between-subjects effects of age group or gender on the usability attribute “clear presentation”.

### **Usability Attribute – “understand information”**

There is a significant between-subject effect on the usability attribute “understand information” between the text display and video stream conditions ( $p=0.03$ ). Participants understood the information presented to them during the task in both



conditions, however the video stream condition (M=6) was rated more highly than the text display condition (M=5.5).

There were no significant between-subjects effects of age group or gender on the usability attribute “understand information”.

### **Usability Attribute – “view information again”**

There are no overall significant between-subject effects on the usability attribute “view information again” between the text display and video stream conditions. In general participants reported that they would be happy to view the information in both conditions again, more so however in the video stream condition (M=5.38) than in the text display condition (M=4.94).

There was a significant between-subjects effect for age on the usability attribute “view information again” ( $p=0.045$ ). The 35+ year age group (M=5.5) on the whole would be happier to view the information again than the 18-34 year age group (M=4.81).

There were no significant between-subjects effects of gender on the usability attribute “view information again”.

There was a significant between-subjects effect for the information delivery method\*age interaction for the usability attribute “view information again” ( $p=0.045$ ). There doesn't appear to be a large difference in attitudes towards being happy to view the information again between the text display (M=4.94) and video stream conditions

(M=4.69). In the 35+ year age group however, participants in the video stream condition would be happier to view the information again (M=6.06) than those in the text display condition (M=4.94).

There was a significant between-subjects effect for the information delivery method\*gender interaction for the usability attribute “view information again” ( $p=0.007$ ). Male participants within the video stream condition (M=5.75) would be happier to view the information again than male participants within the text display condition (M=4.38). Conversely, female participants that experienced the text display condition (M=5.5) would be happier to view the information again than female participants that experienced the video stream condition (M=5).

#### **Usability Attribute – “task”**

There are no significant between-subject effects on the usability attribute “task” between the text display and video stream conditions. Participants in both conditions generally felt that the virtual world was suited to the task, though slight more so in the video stream condition (M=5.63) than in the text display condition (M=5.28).

There were no significant between-subjects effects of age group or gender on the usability attribute “task”.

#### **Usability Attribute – “reliable”**

There is a significant between-subject effect on the usability attribute “reliable” between the text display and video stream conditions ( $p=0.04$ ). Participants felt that the information supplied during the task was reliable in both conditions, however the

video stream condition (M=6.06) was rated more highly than the text display condition (M=5.63).

There were no significant between-subjects effects of age group or gender on the usability attribute “reliable”.

#### **Usability Attribute – “engaged”**

There are no significant between-subject effects on the usability attribute “engaged” between the text display and video stream conditions. Participants felt that the way the information was presented to them felt them feel engaged within the virtual world in both conditions, to a greater extent in the video stream condition (M=5.28) however than in the text display condition (M=4.72).

There were no significant between-subjects effects of age group or gender on the usability attribute “engaged”.

#### **Usability Attribute – “efficient”**

There is a significant between-subject effect on the usability attribute “efficient” between the text display and video stream conditions ( $p=0.024$ ). Participants found the way that the information was presented efficient in both conditions, though significantly more so in the video stream condition (M=5.78) than in the text display condition (M=5.06).

There were no significant between-subjects effects of age group or gender on the usability attribute “efficient”.

### **Usability Attribute – “satisfying”**

There are no significant between-subject effects on the usability attribute “satisfying” between the text display and video stream conditions. In general participants within the video stream condition (M=5.31) found viewing the information more satisfying than those within the text display condition (M=4.97).

There were no significant between-subjects effects of age group or gender on the usability attribute “satisfying”.

### **Usability Attribute – “financial advisor friendly”**

There are no overall significant between-subject effects on the usability attribute “financial advisor friendly” between the text display and video stream conditions. Participants in both conditions thought that the financial advisor was friendly, though slightly more so in the video stream condition (M=6.16) than in the text display condition (M=6.03).

There were no significant between-subjects effects of age group or gender on the usability attribute “financial advisor friendly”.

There was however a significant between-subjects effect for the information delivery method\*age interaction for the usability attribute “financial advisor friendly” ( $p=0.035$ ). Participants in the 35+ year age group that experienced the video stream condition (M=6.19) rated the financial advisor as being friendlier than those in the text display condition (M=5.75). Within the video stream condition, there was little

difference in attitudes between the two age groups, though in the text condition the 35+ year age group rated the financial advisor as being less friendly than the 18-34 year age group.

### **Usability Attribute – “interacting with financial advisor”**

There are no overall significant between-subject effects on the usability attribute “interacting with financial advisor” between the text display and video stream conditions. Participants liked interacting with the financial advisor in both conditions, though slightly more so when viewing the information through video stream ( $M=5.56$ ) than through text display ( $M=5.25$ ).

There were no significant between-subjects effects of age group or gender on the usability attribute “interacting with financial advisor”.

There was however a significant between-subjects effect for the information delivery method\*age interaction for the usability attribute “interacting with financial advisor” ( $p=0.039$ ). Participants within the 35+ year age group that experienced the video stream condition ( $M=5.88$ ) liked interacting with the financial advisor to a greater extent than those within the same age group that experienced the text display condition ( $M=4.94$ ). The 18-34 year age group conversely liked interacting with the financial advisor to a greater extent when viewing the information through text display ( $M=5.56$ ) than through video stream ( $M=5.25$ ). Therefore, within the text condition, the 18-34 year age group liked interacting with the financial advisor to a greater extent than the 35+ year age group whilst in the video stream condition the

35+ year age group liked interacting with the financial advisor more so than the 18-34 year age group.

**Usability Attribute – “future use of virtual world”**

There are no overall significant between-subject effects on the usability attribute “future use of virtual world” between the text display and video stream conditions. In general participants in both conditions would be happy to use the virtual world again, though slightly more so in the video stream condition (M=5.72) than in the text display condition (M=5.16).

There were no significant between-subjects effects of age group or gender on the usability attribute “future use of virtual world”.

There was however a significant between-subjects effect for the information delivery method\*age interaction for the usability attribute “future use of virtual world” ( $p=0.016$ ). In the text display condition, the 18-34 year age group (M=5.63) would be happier to use the virtual world again than the 35+ year age group (M=4.69) whilst in the video stream condition, the 35+ year age group (M=6.06) would be happier to use the virtual world again than the 18-34 year age group (M=5.38). The 18-34 year age group would be happier to use the virtual world again when viewing information through text display than video stream and conversely, the 35+ year age would be happier to use the virtual world again when viewing information through video stream rather than text display.

### **Usability Attribute – “viewing information”**

There are no significant between-subject effects on the usability attribute “viewing information” between the text display and video stream conditions. In general participants liked viewing the information in both conditions, though slightly more through video stream (M=5.5) than text display (M=5.19).

There were no significant between-subjects effects of age group or gender on the usability attribute “viewing information”.

### **Usability Attribute – “voice to communicate”**

There are no overall significant between-subject effects on the usability attribute “voice to communicate” between the text display and video stream conditions. In general, participants liked using voice to communicate with the financial advisor to a greater extent within the video stream condition (M=5.53) than in the text display condition (M=5.25).

There were no significant between-subjects effects of age group or gender on the usability attribute “voice to communicate”.

There was however a significant between-subjects effect for the information delivery method\*age interaction for the usability attribute “voice to communicate” ( $p=0.001$ ). In the text display condition the 18-34 year age group liked using voice to communicate (M=5.69) to a greater extent than the 35+ year age group (M=4.81). Conversely, in the video stream condition, the 35+ year age group liked using voice to communicate (M=6) to a greater extent than the 18-34 year age group (M=5.1). From

these findings it can therefore be seen that the whilst the 18-34 year age group preferred communicating with the financial advisor through voice in the text display condition, the 35+ year age group preferred doing so through video stream.

### **Usability Attribute – “financial advisor polite”**

There are no overall significant between-subject effects on the usability attribute “financial advisor polite” between the text display and video stream conditions. In general, participants within both conditions thought that the financial advisor was polite, though to a slightly greater extent within the video stream condition (M=6.28) than in the text display condition (M=6.19).

There was a significant between-subjects effect of gender on the usability attribute “financial advisor polite” ( $p=0.007$ ). Whilst both male and female participants thought that the financial advisor was polite, females rated the financial advisor as being significantly more polite (M=6.41) than male participants did (M=6.06).

There were no significant between-subjects effects of age on the usability attribute “financial advisor polite”.

There was however a significant between-subjects effect for the information delivery method\*age interaction for the usability attribute “financial advisor polite” ( $p=0.007$ ). In the text display condition, the 18-34 year age group rated the financial advisor as being more polite (M=6.44) than the 35+ year age group (M=5.94). Conversely, in the video stream condition, the 35+ year age group rated the financial advisor as being more polite (M=6.38) than the 18-34 year age group (M=6.19). Overall, the 18-34



year age group felt that the financial advisor was more polite in the text display condition whilst the 35+ year age group felt that the financial advisor was more polite in the video stream condition.

**Usability Attribute – “intimidated by financial advisor”**

There are no significant between-subject effects on the usability attribute “intimidated by financial advisor” between the text display and video stream conditions. Participants did not feel intimidated in either of the conditions, however the video stream condition (M=6.03) was rated more positively than the text display condition (M=5.78).

There were no significant between-subjects effects of age group or gender on the usability attribute “intimidated by financial advisor”.

**Usability Attribute – “prefer real person”**

There are no significant between-subject effects on the usability attribute “prefer real person” between the text display and video stream conditions. In both conditions, participants reported that they would prefer to interact with a real person, though to a greater extent in the text condition (M=3.53) than in the voice condition (M=3.63).

There were no significant between-subjects effects of age group or gender on the usability attribute “prefer real person”.

## Appendix 22

### ***Analysis of Individual Social Presence Attributes (The Learning Experiment)***

#### **Social Presence Attribute – “part of the virtual world”**

There are no significant between-subjects effects on the social presence attribute “part of the virtual world” between the text display and video stream conditions. In general however, participants felt that they were part of the virtual world to a greater extent in the video stream condition (M=5.03) than in the text display condition (M=4.53).

There were no significant between-subjects effects of age group or gender on the social presence attribute “part of the virtual world”.

#### **Social Presence Attribute – “interacting”**

There is a significant between-subject effect on the usability attribute “interacting” between the text display and video stream conditions ( $p=0.044$ ). Participants liked interacting in the virtual world more so when viewing information through video stream (M=5.31) than through text display (M=4.63).

There were no overall significant between-subjects effects of age group or gender on the social presence attribute “interacting”.

There was however a significant between-subjects effect for the information display method\*age interaction for the social presence attribute “interacting” ( $p=0.044$ ). The greatest difference appears to be within the video stream condition where the 35+ year

age liked interacting in the virtual world (M=5.75) to a greater extent than the 18-34 year age group (M=4.88). The 18-34 year age group liked interacting in the virtual world slightly more (M=4.88) than the 35+ year age group (M=4.38) when viewing information through text display. In terms of interacting in the virtual world, overall the 18-34 year age group showed little preference between the two conditions whereas within the 35+ year age group there was a clear preference for the video stream condition.

### **Social Presence Attribute – “viewing information”**

There are no significant between-subjects effects on the social presence attribute “viewing information” between the text display and video stream conditions. In general, participants liked viewing information in the virtual world in both conditions, though more so when viewing the information through video stream (M=5.28) than text display (M=4.81).

There were no significant between-subjects effects of age group or gender on the social presence attribute “viewing information”.

### **Social Presence Attribute – “role play of the task”**

There are no significant between-subjects effects on the social presence attribute “role play of the task” between the text display and video stream conditions. Participants generally enjoyed the role playing aspect of carrying out the task more so when viewing the information through video stream (M=4.94) than through text display (M=4.53).

There were no significant between-subjects effects of age group or gender on the social presence attribute “role play of the task”.

### **Social Presence Attribute – “role play financial advisor”**

There are no significant between-subjects effects on the social presence attribute “role play financial advisor” between the text display and video stream conditions. Participants generally enjoyed the role playing aspect of interacting with the financial advisor in both conditions, though more so when viewing the information through video stream (M=5) than through text display (M=4.75).

There were no overall significant between-subjects effects of age group or gender on the social presence attribute “role play financial advisor”.

There was however a significant between-subjects effect for the information display method\*age interaction for the social presence attribute “role play financial advisor” ( $p=0.007$ ). The 18-34 year age group enjoyed the role playing aspect of interacting with the financial advisor when viewing the information through text display (M=5.25) more so than the 35+ year age group (M=4.25). Conversely, the 35+ year age group enjoyed the role playing aspect of interacting with the financial advisor more so in the video stream condition (M=5.56) more so than the 18-34 year age group (M=4.44). Overall, the 18-34 year age group enjoyed the role playing aspect of interacting with the financial advisor more so in the text display condition whilst the 35+ year age group rated the video stream condition more highly.

### **Social Presence Attribute – “escapism virtual world”**

There are no significant between-subjects effects on the social presence attribute “escapism virtual world” between the text display and video stream conditions. In general, participants liked the escapism aspect of the virtual world to a greater extent in the video stream condition (M=4.75) than in the text display condition (M=4.38).

There were no significant between-subjects effects of age group or gender on the social presence attribute “escapism virtual world”.

### **Social Presence Attribute – “distracted viewing information”**

There are no significant between-subjects effects on the social presence attribute “distracted viewing information” between the text display and video stream conditions. In general, participants were less distracted when viewing information within the virtual bank branch within the video stream condition (M=5.34) than they were in the text display condition (M=4.75).

There were no significant between-subjects effects of age group or gender on the social presence attribute “distracted viewing information”.

### **Social Presence Attribute – “distracted interacting financial advisor”**

There are no significant between-subjects effects on the social presence attribute “distracted viewing information” between the text display and video stream conditions. Overall, participants were not easily distracted whilst interacting with the financial advisor, though they were more distracted during the text display condition (M=4.88) than the video stream condition (M=5.28).

There were no significant between-subjects effects of age group or gender on the social presence attribute “distracted interacting financial advisor”.

**Social Presence Attribute – “computer to control”**

There are no significant between-subjects effects on the social presence attribute “computer to control” between the text display and video stream conditions. Overall, participants in both conditions felt aware of using the computer to control their avatar, though slightly more so in the text display condition (M=2.88) than in the video stream condition (M=2.94).

There were no significant between-subjects effects of age group or gender on the social presence attribute “computer to control”.

**Social Presence Attribute – “financial advisor support”**

There are no significant between-subjects effects on the social presence attribute “financial advisor support” between the text display and video stream conditions. Participants felt that the financial advisor was there to offer support if they needed it in both conditions, though slightly more so when viewing the information through video stream (M=5.63) than text display (M=5.56).

There were no significant between-subjects effects of age group or gender on the social presence attribute “financial advisor support”.

### **Social Presence Attribute – “in control interacting”**

There are no significant between-subjects effects on the social presence attribute “in control interacting” between the text display and video stream conditions. Participants generally felt in control when interacting with the financial advisor in both conditions, though to a greater extent when viewing the information through video stream ( $M=5.47$ ) than through text display ( $M=4.97$ ).

There were no significant between-subjects effects of age group or gender on the social presence attribute “in control interacting”.

### **Social Presence Attribute – “in control viewing information”**

There is a significant between-subject effect on the usability attribute “in control viewing information” between the text display and video stream conditions ( $p=0.009$ ). Participants felt significantly more in control when viewing the information through video stream ( $M=5.75$ ) than through text display ( $M=5.03$ ).

There were no overall significant between-subjects effects of age group or gender on the social presence attribute “in control viewing information”.

There was however a significant between-subjects effect for the information display method\*age interaction for the social presence attribute “in control viewing information” ( $p=0.029$ ). The 18-34 year age group felt more in control when viewing the information through text display ( $M=5.56$ ) than the 35+ year age group ( $M=4.5$ ). Conversely, the 35+ year age group felt more in control when viewing the information through video stream ( $M=5.81$ ) than the 18-34 year age group ( $M=5.56$ ), although in this instance the overall difference in levels of social presence between

the two age groups appears to be very slight. Overall, both age groups felt more in control when viewing the information through video stream.

#### **Social Presence Attribute – “learning”**

There are no significant between-subjects effects on the social presence attribute “learning” between the text display and video stream conditions. In general, participants felt that they learned a lot in the task in both conditions, though slightly more so when viewing the information through video stream ( $M=5.09$ ) than through text display ( $M=5$ ).

There were no significant between-subjects effects of age group or gender on the social presence attribute “learning”.

#### **Social Presence Attribute – “best of ability”**

There are no significant between-subjects effects on the social presence attribute “best of ability” between the text display and video stream conditions. Participants felt overall that it was very important to carry out the task to the best of their ability in both conditions, though slightly more so in the video stream condition ( $M=5.84$ ) than in the text display condition ( $M=5.66$ ).

There were no overall significant between-subjects effects of age group or gender on the social presence attribute “best of ability”.

There was however a significant between-subjects effect for the information display method\*age interaction for the social presence attribute “in best of ability” ( $p=0.044$ ).



The 18-34 year age group thought that it was more important to carry out the task to the best of their ability in the text display condition (M=5.94) than the 35+ year age group (M=5.38). Conversely, in the video stream condition, the 35+ year age group (M=6.06) felt that it was more important to carry out the task to the best of their ability than the 18-34 year age group (M=5.63). Overall, the 18-34 year age group thought that it was more important to carry out the task to the best of their ability within the text display condition whilst the 35+ year age group felt that it was more important to do so within the video stream condition.

**Social Presence Attribute – “other people in the virtual world”**

There are no significant between-subjects effects on the social presence attribute “other people in the virtual world” between the text display and video stream conditions. In general, participants gave responses below neutral showing that in both conditions they did not necessarily feel that there were other people with them within the virtual world though to a greater extent in the text display condition (M=3.47) than in the video stream condition (M=3.94).

There were no significant between-subjects effects of age group or gender on the social presence attribute “other people in the virtual world”.

**Social Presence Attribute – “other avatars in the virtual world”**

There are no significant between-subjects effects on the social presence attribute “other avatars in the virtual world” between the text display and video stream conditions. Overall, participants felt that there were other avatars with them within the virtual world to a greater extent in the text display condition (M=4.56) than in the

video stream condition (M=4.28), although the rating for both conditions were generally neutral.

There were no significant between-subjects effects of age group or gender on the social presence attribute “other avatars in the virtual world”.

### **Social Presence Attribute – “alone”**

There are no significant between-subjects effects on the social presence attribute “alone” between the text display and video stream conditions. Participants generally did not report feeling alone within the virtual world in either of the two conditions, though less so when viewing the information through video stream (M=5.28) than through text display (M=5.03).

There was a significant between-subjects effect for age on the social presence attribute “alone” ( $p=0.024$ ). Whilst neither of the two age groups felt particularly alone within the virtual environment, participants in the 35+ year age group (M=4.81) felt significantly more alone than participants in the 18-34 year age group (M=5.5).

There were no significant between-subjects effects of gender on the social presence attribute “alone”.

### **Social Presence Attribute – “interacting with real person”**

There are no significant between-subjects effects on the social presence attribute “interacting with real person” between the text display and video stream conditions. Overall, participants felt like they were interacting with a real person in both

conditions, though slightly more so when viewing information through video stream (M=5.34) than through text display (M=5.22).

There were no significant between-subjects effects of age group or gender on the social presence attribute “interacting with real person”.

There was however a significant between-subjects effect for the information display method\*age interaction for the social presence attribute “interacting with real person” ( $p=0.037$ ). In the text display condition, participants in the 18-34 year age group (M=5.63) felt like they were interacting with a real person to a greater extent than the 35+ year age group (M=4.81). Conversely in the video stream condition the 35+ year age group (M=5.63) felt like they were interacting with a real person to a greater extent than the 18-34 year age group (M=5.06). Overall, the 18-34 year age group felt that they were interacting with a real person more so in the text condition, whilst the 35+ year age group rated the video stream condition more highly in this instance.

There was also a significant between-subjects effect for the presentation method\*gender interaction for the social presence attribute “interacting with real person” ( $p=0.037$ ). In the text display condition, females (M=5.56) felt that they were interacting with a real person to a greater extent than males (M=4.88). Conversely within the video stream condition, males (M=5.69) felt that they were interacting with a real person more so than females (M=5). Overall, males favoured the video stream condition in this instance whilst females rated more highly within the text display condition.

### **Social Presence Attribute – “interacting with an automated machine”**

There are no significant between-subjects effects on the social presence attribute “interacting with an automated machine” between the text display and video stream conditions. In general, participants did not feel like they were interacting with an automated machine in either of the conditions, though less so when viewing the information through video stream ( $M=5.19$ ) than through text display ( $M=4.84$ ).

There was a significant between-subjects effect for age on the social presence attribute “interacting with an automated machine” ( $p=0.028$ ). The 35+ year age group ( $M=4.63$ ) felt more so that they were interacting with an automated machine than the 18-34 year age group ( $M=5.41$ ).

There were no overall significant between-subjects effects of gender on the social presence attribute “interacting with an automated machine”.

There was however a significant between-subjects effect for the information display method\*gender interaction for the social presence attribute “interacting with real person” ( $p=0.004$ ). Within the text display condition, males ( $M=4.31$ ) felt like they were interacting with an automated machine to a greater extent than females ( $M=5.38$ ). Conversely, in the video stream condition, participants in females ( $M=4.69$ ) felt that they were interacting with an automated machine to a greater extent than males ( $M=5.69$ ). Overall male participants felt less so that they were interacting with an automated machine when viewing the information through video stream whilst females favoured the text display condition in this instance.

### **Social Presence Attribute – “financial advisor controlled by a human”**

There are no significant between-subjects effects on the social presence attribute “financial advisor controlled by a human” between the text display and video stream conditions. In general, participants felt that the financial advisor was being controlled by another human being to a greater extent when viewing the information through video stream ( $M=5.06$ ) than through text display ( $M=4.81$ ).

There was a highly significant between-subjects effect for age on the social presence attribute “financial advisor controlled by a human” ( $p=0.001$ ). Participants in the 18-34 year age group ( $M=5.63$ ) felt that the financial advisor was being controlled by another human being to a significantly greater extent than the 35+ year age group ( $M=4.25$ ).

There were no overall significant between-subjects effects of gender on the social presence attribute “financial advisor controlled by a human”.

### **Social Presence Attribute – “financial advisor’s behaviour”**

There are no significant between-subjects effects on the social presence attribute “financial advisor’s behaviour” between the text display and video stream conditions. Overall, participants felt that the financial advisor’s behaviour was realistic in both conditions, though slightly more so within the text display condition ( $M=5.31$ ) than the video stream condition ( $M=5.16$ ).

There were no significant between-subjects effects of age group or gender on the social presence attribute “financial advisor’s behaviour”.

### **Social Presence Attribute – “virtual bank branch unrealistic”**

There are no significant between-subjects effects on the social presence attribute “virtual bank branch unrealistic” between the text display and video stream conditions. In general participants felt that the virtual bank branch was more realistic in the video stream condition (M=5.53) than in the text display condition (M=4.88).

There were no significant between-subjects effects of age group or gender on the social presence attribute “virtual bank branch unrealistic”.

### **Social Presence Attribute – “task unrealistic”**

There are no significant between-subjects effects on the social presence attribute “task unrealistic” between the text display and video stream conditions. Overall, participants felt that the task was more realistic when viewing the information through video stream (M=5.16) than through text display (M=4.69).

There were no overall significant between-subjects effects of age group or gender on the social presence attribute “task unrealistic”.

There was however a significant between-subjects effect for the information display method\*gender interaction for the social presence attribute “task unrealistic” ( $p=0.003$ ). Within the text display condition, females (M=5.31) thought that the task was more realistic than males (M=4.06). Conversely, within the video stream condition, males (M=5.63) thought that the task was more realistic than females did (M=4.69). Overall, male participants felt that the task was more realistic when

viewing the information through video stream whilst female participants felt that the task was more realistic when viewing the information through text display.

**Social Presence Attribute – “financial advisor impersonal”**

There are no significant between-subjects effects on the social presence attribute “financial advisor impersonal” between the text display and video stream conditions. In general, participants did not feel that interacting with the financial advisor was impersonal, though overall, participants that viewed the information through video stream felt that it was a more personal experience ( $M=5.34$ ) than those that viewed the information through text display ( $M=4.81$ ).

There was a significant between-subjects effect for gender on the social presence attribute “financial advisor impersonal” ( $p=0.045$ ). Whilst neither the male or female participant groups felt overall that interacting with the financial advisor was impersonal, females generally felt that interacting with the financial advisor was a more personal experience ( $M=5.41$ ) than males did ( $M=4.75$ ).

There were no significant between-subjects effects of age group on the social presence attribute “financial advisor impersonal”.

**Social Presence Attribute – “uneasy financial advisor”**

There are no significant between-subjects effects on the social presence attribute “uneasy financial advisor” between the text display and video stream conditions. In general, participants did not feel uneasy when interacting with the financial advisor in

either of the conditions, though the video stream condition (M=5.59) was rated slightly more positively than the text display condition (M=5.34) in this instance.

There were no overall significant between-subjects effects of age group or gender on the social presence attribute “uneasy financial advisor”.

There was however a significant between-subjects effect for the information display method\*age interaction for the social presence attribute “uneasy financial advisor” ( $p=0.01$ ). Whilst neither of the age groups felt uneasy interacting with the financial advisor, within the video stream condition, the 35+ year age group (M=6) rated more positively than the 18-34 year age group (M=5.19). Conversely, in the text display condition, the 35+ year age group (M=5) felt more uneasy than the 18-34 year age group (M=5.69) when interacting with the financial advisor. Overall, in this instance the 18-34 year age group showed a preference for the text display condition in terms of interacting with the financial advisor whilst the 35+ year age group preferred the video stream condition.

### **Social Presence Attribute – “uneasy viewing information”**

There are no significant between-subjects effects on the social presence attribute “uneasy viewing information” between the text display and video stream conditions. In general, participants did not feel uneasy viewing the information in either of the conditions, though they felt more uneasy in the text display condition (M=4.91) than the video stream condition (M=5.5).



There were no significant between-subjects effects of age group or gender on the social presence attribute “uneasy viewing information”.

#### **Social Presence Attribute – “financial advisor responsive”**

There are no significant between-subjects effects on the social presence attribute “financial advisor responsive” between the text display and video stream conditions. Overall, participants felt that the financial advisor was responsive towards them in both the text display and video stream conditions, though slightly more so in the text display condition (M=5.84) than the video stream condition (M=5.75).

There was a significant between-subjects effect for age on the social presence attribute “financial advisor responsive” ( $p=0.003$ ). Whilst both age groups felt that the financial advisor was responsive towards them, the 18-34 year age group (M=6.13) felt that the financial advisor was significantly more responsive than the 35+ year age group (M=5.47).

There were no significant between-subjects effects of gender on the social presence attribute “financial advisor responsive”.

#### **Social Presence Attribute – “present in virtual world”**

There are no significant between-subjects effects on the social presence attribute “present in virtual world” between the text display and video stream conditions. Overall, participants reported feeling present within the virtual world in both the text display and video stream conditions, though to a greater extent when viewing the information through video stream (M=5.31) than through text display (M=4.94).

There were no significant between-subjects effects of age group or gender on the social presence attribute “present in virtual world”.

**Social Presence Attribute – “personally involved”**

There are no significant between-subjects effects on the social presence attribute “personally involved” between the text display and video stream conditions. In general, participants felt personally involved in the task in both conditions, though slightly more so in the video stream condition (M=5.5) than in the text display condition (M=5.22).

There were no significant between-subjects effects of age group or gender on the social presence attribute “personally involved”.

**Social Presence Attribute – “financial advisor competent”**

There are no significant between-subjects effects on the social presence attribute “financial advisor competent” between the text display and video stream conditions. Overall, participants felt that the financial advisor was competent in both conditions, though participants in the video stream condition rated more highly (M=6.03) than those in the text display condition (M=5.81).

There were no significant between-subjects effects of age group or gender on the social presence attribute “financial advisor competent”.

### **Social Presence Attribute – “financial advisor informed”**

There are no significant between-subjects effects on the social presence attribute “financial advisor informed” between the text display and video stream conditions. Participants thought that the financial advisor was informed in both conditions, though slightly more so in the video stream condition ( $M=5.94$ ) than in the text display condition ( $M=5.63$ ).

There were no significant between-subjects effects of age group or gender on the social presence attribute “financial advisor informed”.

### **Social Presence Attribute – “financial advisor unreliable”**

There are no significant between-subjects effects on the social presence attribute “financial advisor unreliable” between the text display and video stream conditions. Participants did not think that the financial advisor was unreliable in either of the conditions, though the overall rating were slightly positive for the video stream condition ( $M=5.97$ ) than in the text display condition ( $M=5.84$ ).

There was a significant between-subjects effect for age on the social presence attribute “financial advisor unreliable” ( $p=0.011$ ). Whilst both the age groups generally felt that the financial advisor was reliable, the 18-34 year age group thought that the financial advisor was significantly more reliable ( $M=6.13$ ) than the 35+ year age group ( $M=5.69$ ).

There were no significant between-subjects effects of gender on the social presence attribute “financial advisor unreliable”.