

**The Integration of Embodied Conversational Agents  
and Pecuniary Traits in Usability Design for Financial  
Services Applications**

**Alexandra Matthews**

**Doctor of Philosophy**



**University of Edinburgh**

**2009**



## **Declaration of Originality**

24<sup>th</sup> April 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.

## **Acknowledgments**

I'd like to thank all at the Centre for Communication Interface Research who have provided me with a very supportive and friendly environment in which I could conduct this work. I would especially like to thank Professor Mervyn Jack for his leadership and understanding throughout the process, as well as Dr. James Anderson and Nicholas Anderson for their technical expertise and patience in explaining novel processes to me. Dr. Fergus McInnes has also been a great source of statistical expertise. Finally I'd like to thank my family for their endless encouragement, words of reassurance and support throughout and in particular my mum for taking the time to proofread.

## **Abstract**

There is a great a need as ever for practical Human-Computer Interaction (HCI) research within the field of financial services due to the increased levels of switching behaviour exhibited by customers as well as possible competitors, pushing banks to provide a modern, flexible and personal service. As a result a much greater focus has been placed on Customer Relationship Management (CRM) over recent years. These factors have led to a large body of research much of which has highlighted the importance of investigating in new user interfaces and distribution channels that can effectively communicate with the customer, as well as delivering new and innovative products.

This work takes a psychological perspective on HCI and the user-centred nature of the user interfaces and systems under investigation. This research presented here provides empirical evidence for the thesis that ECAs represent a highly effective tool for human-computer interactions in future financial services applications, particularly when their product portrayals match the pecuniary traits of the customer. ECAs can provide a personal and effective platform for everyday banking enquiries whilst utilising and realising an effective customer targeting tool. As well as practical metrics with which financial institutions can assess consumer behaviour offering a metric that could be employed to segment customers and predict which products certain groups would be

likely to consider purchasing. Companies can utilise data derived from such metrics to strengthen the customer-company relationship and to increase customer satisfaction, thereby improving the processes for recruiting, retaining and maintaining customers.

## List of Publications

Matthews, A., Anderson, N., Anderson, J., & Jack, M. (2008). *Individualised Product Portrayals in the Usability of a 3D Embodied Conversational Agent in an eBanking Scenario*. Paper presented at the IVA 2008, Tokyo, Japan.

Peevers, G., McInnes, F., Morton, H., Matthews, A., & Jack, M. A. (2009). *The mediating effects of brand music and waiting time updates on customers' satisfaction with a telephone service when put on-hold*. *International Journal of Bank Marketing* 27, (3).

## **List of Abbreviations**

- ECA – Embodied Conversational Agent
- HCI – Human Computer Interaction
- CRM – Customer Relationship Management
- FFM – Five Factor Model
- CASA – Computers As Social Actors
- TTS – Text to Speech
- GSL – Grammar Specification Language
- HMM – Hidden Markov Model
- TPS – Telephone Preference Service
- MAS – Money Attitude Scale
- PCA – Principal Component Analysis
- ATM – Automated Teller Machine
- MMBS – Money Beliefs and Behaviour Scale
- HPP – High Planning Propensity
- LPP – Low Planning Propensity
- HRA – High Risk Averse
- LRA – Low Risk Averse

## List of Figures

Figure 1. The Male ECA.....	29
Figure 4.1. The Blonde Haired Female Banking ECA.....	40
Figure 4.2. The Brown Haired Female Banking ECA.....	40
Figure 4.3. The Blonde Haired Male Banking ECA.....	41
Figure 4.4. The Brown Haired Male Banking ECA.....	41
Figure 4.5. Estimated Marginal Means for Agent Personality.....	88
Figure 4.6. Estimated Marginal Means for Attribute “Fall into Debt”.....	107
Figure 4.7. Estimated Marginal Means for Attribute “Acceptable to be in Debt”.	108
Figure 4.8. Estimated Marginal Means for Attribute “Think Long and Hard”.....	110
Figure 4.9. Estimated Marginal Means for Attribute “Risk Reward”.....	111
Figure 4.9.1. Estimated Marginal Means for Attribute “Gut Feelings”.....	111
Figure 4.9.2. Estimated Marginal Means for the Overall Satisfaction Ratings.....	114
Figure 4.9.3. The Number of Counts for the Appearance of the Preferred Agent.	116
Figure 5.1. Estimated Marginal Means of Version Order Against Age for the Mean Usability Scores.....	142
Figure 5.12. Estimated Marginal Means of Version Order Against Higher Education for the Mean Usability Scores.....	143
Figure 5.13. Estimated Marginal Means of Version Order Against Age for Attribute “Interact Again” .....	145
Figure 5.14. Estimated Marginal Means of Version Order Against Dependents for Attribute “Interact Again” .....	146



Figure 5.15. Estimated Marginal Means of Gender Against Product for Attribute “Information Reliable” .....	148
Figure 5.16. Estimated Marginal Means of Version Order Against Higher Education for Attribute “Difficult” .....	150
Figure 5.17. Estimated Marginal Means of Version Order Against Higher Education for Attribute “Stressed” .....	151
Figure 5.18. Estimated Marginal Means of Products Against Dependents for Attribute “Friendly” .....	152
Figure 5.19. Estimated Marginal Means of Version Order Against Age for Attribute “Enjoyed Interaction” .....	153
Figure 5.20. Estimated Marginal Means of Product Against Version Order for Attribute “Flustered” .....	154
Figure 5.21. Estimated Marginal Means of Version Order Against Age for Attribute “Control” .....	156
Figure 5.22. Estimated Marginal Means of Version Order Against Higher Education for Attribute “Control”.....	158
Figure 5.23. Estimated Marginal Means of Version Order Against Age for Attribute “Concentrate” .....	160
Figure 5.24. Estimated Marginal Means of Version Order Against Dependents for Attribute “Concentrate” .....	161
Figure 5.25. Estimated Marginal Means of Age Against Dependents for Attribute “Concentrate” .....	162
Figure 5.26. Estimated Marginal Means of Age Against Gender for Attribute “Understood Information” .....	163
Figure 5.27. Estimated Marginal Means of Gender Against Dependents for Attribute “Understood Dependents” .....	164
Figure 5.28. Estimated Marginal Means of Product Against Version Order for Attribute “Complicated” .....	166
Figure 5.29. Estimated Marginal Means of Product Against Age for the Relevance Score.....	171
Figure 5.30. Estimated Marginal Means of Version Order Against Age for Attribute “Listen” .....	176
Figure 5.31. Estimated Marginal Means of Version Order Against for Attribute “Listen” .....	177

Figure 5.32. Estimated Marginal Means of Product Against Gender for Attribute “Chosen” .....	180
Figure 6.1. Scree Plot for Pecuniary Questionnaire.....	216

## List of Tables

Table 4.1. Latin Square Design.....	39
Table 4.12. Participants Gender by Age Group Analysis.....	47
Table 4.13. Usability Questionnaire Summary.....	48
Table 4.14. Pecuniary Questionnaire Summary.....	55
Table 4.15. Experiment Summary.....	56
Table 4.16. Mean Usability Scores for the Four Different ECA Personality Portrayals.....	57
Table 4.17. Within Subjects Effects ANOVA for the Mean Usability Scores.....	58
Table 4.18. Pairwise Comparisons for the ECA Personality Portrayals.....	58
Table 4.19. Between-Subjects Effects ANOVA for the Mean Usability Scores...	59
Table 4.20. Within-Subjects Effects ANOVA for Usability Attribute “Confusion” in Appendix 7.....	260
Table 4.21. Within-Subjects Effects ANOVA for Usability Attribute “Concentration” in Appendix 7.....	260
Table 4.22. Within-Subjects Effects ANOVA for Usability Attribute “Flustered” in Appendix 7.....	261
Table 4.23. Within-Subjects Effects ANOVA for Usability Attribute “Stress” in Appendix 7.....	261
Table 4.24. Within-Subjects Effects ANOVA for Usability Attribute “Frustration” in Appendix 7.....	262
Table 4.25. Between-Subjects Effects ANOVA for Usability Attribute “Frustration” in Appendix 7.....	262
Table 4.26. Within-Subjects Effects ANOVA for Usability Attribute “Complication” in Appendix 7.....	263
Table 4.27. Within-Subjects Effects ANOVA for Usability Attribute “In Control” in Appendix 7.....	263
Table 4.28. Within-Subjects Effects ANOVA for Usability Attribute “Competency” in Appendix 7.....	264
Table 4.29. Within-Subjects Effects ANOVA for Usability Attribute “Speed” in Appendix 7.....	264
Table 4.30. Between-Subject Effects ANOVA for Usability Attribute “Speed” in Appendix 7.....	265
Table 4.31. Within-Subjects Effects ANOVA for Usability Attribute “Ease of Use” in Appendix 7.....	265
Table 4.32. Within-Subjects Effects ANOVA for Usability Attribute “Voice Clarity” in Appendix 7.....	266
Table 4.33. Within-Subjects Effects ANOVA for Usability Attribute “Use	266

Again” in Appendix 7.....	267
Table 4.34. Between-Subject Effects ANOVA for Usability Attribute “Use Again” in Appendix 7.....	267
Table 4.35. Within-Subjects Effects ANOVA for Usability Attribute “Reliability” in Appendix 7.....	268
Table 4.36. Within-Subjects Effects ANOVA for Usability Attribute “Engaged” in Appendix 7.....	268
Table 4.37. Between-Subject Effects ANOVA for Usability Attribute “Engaged” in Appendix 7.....	269
Table 4.38. Within-Subjects Effects ANOVA for Usability Attribute “Efficient” in Appendix 7.....	269
Table 4.39. Between-Subjects Effects ANOVA for Usability Attribute “Efficient” in Appendix 7.....	270
Table 4.40. Within-Subjects Effects ANOVA for Usability Attribute “Needs Improvement” in Appendix 7.....	270
Table 4.41. Between-Subjects Effects ANOVA for Usability Attribute “Needs Improvement” in Appendix 7.....	271
Table 4.42. Within-Subjects Effects ANOVA for Usability Attribute “Friendly” in Appendix 7.....	271
Table 4.43. Between-Subjects Effects ANOVA for Usability Attribute “Friendly” in Appendix 7.....	272
Table 4.44. Within-Subjects Effects ANOVA for Usability Attribute “Liked Voice” in Appendix 7.....	272
Table 4.45. Within-Subjects Effects ANOVA for Usability Attribute “Enjoyment” in Appendix 7.....	273
Table 4.46. Between-Subjects Effects ANOVA for Usability Attribute “Enjoyment” in Appendix 7.....	273
Table 4.47. Within-Subjects Effects ANOVA for Usability Attribute “Polite” in Appendix 7.....	274
Table 4.48. Within-Subjects Effects ANOVA for Usability Attribute “Intimidating” in Appendix 7.....	274
Table 4.49. Within-Subjects Effects ANOVA for Usability Attribute “Prefer Human” in Appendix 7.....	274
Table 4.50. Within-Subjects Effects ANOVA for Usability Attribute “Appearance Distracting” in Appendix 7.....	87
Table 4.51. Descriptive Statistics for Agent Personality and Gender.....	90
Table 4.52. Agent Personality-Participant Personality Correlations.....	92
Table 4.53. Correlations between Participants’ Personality and Their Preferred Agent.....	92
Table 4.54. Highest Rated Personality * Extroversion Scale Crosstabulations....	92
Table 4.55. Preference Percentage Rates for Each ECA Portrayal.....	94
Table 4.56. Pecuniary Item-Total Statistics.....	96
Table 4.57. Varimax Rotation of Two Factor Solution for Pecuniary Items.....	96
Table 4.58. Correlations for Saving-Debt Dimension.....	97
Table 4.59. Saving Sensible * Fall into Debt Crosstabulations.....	275
Table 4.67. Tests of Between-Subjects Effects for the Saving-Debt Dimension..	276
Table 4.68. Tests of Between-Subjects Effects for the Cognitive-Expressive Dimension.....	278
Table 4.69. Tests of Between-Subjects Effects for MAS Items.....	113
Table 4.70. One Sample T-Test on Agent Gender.....	

Table 4.71. Means for Gender * Personality Interaction.....	115
Table 5.1. Pecuniary Questionnaire Summary.....	128
Table 5.12. Latin Square Design.....	136
Table 5.13. Participants Gender by Age Group Analysis.....	136
Table 5.14. The Text Box Information.....	137
Table 5.15. Experiment Summary.....	139
Table 5.16. Mean Usability Scores for the Four Different Product Portrayals.....	140
Table 5.17. Tests of Between-Subjects Effects on the mean Usability Scores.....	141
Table 5.18. Between-Subjects Effects for Usability Attribute “Interact Again” in Appendix 9.....	286
Table 5.19. Between-Subjects Effects for Usability Attribute “Intimidated” in Appendix 9.....	286
Table 5.20. Pairwise Comparisons for Usability Attribute “Intimidated” in Appendix 9.....	287
Table 5.21. Within-Subject Effects for Usability Attribute “Information Reliable” ” in Appendix 9.....	287
Table 5.22. Between-Subjects Effects for Usability Attribute “Information Reliable” in Appendix 9.....	287
Table 5.23. Between-Subjects Effects for Usability Attribute “Difficult” in Appendix 9.....	288
Table 5.24. Between-Subjects Effects for Usability Attribute “Stressed” in Appendix 9.....	288
Table 5.25. Within Subjects Effects for Usability Attribute “Friendly” in Appendix 9.....	289
Table 5.26. Between-Subjects Effects for Usability Attribute “Enjoyed Interaction” in Appendix 9.....	289
Table 5.27. Within-Subjects Effects for Usability Attribute “Flustered” in Appendix 9.....	289
Table 5.28. Between-Subjects Effects for Usability Attribute “Engaged with Service” in Appendix 9.....	290
Table 5.29. Between-Subjects Effects for Usability Attribute “Didn’t Like Voice” in Appendix 9.....	290
Table 5.30. Between-Subjects Effects for Usability Attribute “Control” in Appendix 9.....	291
Table 5.31. Between-Subjects Effects for Usability Attribute “Concentration” in Appendix 9.....	291
Table 5.32. Between-Subjects Effects for Usability Attribute “Understood Information” in Appendix 9.....	292
Table 5.33. Between-Subjects Effects for Usability Attribute “Frustrated” in Appendix 9.....	292
Table 5.34. Within-Subjects Effects for Usability Attribute “Complicated” in Appendix 9.....	293
Table 5.35. Between-Subjects Effects for Usability Attribute “Complicated” in Appendix 9.....	293
Table 5.36. Between-Subjects Effects for Usability Attribute “Efficient” in Appendix 9.....	294
Table 5.37. Between-Subjects Effects for Usability Attribute “Interaction Satisfying” in Appendix 9.....	294
Table 5.38. Between-Subjects Effects for Usability Attribute “Text Box” in Appendix 9.....	295

Table 5.39. Between-Subjects Effects for the Mean Usability Score in Appendix 9.....	295
Table 5.40. Within-Subject Effects for the Relevance Score	170
Table 5.41. Between-Subjects Effects for the Relevance Score	172
Table 5.42. Mean Product Uptake Scores for the Four Different Product Portrayals.....	173
Table 5.43. Tests of Between-Subjects Effects on the Mean Product Uptake Scores.....	174
Table 5.44. Tests of Between-Subjects Effects on the Attribute “Presentation” in Appendix 9.....	296
Table 5.45. Tests of Between-Subjects Effects on the Attribute “Text Useful” in Appendix 9.....	296
Table 5.46. Tests of Between-Subjects Effects on the Attribute “Listen” in Appendix 9.....	297
Table 5.47. Tests of Within-Subjects Effects on the Attribute “Product Useful” in Appendix 9.....	297
Table 5.48. Tests of Within-Subjects Effects on the Attribute “Tailored” in Appendix 9.....	297
Table 5.49. Tests of Within-Subjects Effects on the Attribute “Chosen” in Appendix 9.....	298
Table 5.50. Tests of Between-Subjects Effects on the Mean Product Uptake Score	181
Table 5.51. Correlations for Four Demographic Variables and Risk Aversion Items in Appendix 9.....	298
Table 5.52. Correlations for Four Demographic Variables and Risk Aversion Items in Appendix 9.....	298
Table 5.53. Correlations for Four Demographic Variables and Planning Propensity Items in Appendix 9.....	299
Table 5.54. Correlations for Four Demographic Variables and Planning Propensity Items in Appendix 9.....	299
Table 5.55. Correlations for Four Demographic Variables and Planning Propensity Items in Appendix 9.....	300
Table 5.56. Correlations for Five Demographic Variables and Planning Propensity Items in Appendix 9.....	301
Table 5.57. Pecuniary Questionnaire Item-Total Statistics.....	188
Table 5.58. Varimax Rotation of Seven Factor Solution for Pecuniary Items.....	191
Table 5.59. Correlations for Factor one: “Emotional Spenders” of the Pecuniary Items.....	194
Table 5.60. Correlations for Factor one: “Emotional Spenders” of the Pecuniary Items.....	195
Table 5.61. Correlations for the seven Pecuniary Factors and the Mean Product Uptake Scores.....	196
Table 5.62. Correlations for the Seven Pecuniary Factors and the Relevance Ratings for all Four Products.....	198
Table 5.63. Correlations for the Seven Pecuniary Factors and Demographic Variables.....	201
Table 5.64. ANOVA results for the Pecuniary Factors and Demographic Variables.....	202
Table 6.1. Pecuniary Questionnaire Item-Total Statistics.....	214
Table 6.12. Rotated Factor Solution.....	217

Table 6.13. Customer Profile..... 220  
Table 6.14. Item-total Statistics for Anti-Crediters..... 221  
Table 6.15. Item-total Statistics for Instinctual Financiers..... 221

## Table of Contents

<b>Chapter One</b> .....	<b>1</b>
<b>Introduction</b> .....	<b>2</b>
<b>Chapter Two</b> .....	<b>5</b>
<b><i>The Psychology of Human-Computer Interaction and Consumer Behaviour with Relevance to the Financial Services Sector</i></b> .....	<b>6</b>
<b>2.1 Introduction</b> .....	<b>6</b>
<b>2.2 Financial Services Industry</b> .....	<b>7</b>
<b>2.3 Consumer Behaviour and the Link with Social Psychology</b> .....	<b>10</b>
<b>2.4 Personality</b> .....	<b>14</b>
<b>2.5 Personality and Human-Computer Interaction</b> .....	<b>17</b>
<b>2.6 Personality and Economic Behaviour</b> .....	<b>18</b>
<b>2.7 Behaviour and Attitudes</b> .....	<b>20</b>
2.7.1 Questionnaires.....	22
<b>2.8 Summary</b> .....	<b>23</b>
<b>Chapter Three</b> .....	<b>24</b>
<b><i>Embodied Conversational Agents in Financial Services Applications</i></b> .....	<b>25</b>
<b>3.1 Introduction</b> .....	<b>25</b>
<b>3.2 Animated Virtual Agents</b> .....	<b>25</b>
<b>3.3 Embodied Conversational Agent Designs Used in the Research</b> .....	<b>28</b>
<b>3.4 Agent Technology</b> .....	<b>30</b>
<b>3.5 System Design and Architecture</b> .....	<b>30</b>
<b>3.6 Speech Recognition</b> .....	<b>32</b>
<b>3.7 Research Methodology for Usability Engineering</b> .....	<b>32</b>
<b>3.8 Summary</b> .....	<b>34</b>
<b>Chapter Four</b> .....	<b>35</b>
<b><i>The Effect of Personality Portrayal on the Usability of Embodied Conversational Agents in a Mortgage Application eBanking Scenario</i></b> .....	<b>36</b>
<b>4.1 Introduction</b> .....	<b>36</b>



<b>4.2 Embodied Conversational Agent Designs Used in the Research</b> .....	<b>38</b>
4.2.1 Spoken Language.....	42
4.2.2 Body Language.....	43
<b>4.3 Experiment Design and Procedure</b> .....	<b>45</b>
4.3.1 Pecuniary Questionnaire Design .....	50
4.3.2 Saving and Debt.....	51
4.3.3 Temporal Aspects.....	52
4.3.4 Information Processing Style .....	52
4.3.5 Money Attitude Scale.....	53
<b>4.4 Experiment Results</b> .....	<b>58</b>
4.4.1 Usability Questionnaire Results .....	58
4.4.2 Individual Attribute Analysis .....	71
4.4.3 Agent Personality and Agent-Participant Personality Congruence .....	88
4.4.4 Correlations .....	89
4.4.5 Agent Personality-Participant Personality Congruence .....	90
4.4.6 Pecuniary Questionnaire .....	94
4.4.7 Reliability of Scale .....	94
4.4.8 Factor Analysis.....	95
4.4.9 Correlations between Questionnaire Items.....	97
4.4.10 Pecuniary Questionnaire Items and Personality Traits.....	103
4.5.0 Inter-Item Correlations.....	105
4.5.1 Further Analysis.....	107
4.5.2 Exit Questionnaire.....	114
4.5.3 Interview Comments .....	118
<b>4.6 Discussion and Conclusions</b> .....	<b>120</b>
<b>4.7 Summary</b> .....	<b>124</b>
<b>Chapter Five</b> .....	<b>126</b>
<b><i>The Effect of Individualised Product Portrayals on the Usability of ECAs in and eBanking Scenario</i></b> .....	<b>127</b>
<b>5.1 Introduction</b> .....	<b>127</b>
<b>5.2 Revised Pecuniary Questionnaire Design</b> .....	<b>128</b>
5.2.1 Pecuniary Factors Exploited in the Questionnaire .....	130
5.2.2 Money Attitude .....	130
5.2.3 Cognitive Style.....	130
5.2.4 Economic Behaviour.....	131
5.2.5 Background Characteristics.....	132
5.2.6 Psychological Traits .....	132
5.2.7 Credit (and Saving) Attitudes.....	133
<b>5.3 Product Uptake Questionnaire Design</b> .....	<b>134</b>
<b>5.3 Experiment Design and Procedure</b> .....	<b>134</b>
<b>5.5 Results</b> .....	<b>141</b>
5.5.1 Usability Questionnaire Results .....	141
5.5.2 Mean Usability Scores .....	141
5.5.3 Individual Usability Attribute Analysis.....	145
5.5.4 Product Uptake Questionnaire Results.....	174
5.5.5 Mean Product Uptake Scores .....	174
5.5.6 Product Uptake Attribute Analysis.....	175
5.5.7 Demographic Correlations .....	182
5.5.8 Pecuniary Questionnaire .....	188
5.5.9 Reliability of Scale .....	188
5.6.0 Factor Analysis.....	190
5.6.1 Correlations.....	194
5.6.2 Pecuniary Questionnaire Factors and Demographics .....	200

5.6.3 Further Analysis.....	203
<b>5.7 Interview Comments.....</b>	<b>204</b>
<b>5.8 Discussion and Conclusions .....</b>	<b>206</b>
<b>5.9 Summary .....</b>	<b>211</b>
<b>Chapter Six.....</b>	<b>212</b>
<b><i>Empirical Evaluation of the Pecuniary Questionnaire .....</i></b>	<b><i>213</i></b>
<b>6.1 Introduction.....</b>	<b>213</b>
<b>6.2 Reliability of Scale.....</b>	<b>213</b>
<b>6.3 Factor Analysis.....</b>	<b>216</b>
<b>6.4 Discussion and Conclusions .....</b>	<b>220</b>
<b>6.5 Future Applications .....</b>	<b>223</b>
<b>Chapter Seven .....</b>	<b>225</b>
<b><i>Conclusions and Suggestions for Future Work .....</i></b>	<b><i>226</i></b>
<b><i>Bibliography.....</i></b>	<b><i>235</i></b>
<b>Appendix 1 .....</b>	<b>240</b>
Scripts .....	240
<b>Appendix 2 .....</b>	<b>242</b>
Usability Questionnaire.....	242
<b>Appendix 3 .....</b>	<b>247</b>
Avatar Personality.....	247
<b>Appendix 4 .....</b>	<b>250</b>
Exit Questionnaire.....	250
<b>Appendix 5 .....</b>	<b>254</b>
Demographic Questionnaire.....	254
<b>Appendix 6 .....</b>	<b>255</b>
Pecuniary Questionnaire .....	255
<b>Appendix 7 .....</b>	<b>259</b>
Results from Chapter 4, ANOVA Tables.....	259
<b>Appendix 8 .....</b>	<b>278</b>
Pecuniary Questionnaire (revised) .....	278
<b>Appendix 9 .....</b>	<b>285</b>
Results from Chapter 5, ANOVA Tables.....	300
<b>Appendix 10 .....</b>	<b>285</b>
Product Purchase Questionnaire.....	285
<b>Appendix 11 .....</b>	<b>287</b>
Usability Questionnaire.....	287
<b>Appendix 12 .....</b>	<b>292</b>
Exit Questionnaire.....	292
<b>Appendix 13 .....</b>	<b>295</b>
Demographic Questionnaire.....	295
<b>Appendix 14 .....</b>	<b>297</b>
Scripts .....	297

# Chapter One

# Introduction

The thesis expounded in this work is that Embodied Conversational Agents (ECAs) represent a highly effective tool for human-computer interactions in future financial services applications, particularly when their product portrayals match the pecuniary traits of the customer. ECAs can provide a personal and effective platform for everyday banking enquiries whilst utilising and realising an effective customer targeting tool.

The motivation for this research is to make a contribution to knowledge in the field of ECAs, and gain insights on how best to realise their practical application. The foundations of the research are theories of personality traits and pecuniary traits as applied to ECAs. The research is based on a series of practical experiments conducted to explore the usability design issues of ECAs within (virtual reality) banking applications, resulting in the design and validation of a new empirical metric for users' pecuniary traits, enabling financial services applications that incorporate ECA technologies to be designed more effectively.

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 consumer behaviour and Human-Computer Interaction (HCI), emphasising the multi-faceted and varied research in these fields. The importance of studying consumer behaviour is identified and a number of key factors affecting this are discussed. The chapter also details the connections and foundations of HCI with the disciplines of psychology and social psychology. These are points of departure for the research work being presented here, in identifying how models of human personality and attraction and their

application to HCI - and more specifically ECAs - can potentially improve the quality and satisfaction of the user interaction. The chapter then goes on to link the disciplines of psychology and economics to discuss pecuniary traits and behaviours of consumers of financial services - a central interest in this research. Finally this chapter addresses the issues and methodologies involved in practical measurement of usability, personality and pecuniary traits.

Chapter 3 describes the technologies used in the experiments reported here. Details of the virtual agent graphics, the speech recognition and speech synthesis technologies and the architecture and eBanking application designs using ECAs employed in this research are covered within this chapter.

Two empirical investigations of ECAs, their design and possible practical applications, are then presented, together with a discussion of the results of qualitative analysis of a new pecuniary questionnaire, proposed here. Chapter 4 compares designs of 3-D virtual ECAs in an eBanking mortgage application scenario with ECAs differing in terms of gender and personality. In the experiments, participants were asked to perform tasks with each ECA, completing usability questionnaires and personality questionnaires for each ECA. Participants also completed a personality questionnaire to assess their own personality traits, and a pecuniary questionnaire to assess their attitudes towards financial matters. The findings of this experiment serve to define the details for the experiment design discussed in Chapter 5.

Chapter 5 compares scenarios portraying two different products via an ECA in an eBanking scenario. The ECA was a male extrovert agent design based on previous

results and was used to administer a service that offered common banking tasks as well as portraying four different product offers. Participant's attitudes on pecuniary traits were again assessed to investigate correlations between pecuniary attitudes towards planning and risk and participants product choice. The results offer evidence that the participant's demographic and economic situation affects the relevance of a given product. Participants felt more positively towards the service and the ECA when they felt the product was relevant to them and their needs. Factor analysis on the pecuniary questionnaire data identified seven non-overlapping factors that in turn correlate with several demographic and economic variables as well as product uptake scores, offering a metric that could be employed to segment customers and predict which products certain groups would be likely to consider purchasing.

Chapter 6 reports further detailed analysis of the pecuniary questionnaire with a larger sample size to improve statistical validity. These results provide evidence to support the future use of this metric in that customers' attitudes can be categorised into seven factors and these factors have good reliability.

Chapter 7 details the main findings and the contributions that this research provides and makes suggestions for further work.

## Chapter Two

# **The Psychology of Human-Computer Interaction and Consumer Behaviour with Relevance to the Financial Services Sector**

## **2.1 Introduction**

This research seeks to identify practical metrics with which financial institutions can assess consumer behaviour. Companies can then utilise data derived from such metrics to strengthen the customer-company relationship and to increase customer satisfaction, thereby improving the processes for recruiting, retaining and maintaining customers. The study of consumer behaviour helps firms improve their marketing strategies by understanding issues such as:

- The psychology of how consumers think, feel, reason and select between alternative brands and products;
- The psychology of how the consumer is influenced by their environment (e.g. culture, family, media);
- The behaviour of the consumer while making other purchasing or investment decisions; limitations in consumer knowledge or information processing abilities that influence buying decisions;
- How consumer motivation and decision strategies differ between product types, which in turn differ in their level of importance or interest for the consumer; and
- How companies can adapt and improve their marketing campaigns and strategies to more effectively reach the consumer.

This work takes a psychological perspective on HCI and the user-centred nature of the user interfaces and systems under investigation. All fields involved in HCI share the



goal of producing interactive systems that can be used efficiently, effectively and with satisfaction (Frótkjar, Hertzum & Hornback, 2000); these are three of the core usability facets. HCI is a multi-disciplinary approach which can be applied to many different sectors and areas of business and everyday life. Inextricably linked to HCI is usability. This can be defined as “ease of use plus usefulness” (Hartson, 1998). The work presented here is embedded within the financial services sector so it is necessary to outline the aspects are under investigation, and how previous research in the fields of agent technology, psychology, usability and economics has contributed to and motivate this research.

This chapter will illustrate and discuss how developing and investigating consumer interactions (within the financial services sector) with different interfaces, affect the attitudes that are formed of the company and the brand.

## ***2.2 Financial Services Industry***

Following on from the deregulation of the financial services industry the need for studying consumer behaviour has never been more apparent. The deregulation and the emergence of new technologies have destroyed the previously rigid structure of the industry giving way to more flexible and transparent methods of banking (Beckett, Hewer & Howcroft, 2000). Consumers have more product choice and more information available about their choices. This has led to increased levels of switching behaviour exhibited by customers as well as possible competitors, pushing banks to provide a modern, flexible and personal service. As a result a much greater focus has been placed on Customer Relationship Management (CRM) over recent years. The aim of such

strategies is “*to build long term, profitable relationships with specific customers*” (Ling & Yen, 2001).

All of the above factors have led to a large body of research much of which has highlighted the importance of investigating new user interfaces and distribution channels that can effectively communicate with the customer, as well as delivering new and innovative products (Costanzo & Ashton, 2006), particularly to encourage saving. Consumers need to be able to distinguish between the product offerings of competitors and institutions need to identify profitable groups of consumers. There are two main factors known to be critical in a customer’s choice of financial institution - the ease of doing business (usability) and the quality of personal service (Athanasopoulos, 2000; Levesque & McDougall, 1996). Usability has been shown to influence user attitudes, emotions and acceptance of the design of a system; as have the personal interactions (Nielsen, 1993; Hartson, 1998). It therefore seems that introducing new technologies that are usable and can be perceived as personable, either be utilised online or via a kiosk in a branch are vital requirements for banks.

The technology utilised and investigated in the research presented here was chosen as it offers the potential to fulfil the needs of the customer, offering effective communication as well as delivering the products and services required, therefore hopefully satisfying the customer’s expectations. The technology exploits virtual reality software. The study of virtual agents or ECAs and their possible applications is still relatively new. There are many ways in which these ECAs could assist in the financial services industry, offer customers greater choice and personable services and the bank more ways in which to save on valuable resources. Chapter 3 will describe the technology and previous research in this field in more detail.

With this new focus on CRM, customer-centred design and marketing strategies it is imperative that more research is conducted into how companies can target and communicate with their customers more effectively. There are several methods commonly employed to target customers, for example segmentation and profiling these can be done in a number of ways but the most popular being customer mapping<sup>1</sup> and data mining<sup>2</sup>. Segmentation involves dividing customers into groups so that those members of one group are as similar as possible to the members of that same group, whilst being as different as possible from member of other groups/segments (Harrison, 1994). This then enables companies to treat each segment differently by; providing different products, offering different price packages and distribution strategies. Segmentation of customers can bridge the gap between money-saving standardisation practices and the individual service. Many of the previous research in this area has been uni-dimensional, however part of the research presented here takes on a more psychographic approach (assessing basic personality characteristics, attitudes and beliefs). Profiling can occur after segmentation, allowing companies to form individual profiles detailing behavioural patterns, demographic information, and product preferences so on and so forth. By drawing upon demographic information, psychological characteristics and customer information files customers' preferences, needs and attitudes can be directly accessed.

---

<sup>1</sup> This can be a map based on geographical, attitudinal or behavioural information.

<sup>2</sup> Data Mining can be defined as the process of extracting or detecting hidden patterns or information from large databases (Berry & Linoff, 2004).

### ***2.3 Consumer Behaviour and the Link with Social Psychology***

Competition is high within the financial sector and the use of advanced technology in retaining and appealing to new customers is crucial. So, the relationship between an individual's behaviour, the reasons behind that behaviour and the resulting relationship with this technology must be investigated. In the multidisciplinary fields of HCI and consumer behaviour research there is large interest from social psychologists, particularly in the transfer of theorems from interpersonal relationships. Banks must aim to build not only short-term relationships with their customers but long-term ones.

Social psychology postulates several theories underpinning one individual's initial attraction to another individual and their development and maintenance of these relationships: and researchers in consumer behaviour and HCI have in turn adapted these theories in terms of products, brands and computers.

What makes us as humans attracted to some people or products more than others? There are several principles that facilitate who and what we are attracted to, not necessarily with equal weighting and with differing support from the theorists; physical attractiveness, proximity, familiarity, reciprocity, similarity and complementarity of needs (Hogg & Vaughan 1998). Physical attractiveness (in the Western world) is usually one of the first things we notice about a person, company or product; and we evaluate them according to individual tastes. It has been shown through many studies that more often than not an attractive person is rated more positively, are more likely to receive high evaluations of written work (Landy & Sigall, 1974); recommended for a job (Dipboye et al. 1977); more likely to have jurors be lenient on them (Sigall & Ostrove, 1975); and as being happier more successful people who have better

personalities than less attractive people (Dion et al. 1972). The simple rule of proximity has been shown to affect who we are attracted to. One study carried out in a housing complex found those who were living on the same floor were more likely to be friends with each other than those from different floors or buildings (Festinger et al, 1950). Familiarity generally leads on from proximity; repeated encounters will occur more often if we are in close proximity to that stimulus, and it has been found that repeated exposures to a stimulus increases your liking of others (Zajonc, 1968). The reciprocity principle states that we tend to like those who like us and dislike those who dislike us. The effect of similarity, in particular of attitudes and values has been demonstrated in several classic studies in the 1960's and 70's. For example, students who were attending university were given rent-free accommodation in return for answering questionnaires on their attitudes and values: once before arrival at their accommodation and on several occasions after. Attraction was measured between the students and any attitudes changes that had occurred. Results showed that proximity was the biggest factor in attraction initially but as time went on, attraction seemed to be more related to the similarity of attitudes (held before they arrived) (Newcomb, 1961). A theory based on the 'complementarity of needs' postulates that we look for others who will satisfy our needs; these usually being opposites, for example a dominant individual will look for a submissive partner. Although this theory has received mixed support since its relevance varies with the different stages in a relationship i.e. it might not occur at the start, in attraction, but later on in the maintenance or love aspect of a relationship (Lipetz et al. 1970).

There are several other theories of attraction which all offer different perspectives. The main theories involve those based on 'balance', 'reinforcement', and 'social exchange'.

These theories have been applied to consumer psychology too, in differing degrees. All offer some insight as to why we might choose one product or company over another. An overview of each of these psychological theories is presented in the next sections.

Theories based on 'balance' (Heider, 1958), which can only be applied in certain interactions, postulate that we like people who are similar to ourselves because this increases the chances of a positive feeling due to the affirming affect. They focus mostly on the cognitive and emotional state of a person rather than an objective view. For example a cognitive imbalance (dissonance) might occur when someone we like expresses a view that contradicts our own, such that something must give in order to return our internal balance (Hogg & Vaughan, 1998).

Models based on 'reinforcement' (Byrne, 1971) in their simplest form suggest that we like those who are present when we experience a positive feeling, which is a reward in itself so becomes reinforcing. There is another branch to this model; the reinforcement-affect model (Byrne and Clore, 1970). This relies more on association, for example, we can like a person or a neutral stimulus just because they were present at the time positive feelings were experienced and those feeling were recognised. To illustrate this, one study told participants to rate how much they liked or disliked a stranger based on a statement (a neutral stimulus). These statements were either given to them in a comfortable environment (few people present and comfortable room temperature) or uncomfortable environment (hot and crowded). The results showed that the stranger's statements had become associated with the negative feeling felt during the physically uncomfortable condition because participants liked the strangers less after experiencing the uncomfortable condition (Griffit & Veitch, 1971).

Theories based on 'social exchange' (Hormans, 1961) are more complex when compared to the others; they recognise the more interactive nature of relationships. There are several facets to such models, all of which play a vital role in the development of a social exchange relationship. The cost-reward ratio relates to the idea that the degree of liking someone is determined by the cost of gaining a positive reward from that person. These rewards could be goods (products or objects), information (advice, or opinions), love (affection or warmth), money (coin or something of value to that person), services (belonging to that individual) and status (a high or low prestige related judgement) (Foa & Foa, 1975). The aim is to minimise the cost of this exchange and maximise the rewards. Another important aspect of the social exchange theory is a person's comparison level which is a standard that develops over time and allows self-judgement of a new relationship. There are several adjustments to this theory depending on which culture it is being applied.

There has been a large body of work that has investigated the process of how humans build and maintain relationships with computers and ECAs, building trust and maintaining long-term relationships (for example Cassell et al, 2000). The research presented here seeks to create realistic and responsive agents that have the ability to interact with users naturally because they not only make the experience easier and more enjoyable, but also open the door for sales, and for motivational and persuasion techniques to be employed. Interactive computing systems that are designed to change people's attitudes or behaviours have been defined as 'persuasive technology' and the subsequent emerging area as Captology (Fogg, 2003). Similarly 'relational agents' have been identified as computer-generated lifelike entities that can build durable, social-

emotional relationships with their users (Bickmore & Picard, 2005). These ideas have been employed in the design of the first experiment presented in Chapter 4, developing an ECA that can motivate and persuade customers through relational strategies such as trust and personality similarity.

## **2.4 Personality**

There are many factors that affect consumer behaviour including demographics, social expectations, laws of attraction as well as personality and self-image. Many researchers have investigated the link between personality/self-concept and consumer behaviour and their effects on the brand or product (for example Kassirjian, 1971, Sirgy, 1982, Shank & Langmeyer, 1994, Aaker, 1999). Personality is fundamental to any ECA design for a user interface as it can shape the type of social relationships that evolve and even impact on the satisfaction for the participant (Dryer & Horowitz, 1997).

Within the field of psychology there are several accepted theories on personality. A general definition of personality is the patterns of behaviour, thought, and emotion that are unique to an individual, shaping the ways they interact with others across different situations. Personality research is based on several broad paradigms: psychoanalytical, trait, behaviourist and humanistic. The trait approach is probably one of the more widely accepted approaches, although research and debate in all these areas continue. The three most prominent theorems within the trait approach are the sixteen personality factor system (Cattell, 1947), the three factor approach (Eysenck, 1970) and the five-factor model (Costa & McCrae, 1992; Goldberg, 1992). The five-factor model (FFM) was chosen as the framework for investigating personality in the current study as its adjective response checklists are advantageous in requiring little space or time for



administration and little effort for processing. The commercially-available personality tests NEO-PI-R<sup>3</sup> (240 items) and NEO-FFI (60 items) were developed based on the FFM. Some of the major advantages of these assessments are there has been a substantial amount of reliability and validity research conducted with them (Goldberg, 1992; Trapnell & Wiggins, 1990) and they have been applied in a variety of different domains.

The FFM posits that there are five basic dimensions of personality which remain consistent over time, Extraversion, Agreeableness, Emotional Stability (Neuroticism), Conscientiousness and Openness. The theory emphasises that stable and underlying dispositions (i.e. traits) are the primary determinants of behaviour. *“Traits are characterised as general, enduring internalised characteristics of the individual that function as a predispositional basis for behaviour tendencies across a broad range of diverse situations”* (Endler & Rosenstein, 1997).

Each of the five basic traits / dimensions contains six facets and each facet has a number of relating adjectives. The Neuroticism dimension is characterised by the facets; Anxiety (related adjectives; fearful, tense), Angry Hostility (related adjectives; irritable, excitable), Depression (related adjectives; worrying, pessimistic), Self-consciousness (related adjectives; shy, timid), Impulsiveness (related adjectives; moody, irritable) and Vulnerability (related adjectives; anxious, careless). The Openness dimension is characterised by Fantasy (related adjectives; dreamy, imaginative), Aesthetics (related adjectives; artistic, inventive), Feelings (related

---

<sup>3</sup> **Revised NEO Personality Inventory (NEO PI-R)** developed by Costa, P. T. Jr. and McCrae, R. R. for use with adult men and women (without psychopathology). It is a psychological personality inventory measuring the Five Factor Model: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience, as well as the six subordinate facets of each of the "Big Five" personality factors.

adjectives; excitable, spontaneous), Actions (related adjectives; wide interests, adventurous), Ideas (related adjectives; idealistic, curious) and Values (related adjectives; unconventional, flirtatious). The Agreeableness dimension is characterised by Trust (related adjectives; forgiving, trusting), Straightforwardness (related adjectives; uncomplicated, naive), Altruism (related adjectives; warm, gentle), Compliance (related adjectives; patient, tolerant), Modesty (related adjectives; self-conscious, passive), Tender-mindedness (related adjectives; friendly, warm). The Conscientiousness dimension is characterised by Competence (related adjectives; efficient, self-confident), Order (related adjectives; organised, thorough), Dutifulness (related adjectives; careful, active), Achievement striving (related adjectives; ambitious, enterprising), Self-discipline (related adjectives; organised, efficient), Deliberation (related adjectives; careful, cautious). The last dimension of Extroversion is characterised by Warmth (related adjectives; friendly, warm), Gregariousness (related adjectives; sociable, outgoing), Assertiveness (related adjectives; aggressive, assertive), Activity (related adjectives; energetic, hurried), Excitement-seeking (related adjectives; pleasure-seeking, daring), Positive Emotions (related adjectives; enthusiastic, humorous).

For the purposes of the experiments presented in this research (Chapter 4) only one dimension (extroversion) was investigated since it was judged that for an ECA designed to provide a financial information service, the other four traits were of little interest as no user would want a neurotic, disagreeable, hesitant or careless ECA as a financial service provider. As a consequence the ECAs investigated in the first experiment (detailed in Chapter 4) were designed to portray either an extrovert or an introvert

personality type based on characteristics outlined in the FFM. The aim was to design the ECAs so they portray identifiable and realistic personalities.

## ***2.5 Personality and Human-Computer Interaction***

There have been several studies that have explored the theoretical link between personality and HCI. The two hypotheses that have received most attention are the similarity-attraction hypothesis and the complementarity hypothesis. As mentioned previously the similarity-attraction hypothesis is an elegant theory which postulates that people are attracted to others who hold similar attitudes to them, have similar personalities and/or share physical and demographic characteristics (Furnham & Heaven, 1999). The theory of complementarity of needs (Winch, 1958, Cited in Hogg & Vaughan, 1998) suggests that people seek others who can best satisfy their needs, for example a dominant person would prefer to interact with a submissive partner (Hogg & Vaughan, 1998). HCI researchers have borrowed from social psychology and applied these theorems to human-computer interactions. Studies have provided contradictory evidence in relation to each of these theories. Even in limited experiences, such as with text-only user interfaces it has been shown that extroverts prefer interfaces that present the information using language that is associated with extrovert traits and introverts prefer the use of introvert traits. The interfaces that matched the user's personality traits were judged more positively, rated more attractive, credible and informative, thus supporting the similarity-attraction hypothesis (Nass, Moon, Fogg, Reeves, & Dryer, 1995). Support has also been provided for this hypothesis from studies that found that participants preferred interacting with a computer that exhibits a similar personality to their own (with regards to dominance) (Moon & Nass, 1996). However, others argue that although the complementarity principle needs reviewing there is evidence that

people prefer to interact and are more satisfied with the interactions if the computer exhibits the opposing behaviour (with regards to dominance) (Dryer & Horowitz, 1997). The first experiment discussed in this research sought to investigate the correlation between the computer's personality and the user's personality, thus applying the similarity-attraction hypothesis to HCI.

## ***2.6 Personality and Economic Behaviour***

Research has attempted to address the probable link between economic behaviour and personality (Brandstätter & Königstein, 2001; Kurzban & Houser, 2001; Lunt & Livingstone, 1991; Nyhus & Webley, 2001; Verplanken & Herabadi, 2001; Yamauchi & Templer, 1982; Zaleskiewicz, 2001). Evidence from such studies is offered in support of the existence of personality characteristics as being amongst some of the main driving forces behind consumers' economic behaviour. Attitudes toward financial issues will have a significant motivating effect and thus an ability to predict an individual's economic behaviour could be extremely valuable.

From the area of literature that focuses on consumer's behaviour, particularly regarding saving and borrowing, three prominent issues emerge. These are firstly, attitudes held by the consumer about saving and borrowing; secondly, attitudes towards money itself (Nyhus & Webley, 2001; Perugini & De Raad, 2001; Yamauchi & Templer, 1982); and finally consumers' thinking styles (Verplanken & Herabadi, 2001; Zaleskiewicz, 2001). A large proportion of the published literature on this topic reveals an influence of personality on economic behaviour. However, there is disagreement on exactly how and what traits influence economic attitudes and subsequent behaviour. The most commonly used tool in the aforementioned studies is the development and

administration of questionnaires. Many of these questionnaires focus on one aspect only, for example risk (seeking and aversion) behaviour (Zaleskiewicz, 2001). However, one study (Lunt & Livingstone, 1991) employed a questionnaire that was constructed from a variety of different concepts such as, demographic details, income, financial strategies, judgements and expectations as well as patterns of shopping and coping strategies; all identified from previous empirical work. The responses to this questionnaire were then correlated with certain psychological factors. A similar structure has been utilised and applied to the pecuniary<sup>4</sup> questionnaire being developed for the current research. Therefore, three of the key concepts (attitudes held by the consumer about saving and borrowing, attitudes towards money itself and consumers' thinking styles) have been combined to produce the first version of the questionnaire (detailed in Chapter 4) to allow correlations to be analysed between these concepts and the NEO-FFM personality traits of the individual as well.

The aim of the pecuniary questionnaire being developed as part of this research is to measure correlations between the responses to the questionnaire and the personality traits. The questionnaire was initially divided into sections that focus on several different aspects of attitudes relating to money and finance. For example, it assessed respondents' attitudes towards saving and debt, as well as towards the temporal aspects of saving (for example whether they are forward thinking or just think for the present), also their thinking and processing style and finally their attitude towards money itself. It was hypothesised that this could lead to experiments that would utilise any correlations between these responses and individuals' personalities in order to develop an ECA that will be personalised, and in turn aim to predict and/or influence customers' behaviour

---

<sup>4</sup> **Pecuniary** – of or pertaining to money.

through their interaction with the ECA. Such experiments could also attempt to gather information to allow the prediction of financial motives in using specific financial service modalities, such as the Branch, ATM, Internet, and Kiosk. One benefit of such predictions is the possible elimination of customers' avoidance strategies and movement to using money-saving service options, for example encouraging customers to migrate from their Branch to Kiosks, ATMs and the Internet to conduct the majority of their transactions, with potential cost savings. In other words the pecuniary metric could allow for segmentation and targeting of customers financial attitudes, allowing for an ECA to provide tailored information about the most suitable products for that individual. By utilising the resources available to the Bank such as financial status and demographic information through which they would be able to infer an individual's position on the pecuniary scale, they would in turn be able to target specific attitudes through the tailored information provided by an ECA.

## ***2.7 Behaviour and Attitudes***

An important aspect of psychology in the study of consumer psychology is the link between attitudes and behaviour, particularly as questionnaires are one of the most popular methodologies. The link between attitudes and behaviour is well documented within psychology (for example, Fishbein, 1967). There are several theories behind attitude formation and structure. The main ones being; the one-component attitude model; the two-component attitude model (Allport, 1935, Cited in Hogg & Vaughn, 1998); the three-component attitude model (for example, Rosenberg & Hovland, 1960); and the cognitive-consistency theories (a combination of several theories). It is important to consider how attitudes are formed before any assessment of how they affect our behaviour can be undertaken.

The one-component theory is holistic in the sense that it is not only the simplest theory but postulates that an attitude is *“the degree of positive or negative affect associated with some psychological object”* (Edwards, 1957, p.2). The two-component theory (Allport, 1935), hypothesizes that an attitude is first of all a mental state where we are preparing to act (state of readiness), and secondly that it can guide our evaluative responses due to its ability to be generalised. The three-component model is one of the more popular theories on attitude that consists of cognitive, affective and behavioural components. Many academics and theorists have challenged this theory due to its presumption of links between attitudes and behaviour. However it is still one of the most researched and supported theories. The theory also stresses that attitudes are relatively permanent (persisting across time and situations); are limited to socially significant events or objects; and can be generalised. The cognitive consistency theories emphasise that individuals strive to maintain an internal consistency between their beliefs and when inconsistency arises, they become unbalanced and disturbed by this dissonance. The outcome of this is that we endeavour to maintain and restore consistency, i.e. change our behaviour or situation to restore balance. These theories are key in attempting to explain the link between attitudes and behaviour.

The function of attitudes is not clearly defined either. Some are more explicit in their definition than others. For example it has been proposed that there are different types of attitudes each performing a slightly different function (Katz, 1960). These functions have been defined as knowledge, instrumentality (means to an end), ego-defence (protecting one’s self-esteem), and value expressive (Hogg & Vaughan, 1998). Later others argued that the main function of attitudes is a utilitarian one. In other words,

attitudes assist us in object evaluation. Understanding how people form their attitudes and how these in turn affect behaviour and decisions is key to the study of consumer behaviour and purchasing behaviour.

### 2.7.1 Questionnaires

Questionnaires are one of the most widely used instruments for attitude assessment and have been used throughout this research for such purposes. They have both advantages and disadvantages however they were deemed the most suitable instrument for this research. For instance questionnaires are familiar to most people, and are easily analysed, particularly if Likert<sup>5</sup> statements are employed. They are also cost-effective especially when compared to face-to-face interviews, and they reduce or negate interviewer bias (Walonick, 1993). In the research reported here attitudes were assessed regarding participants opinions on the interactions, technology used and on a variety of financial matters, all in an attempt to assess the usability of an ECA and its effectiveness as a bank agent offering traditional banking services and products. The pecuniary questionnaire (using a Likert-style response scale) developed throughout this research supports the efforts of the current research to assess customers' attitudes towards financial matters so that in turn their behaviours may be predicted and influenced. It was designed to assess customers' attitudes towards a variety of financial matters as well as personality characteristics that have been shown to influence such issues, to allow for customer segmentation to occur.

---

<sup>5</sup> **Likert Scale** – Rensis Likert (1932) developed a direct measure of attitudes called the Likert Scale. It is a bipolar scaling method, measuring either positive or negative response to a statement. A Likert item is simply a statement which the respondent is asked to evaluate according to some kind of subjective or objective criteria; generally the level of agreement or disagreement is measured. Often five or seven ordered response levels are used.



## **2.8 Summary**

This chapter has introduced the main psychological, economical and HCI theorems that have influenced and provided evidence for the ideas and experiments presented here. It shows that there is a great need within the financial services sector to study consumer behaviour and introduce new and innovative technologies. The area of HCI subsequently has become of great importance. Theories from psychology relating to how people interact, why and how they are attracted to a person / product, build relationships, maintain that relationship, form attitudes of brands and companies, have all been applied throughout this work. It is hoped that this will go some way in helping our understanding consumer behaviour and in possibly predicting or influencing it.

## **Chapter Three**

# **Embodied Conversational Agents in Financial Services Applications**

## **3.1 Introduction**

Chapter 2 described and explained some of the key psychological and HCI theorems that support the research presented here. This chapter will explain in more detail the technology under investigation (ECAs), their use in financial services, and the methodology used to examine them in a real-life application.

## **3.2 Animated Virtual Agents**

The fast growing field of HCI has led to more and more research into the uses and benefits of ECAs. ECAs are agents that portray human-like qualities and behaviours in face-to-face conversation and stand apart from other user interfaces through four main abilities: recognising and responding to verbal and non-verbal input, generating verbal and non-verbal output, using conversational rules such as turn-taking and feed-back techniques, and giving signals to indicate specific conversational states as well as contributing new ideas to the exchange (Cassell, 2000). In other words ECAs can use facial expressions, gaze, gesture and intonation to engage in and manage a conversation. One reason that this field merits so much attention is because it is widely accepted that humans react and behave toward computers in a similar way as they do with other humans, as depicted by the 'computers as social actors' theorem (CASA, Reeves & Nass, 1996). The social rules that govern human-to-human interaction, stereotypes and even personality attribution also apply to HCI (Cassell, Sullivan, Prevost, & Churchill, 2000; Dryer, 1999; Isbister & Nass, 2000; Prendinger, Ma, & Yingzi, 2005; Reeves & Nass, 1996). For example, studies have found that people

prefer to interact with a computer that displays a similar personality to themselves (Nass et al., 1995), just as they would another human (similarity-attraction hypothesis).

In the field of ECAs the debate over if and how they improve the quality, usability and persuasiveness of the services they inhabit is of key interest. There is general agreement in terms of the potential of ECAs but how to achieve that potential remains unresolved. ECAs bring a personal quality to an otherwise impersonal medium. This aspect in particular could be of benefit to the financial services industry. The Internet has encouraged growth of a consumer culture that causes customers to demand immediacy and value for money from personal services. It is not only in the interests of the service provider to create a personal experience at the convenience of its customers but they also need to make that experience as innovative and engaging as possible to attract new customers as well as hold on to the customers they already have. ECAs therefore have the potential to promote a company into the forefront of technological advancement and also increase the sales potential through reducing costs. ECAs can effectively take the role of a financial planner. If the level of personalisation is correct then ECAs will elicit the desired social responses from users. In fact if ECAs are successful in bringing the desired level of personalisation to services then this would not only be beneficial to the financial institution but the customer as well, by being more efficient and responsive to their needs.

The presence of ECAs in user interfaces has been shown to enhance such interfaces (Berry, Butler, & De Rosis, 2005; Nakanishi, Nakazawa, Ishida, Takanashi, & Isbister, 2003). Users' preferences and successes will depend on not only which domain the interaction takes place, for example eLearning applications or for informational

displays, but also what type of agent is employed (Berry et al., 2005). The banking industry is very different from that of the gaming world, thus would probably need a different type of agent to mediate the communication with the user. For example, in general, financial institutions want to be perceived as reliable, professional, and security conscious, whereas a computer game needs to be entertaining and have the ability to capture the users' attention for longer than just a few minutes at a time. It would therefore seem reasonable to assume that employing more realistic lifelike agents as ECAs would satisfy the consumers' wants, needs and expectations from such an industry, in comparison with the use of a caricature, which maybe more suitable for the gaming world.

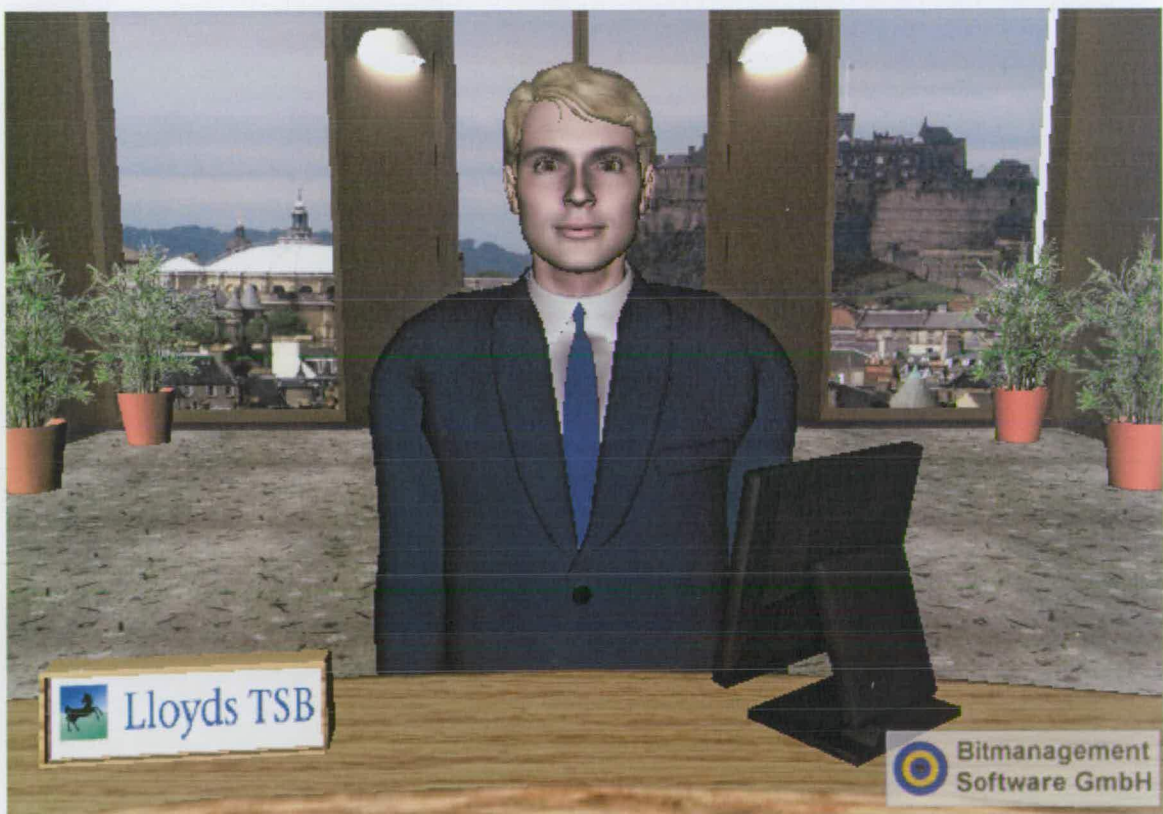
One particular focus of research into ECAs is that of personification, creating virtual humans that can react to their environment using natural language, respond emotionally and convey a personality (André, Klesen, Gebhard, Allen, & Rist, 1999; Dryer, 1999; Kshirsagar & Magnenat-Thalman, 2002). There are many variables to consider when designing an ECA and these variables in turn produce the vast array of agents under investigation. For example decisions about whether the character should be lifelike or a caricature, communicate through text, recorded voice or text-to-speech synthesis (TTS). The final application will dictate the choices made. Studies have shown that in sales or an informational display service a realistic agent serves best (Berry et al., 2005); others have shown that TTS produces the best response as users prefer a consistent experience, in other words if they are viewing a computer-generated image they prefer to hear a computer generated voice and in turn respond better to cognitive tests (Gong & Nass, 2000; Nass & Lee, 2001). However, other studies have found that natural recorded voice elicits more disclosure, for example as required for a mortgage application, than a

synthesized voice (Robles, Bienstock, Treinen, Heenan, & Nass, 2000). Based on such research it was decided that realistic, lifelike virtual agents that possess human recorded voices would be employed.

### ***3.3 Embodied Conversational Agent Designs Used in the Research***

Non-verbal behaviour is an essential component of any interpersonal interaction. An individual not only perceives conversational cues through the language used but also infers important aspects of the other person's character through body language such as their emotional state and personality, to which they can respond appropriately. For example it has been shown in the psychology literature that a more expressive face encourages more involvement in the conversation as well as more persuasiveness (for example Burgoon, Birk & Pfau, 1990), and this is also found in HCI research (Baylor & Kim, 2008). What makes ECAs differ from other virtual agents is that they should be as realistic and natural as possible using facial expressions, gaze, gesture and intonation to manage a conversation. The research being reported here exploits the CASA theorem (CASA, Reeves & Nass, 1996) in investigating the postulate that humans react and behave toward computers in a similar way as they do with other humans. As it is important to get the body language of the ECAs as realistic and perceivable as possible the same movements and gestures were used as in the first experiment. These were compiled from videos of a male and a female actor in the studio to model the body language that accompanied the corresponding script and extrovert personality characteristics. The actors hold degrees in Acting and Performance from Scottish colleges.

From these films body movements and facial animations were extracted and categorised. It has been shown that individuals raise their eyebrows as they raise their pitch either as emphasis, surprise or another form of micro-expression (Albrecht, Haber, & Seidel, 2002). To create a cohesive audio-visual presentation it was ensured that the lip-syncing was as accurate as possible as this has an impact on the persuasiveness of the encounter (Baylor & Kim, 2008). This was conducted using an in-house application<sup>6</sup>, which analyses the audio files to make a text and then a phonemic translation of the speech; these are then used to control the 3D ECA by informing the software which facial poses to use.



**Figure 1: The Male ECA**

---

<sup>6</sup> **Lipsync** - is a Win32 command-line application (written in C++) for creating lipsync animation scripts from recorded speech prompts (in standard PCM wave audio format). It uses the Microsoft SAPI speech recognition engine (with a dictation grammar) to try to estimate phoneme and timing information from the audio files. The recognition accuracy can vary but because the resultant phoneme sequences sound very similar to the original speech, whether or not the word recognition is exactly correct, so the resultant viseme sequences look very similar to what you would expect.

### **3.4 Agent Technology**

A banking scenario was specified in XML format, a high-level description of an ECA application, which specifies: a scene; one or more ECAs (assigning an avatar and a dialogue to each one); and a speech recognition grammar (to be used by all agents). In this case the application was a banking service set in a virtual branch of the case bank, with an ECA playing the role of financial advisor and bank employee, helping the user complete a set of simple banking enquiries. The ECAs use automatic speech recognition to understand the customer's phrases such as currency amounts and teller requests.

### **3.5 System Design and Architecture**

The application software used a set of Java packages and was designed to allow the different versions of the ECAs to exist within a 3D virtual environment and interact with the user through speech synthesis and recognition. An agent dialogue was written for each of the versions of the agent in a dialogue editor application. This determines the response of the agent to events within a scenario. A set of auxiliary modules determine the range of events to which the agent can respond to, these include: a set of events; a set of functions; and a set of actions.

The dialogue manager follows a simple procedure each time a scenario is loaded:

1. Load the dialogue script.
2. Wait for a signal to start the dialogue execution.
3. Wait for an event.



4. Determine and execute the response to the event (if any).
5. Loop back to stage 3 until signalled to stop the dialogue execution.

A dialogue script involves a set of *states*, a set of *conditions* and a set of *results* (each with a unique ID number). Each *state* specified by a dialogue script has four elements: a text description of the state (e.g. “waiting for an instruction”); a condition-result pair list for ‘verbal’ events; a condition-result pair list for ‘visual’ events; and a condition result pair list for ‘internal’ events.

A condition-result pair list is a list of condition-result pairs, which are a pair of ID numbers, the first identifying a condition (as specified by the dialogue script) and the second identifying a result (as specified by the dialogue script). Condition-result pairs can either allow (denoted by round brackets) or block (denoted by square brackets) that condition or result.

Events passed to the dialogue manager are categorised as either ‘*verbal*’, ‘*visual*’ or ‘*internal*’. *Verbal* events relate to the users’ spoken input and will be controlled by events received from a speech recognition module. *Visual* events are non-verbal events that are external to the agent (for example the user or another agent). *Internal* events are non-verbal events that are internal to the agent such as the expiration of a timer set by the agent.

### **3.6 Speech Recognition**

The speech recognition grammar for the application was written in Nuance<sup>7</sup> Grammar Specification Language (GSL). This is a formal specification of the range of spoken phrases to be 'understood' by the agents (through its speech recognition module). The speech recognition technology is based on recognition of context-sensitive phonemes, the basic linguistic units that are the building blocks from which words are made. Phonemes are sounds that when combined produce a word, for example the words 'thief' and 'sweet' both contain the phoneme 'ee'. In the English language there are some 44 phonemes that are used in everyday speech. The speech waveforms are analysed and then converted into phonemes, words and sentences by a hidden Markov models (HMMs) which are particularly effective in coping with the variability of a speech signal as it is unlikely that a speaker can reproduce exactly the same speech pattern each time.

### **3.7 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 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

---

<sup>7</sup> **Nuance** is a company that provides speech recognition software that can be applied to many different technologies, applications and services. For example server and embedded speech recognition, telephone call steering systems, automated telephone directory services, medical transcription software and desktop imaging software.

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 customer 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 specific criterion).

The experiments presented in Chapter 4 and Chapter 5 are 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 that the results are not biased (Preece, Rogers, & Sharp, 2002).

The experiments in Chapter 4 and Chapter 5 investigate the usability of a new user interface for a new product (ECAs in an eBanking scenario) therefore it was essential that the environment created enables the interaction between user and the service to be systematically assessed and measured. The interaction consists of the user using the new service as a means of achieving a specified bundle of tasks, in this case three simple banking tasks (for example a balance enquiry, new chequebook request, and a

mortgage information request and application). Participants were selected from the case banks customer database that had been TPS<sup>8</sup> verified. Participants were balanced for gender and age (two age groups: ages 18-34 and 35 and over).

Participants completed a demographics questionnaire to establish specific characteristics that would in turn be used to measure the effectiveness of the new service (for detailed examples see Chapter 4 and 5 respectively). 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, income and occupation). Demographic data have been shown to correlate with consumers' preferences, requirements and usage levels of products. In other words obtaining this information allows demographic segmentation to occur and in turn allows the company to target a market more successfully.

### **3.8 Summary**

This chapter has detailed the technology under investigation throughout this body of work, namely ECAs, their use in financial services, and the methodology used to examine them in financial services applications. It has highlighted the unique qualities that ECAs possess to allow them to conduct face-to-face conversation and stand apart from other user interfaces. It also underlined the importance of testing the usability of such technology and its subsequent applications.

---

<sup>8</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.

## **Chapter Four**

# **The Effect of Personality Portrayal on the Usability of Embodied Conversational Agents in a Mortgage Application eBanking Scenario**

## ***4.1 Introduction***

This chapter discusses the results of an empirical evaluation assessing the use of 3D ECAs in an eBanking scenario. The aim of the experiment was to assess the impact of ECAs which have been designed to portray different personalities, on the usability of a mortgage application eBanking scenario. The ECAs' personalities were based on the attributes from the Five Factor Model (FFM) of personality (Costa & McCrae, 1992). Four fundamental designs for the virtual agents were explored; a female extrovert agent, male extrovert agent, female introvert agent and a male introvert agent. As part of the research customers' pecuniary attitudes were assessed in an investigation of the link between personality traits and attitudes to financial matters.

In the field of ECA research the debate over if and how they improve the quality, usability and persuasiveness of the services they inhabit is of key interest. There is general agreement in terms of the potential of ECAs but how to achieve that potential is still disputed. ECAs bring a personal quality to an otherwise impersonal medium. This aspect in particular could be of benefit to the financial services industry. The Internet has encouraged growth of a consumer culture that causes customers to demand immediacy and value for money from personal services. It is not only in the interests of the service provider to create a personal experience at the convenience of its customers but they also need to make that experience as innovative and engaging as possible to attract new customers as well as hold on to the customers they already have. ECAs therefore have the potential to promote a company into the forefront of technological

advancement and also increase the sales potential through reducing costs. ECAs can effectively take the role of a financial planner. As long as the level of personalisation is right then ECAs will elicit the desired social responses from users. If in fact ECAs are successful in bringing the desired level of personalisation to services then not only would this be beneficial to the financial institution itself but the customer as well, by being more efficient and responsive to their needs.

The experiment described here was designed to use agents with distinct and recognisable personality types to assess the usability and the effects of the different personality traits in an eBanking scenario. This experiment was also designed to assess the possible correlation between consumers' financial attitudes and their personality type. Although there has been research into this area previously, such links, if established may help to go some way to predicting consumers behaviour and even influencing or directing their behaviour through the use of the agent technology.

For the purposes of this experiment only one dimension (extroversion) was chosen to be investigated. It was judged that for an agent designed to provide a financial information service, the other four traits were of little interest as no user would want a neurotic, disagreeable, hesitant or careless ECA as a financial service provider. As a consequence, the ECAs in the current study were designed to portray either an extrovert or an introvert personality type based on characteristics outlined in the FFM. Further evidence for this decision comes from the large number of studies which also chose to investigate similar traits in their HCI studies, for example dominance and submission (for example, Moon & Nass, 1996). The aim was to design the ECAs so they portray identifiable and realistic personalities.

## **4.2 Embodied Conversational Agent Designs Used in the Research**

The ECAs used were designed and modelled as described in Chapter 3. As discussed earlier, non-verbal behaviour is an essential component of any interpersonal interaction. An individual not only perceives conversational cues through the language used but also infers (through body language) important aspects of the other person's character such as their emotional state and personality to which they can respond appropriately. Because the main variable under investigation in the current research is the agent's personality, it was therefore deemed important to get both the spoken language (see section 4.2.1) and the body language of the ECAs as realistic and perceivable as possible (see section 4.2.2). A male and a female actor were recruited to model the body language that accompanied the corresponding script and personality characteristics. Both the male and female actors hold degrees in Acting and Performance from Scottish Colleges. The spoken language used was also important as research has shown that gender and personality can affect language usage (see section 4.2.1).

Details of the ECAs appearance were changed slightly from the extrovert case to the introvert case in order to allow participants to easily distinguish between the conditions. Hair colour was the most practical feature to alter, as it creates an obvious distinction but also allows the other aspects of the agent to remain the same (See Figure 4.1 through to Figure 4.4 for screen shots). Half the participants experienced a blonde haired extrovert (in both male and female conditions) and a brown haired introvert (male and female), and the other half of the participants experienced a brown haired extrovert and a blonde haired introvert (in the male and female conditions). It is not expected that the hair colour will impact on the outcome of the experiment (See Section



4.4). The key agent variables of introversion/extroversion, male/female and blonde/brown hair were balanced using a Latin Square design with 8 orders as (Table 4.1)

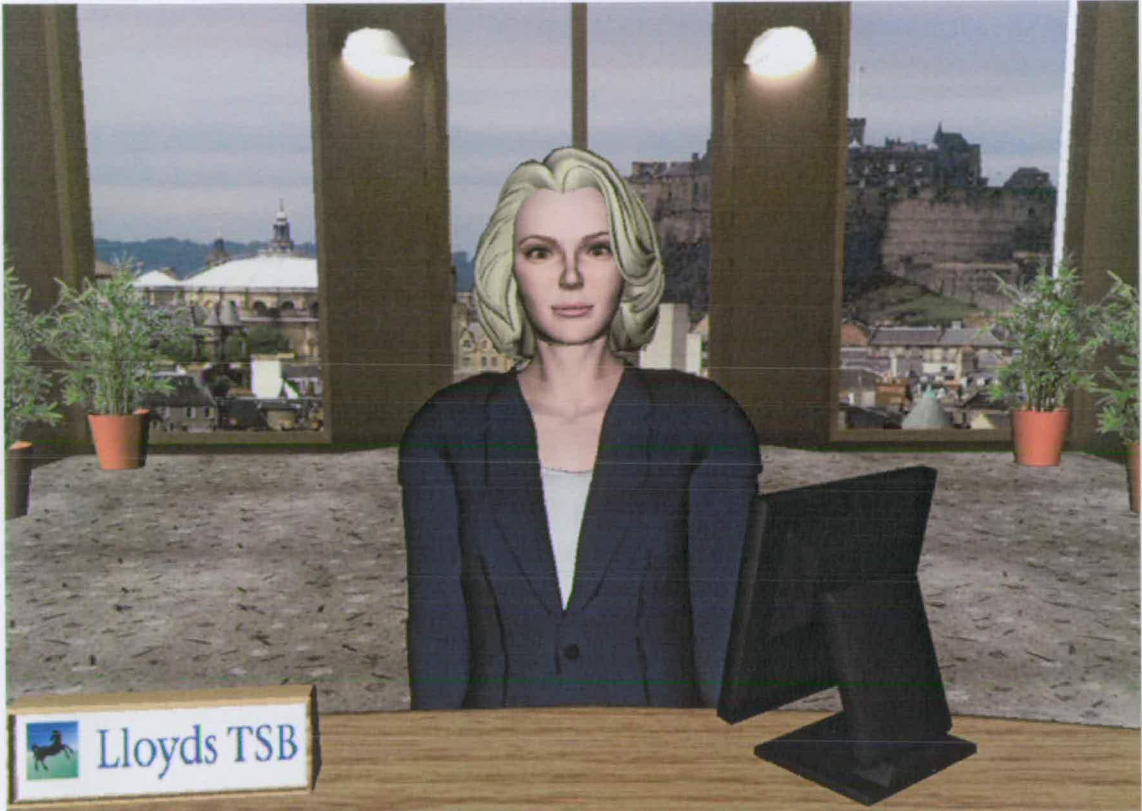
<b>Order 1</b>	EFR	EMR	IFB	IMB
<b>Order 2</b>	EMB	IMR	EFB	IFR
<b>Order 3</b>	IFR	EFB	IMR	EMB
<b>Order 4</b>	IMB	IFB	EMR	EFR
<b>Order 5</b>	EFB	EMB	IFR	IMR
<b>Order 6</b>	EMR	IMB	EFR	IFB
<b>Order 7</b>	IFB	EFR	IMB	EMR
<b>Order 8</b>	IMR	IFR	EMB	EFB

**Key:**

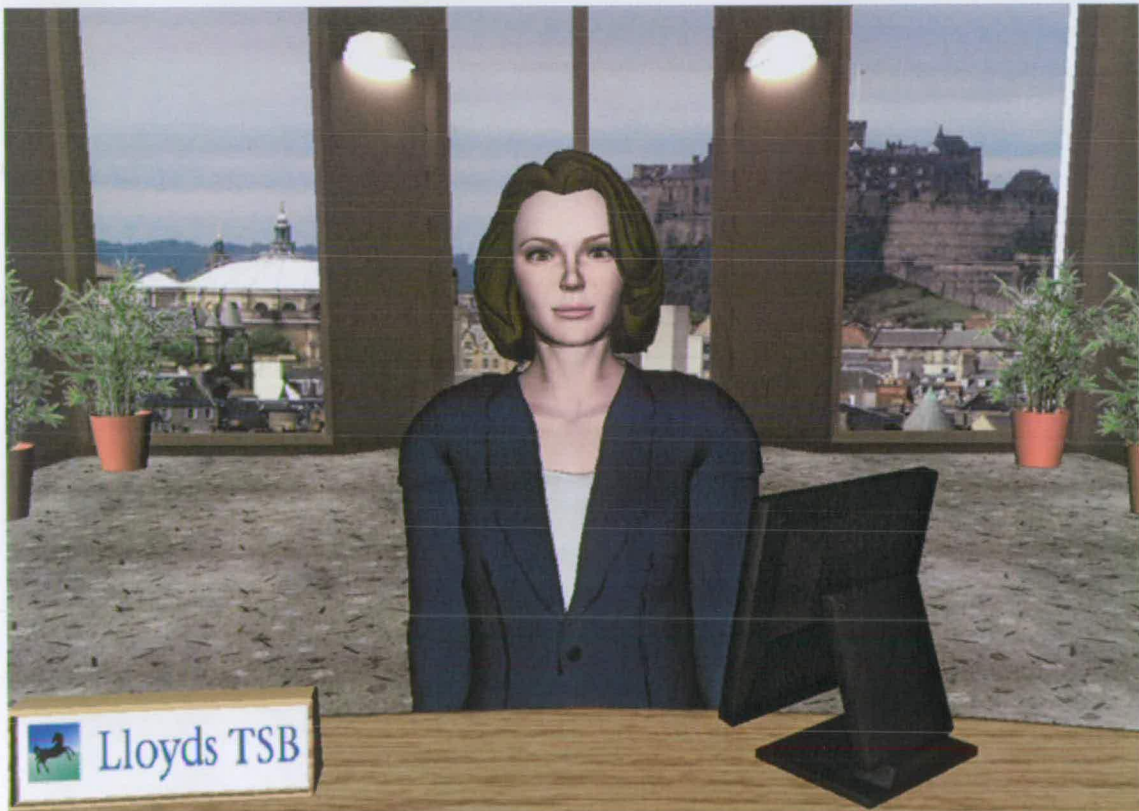
**I** : Introvert | **E** : Extrovert | **F** : Female | **M** : Male | **R** : Blonde Hair | **B** : Brown Hair

**Table 4.1: Latin Square Design**

In total there are eight versions of the ECA was used, although participants will only ever experience four of these during one session. The agents perform gestures, exhibit general life signs, typing in order to communicate with the user and appear as realistic as possible. They also speak using pre-recorded audio prompts.



**Figure 4.1: The Blonde Haired Female Banking ECA**



**Figure 4.2: The Brown Haired Female Banking ECA**

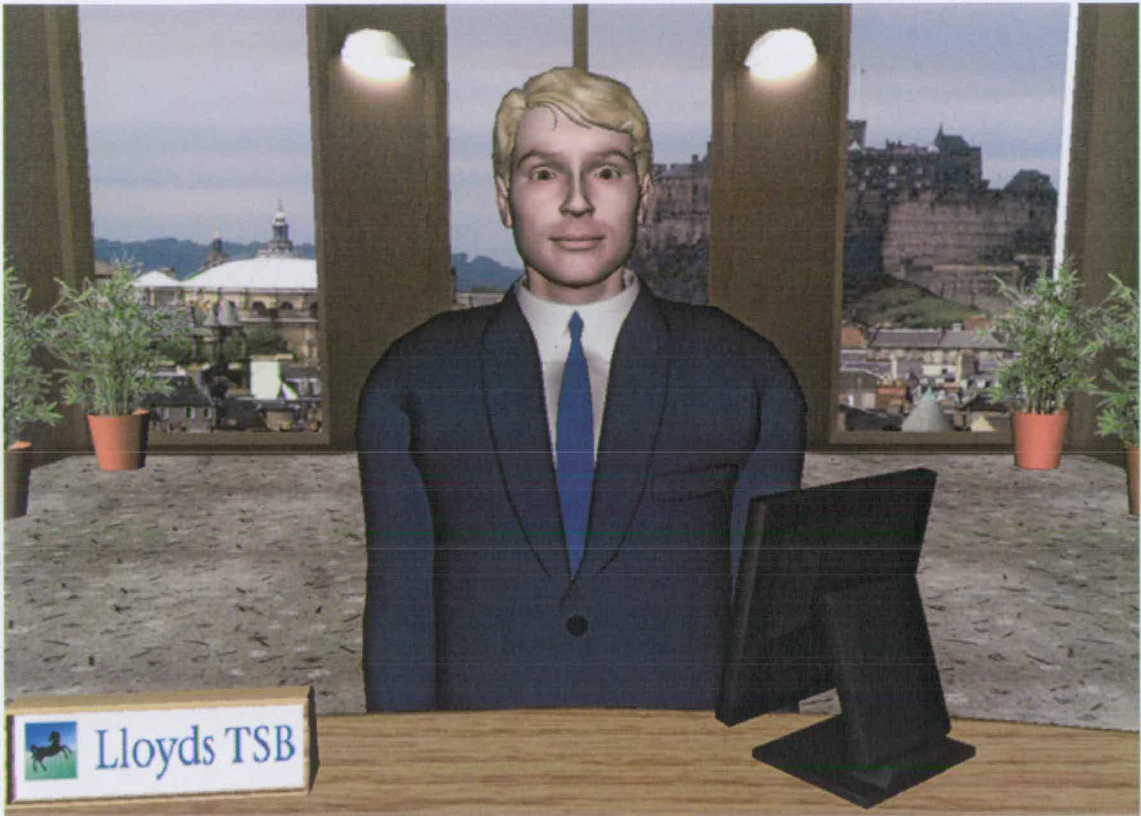


Figure 4.3: The Blonde Haired Male Banking ECA

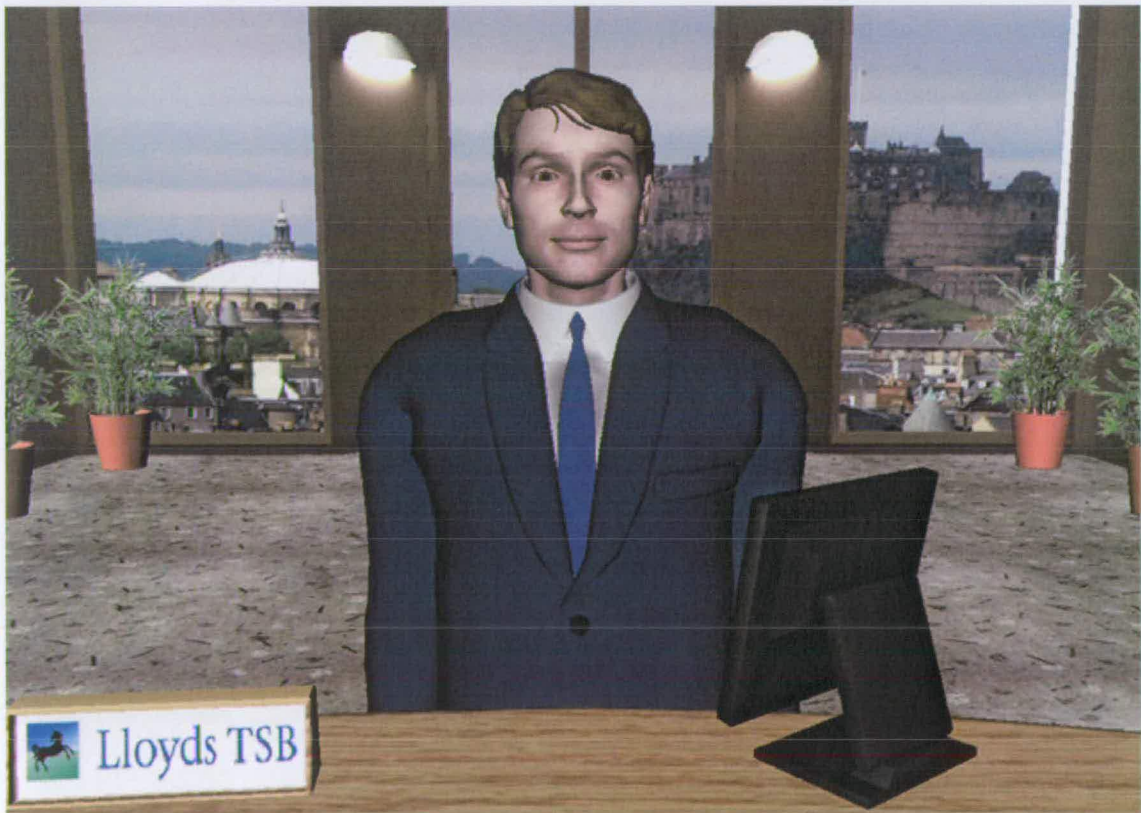


Figure 4.4: The Brown Haired Male Banking ECA

### **4.2.1 Spoken Language**

The actors were given two different scripts from which to read, one for the introvert portrayal and one for the extrovert portrayal (See Appendix 1 for the audio scripts). It has been reported that extroverts are amongst other things, less formal in their language use and use more verbs, adverbs and pronouns and speak quicker and louder than introverts (Furnham, 1990; Scherer, 1978). Other research has analysed transcribed texts and categorised them into the 'warm' facet of extroversion (NEO-FFM) where the speaker used fewer negative emotion words, more present tense verb, used more words, and in turn the text was labelled dominant. Dominant texts contained less unique words, positive emotion words and more self referents. Similar results were found from analysis of written texts (Gill & Oberlander, 2002; Pennebaker & King, 1999).

The actors were asked to read the scripts aloud and the prompts were recorded in .wav files and edited as appropriate in the software programme Cool Edit. See Appendix 1 for the extrovert and the introvert audio scripts.

The actors were also given a comprehensive tutorial on trait adjectives and descriptions from the FFM literature as well as a general outline of the expected body language performances: General traits for extroverts are friendly, outgoing, social, and enthusiastic, prefer face to face communication, easily aroused, display leadership qualities, and trust others easily. General traits for introverts are serious, quiet, and private, often like to be alone, independent, reserved, steady, can appear unfriendly. The actors were also instructed to personality patterns in language use: extroverts use strong, confident words and phrasing and speak very fluidly (Dewaele & Furnham, 2000), use more verbs, adverbs and pronouns, language is less formal, use vocabulary

more loosely, prefer implicitness (Gill & Oberlander, 2004; Argamon, et al. 2005) speak more rapidly, loudly, with a higher pitch and with more pitch variation than introverts (for example Scherer, 1979). Whereas introverts might be more hesitant in speech and use less direct and confident phrasing (Dewaele & Furnham, 2000), prefer explicit language; use more nouns, adjectives, and prepositions (Gill & Oberlander, 2004;(Argamon, Dhawle, Koppel, & Pennebaker, 2005), and often speak more slowly, quieter, at a lower pitch and with less variation in the pitch than extroverts (for example Scherer, 1979). The differences in body language are: extroverts use more open, expansive gestures and may approach more readily, and the face is often more expressive (for example Mehrabian, 2007). With introverts, gestures are usually close to their body, with few open movements and introverts do not like to be too close to other people's personal space (avoid approaching); and their face is generally less expressive (for example Mehrabian, 2007).

#### **4.2.2. Body Language**

The actors were filmed using a digital camera positioned on a tripod as they performed the scripts in order that the natural body movements of each performance could be captured. The actors were given no coaching as how to portray an introvert or an extrovert apart from the description of body language at the top of each script (as shown above). This was to ensure that the movements were as natural and fluid as possible. The body movements were then categorised into extroverted and introverted movements and then copied into computer poses for the ECAs.

Close attention was paid to facial animation as it has been shown in the psychology and HCI literature that a more expressive face encourages more involvement in the

conversation, as well as more persuasiveness (for example Burgoon, Birk & Pfau, 1990; (Baylor & Kim, 2008). Facial animations were extracted and categorised, primarily in terms of the raising of eyebrows, gaze pattern, moving of the head and smiling. Especially with the extrovert there was more variation in pitch and therefore more raising of the eyebrows. It has been shown that individuals raise their eyebrows as they raise their pitch either as emphasis, surprise or another form of micro-expression (Albrecht et al., 2002). Head tilting was also included as an aspect of the personality portrayal (Mignault & Chaudhuri, 2003). The poses were then synchronised to the audio files (as detailed in Chapter 3) to create a cohesive audio-visual presentation. It was ensured that the lip-syncing was as accurate as possible as again this has an impact on the persuasiveness of the encounter (Baylor & Kim, 2008). This was conducted using an in-house application, coded in Java in which the audio files were converted into phonemes.

Gaze behaviour is one area that is gaining more and more interest as an important field in virtual agent research. Only now are researchers realising the importance of gaze behaviour in making a virtual agent more realistic, easy to interact with and engaging (for example Garau, Slater, Bee, & Sasse, 2001; Garau et al., 2003; Ishii & Nakano, 2008; Lance & Marsella, 2008). Here it was included as it is an important aspect of personality. For example introverts generally do not like to hold another person's gaze for any length of time. A set of gaze behaviours were implemented as part of the ECAs personality creation.

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

In their experiment session, the participant was presented with four scenarios, a male extrovert agent and a female extrovert agent, male introvert and a female introvert. There were eight possible versions altogether as participants experienced different hair colour for the introvert and extrovert versions. The 3D virtual banking agent was situated within a 3D virtual branch and offered basic transactions (balance enquiry and ordering a new chequebook) as well as information about the different variations of a mortgage and the basic mortgage application process. Participants completed three tasks in order that they would interact as much as possible with the agent. After each of the interactions the participants completed a usability questionnaire regarding their attitude towards the scenarios and the agents as well as an agent personality questionnaire. At the end of the session participants completed a NEO-FFI personality questionnaire to assess their own personality traits and they also completed the pecuniary questionnaire to assess their attitudes towards financial matters.

The research aimed to test the following hypotheses:

**H<sub>0A</sub>:** There will be no significant differences between the usability for each of the ECAs experienced.

**H<sub>1A</sub>:** There will be significant differences between the usability for each of the ECAs experienced.

---

**H<sub>0B</sub>:** There will be no significant correlations observed between the ECA personality portrayals and the participant's personality.

**H<sub>1B</sub>:** There will be significant correlations between the ECA personality portrayals and the participant's personality.

---

**H<sub>0C</sub>:** There will be no preference shown for one the ECAs personality portrayals.

**H<sub>1C</sub>:** There will be a preference shown for one of the ECAs personality portrayals.

---

---

**H<sub>0D</sub>:** There will be no significant correlations between participant's personality and their financial attitudes.

**H<sub>1D</sub>:** There will be significant correlations between participant's personality and their financial attitudes.

---

**H<sub>0E</sub>:** There will be no preference shown for ECA gender.

**H<sub>1E</sub>:** There will be a preference shown for ECA gender.

---

**H<sub>0F</sub>:** There will be no preference shown for the appearance of the ECAs.

**H<sub>1F</sub>:** There will be a preference shown for the appearance of the ECAs.

The dependent variables in the experiment were the responses to the individual statements in the usability questionnaire and attitudes towards the agents, the perceived agent personality, participant personality (NEO-FFI) and the comparisons between the overall satisfaction levels with the different agent experiences. The independent variables were the eight different treatments (two agent personalities, two genders and two different hair colours) as well as participant gender and age group. The experiment was a repeated-measures within-subject design and the order of the presentation of the four agents was balanced across participants.

A sample of 64 customers of the Case Bank was recruited for the experiment. Participants were given an honorarium of £30 as a thankyou 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 4.12), such that gender and age effects could be investigated. The cut-off point for the age groups was chosen because it is pertinent to personality change and stability as well as to economic behaviour patterns.



Participants	Male	Female	Total
Age 18 – 34	15	15	30
Age 35 and over	17	17	34
Total	32	32	64

**Table 4.12: Participants Gender by Age Group Analysis**

The procedure consisted of a set of clear stages. Participants were told that they would be experiencing four different versions of a 3D virtual banking agent and that they need to carry out three simple banking tasks in each of the interactions. Participants were seated in front of a large 800x450 (pixel ratio) plasma screen and approximately 4 feet away. The distance from the screen was judged to be the most comfortable and suitable, was kept constant throughout the experiment and had been tested on five colleagues. The large plasma screen was chosen instead of a desktop monitor screen because previous studies have shown that larger screens afford a greater sense of presence and greater effect of persuasion (for example Grayson & Coventry, 1998; Tan, Gergle, Scupelli, & Pausch, 2003). The distance from the screen was judged to be the most comfortable and was kept constant throughout. Participants were given a different persona to use for each of the scenarios in order that they perceived each interaction as separate entities. Once the first task was completed (a balance enquiry), the agent asks if there is anything else they can help with and the participant is instructed to request a new chequebook. Once the second task is complete the agent again asks if there is anything else they can help with and at this point the participant is instructed to ask about the different types of mortgages. Once the agent has presented the list of mortgages they ask the participants if they would like to proceed with the basic mortgage application process and the participant is instructed to respond with a “yes”. After a series of mortgage application questions the participant is told the appropriate mortgage amount (corresponding to their balance) that the case bank could offer them (see Appendix 1 for scripts).

Participants were told to observe the agents carefully as their opinions on the interactions were of prime importance. After each scenario participants were asked to complete a usability questionnaire relating to the scenario and a questionnaire to assess their perceptions of the agent’s personality. The questionnaire items were presented randomly via a networked laptop. An established usability questionnaire was used to assess the contributions to usability made by a set of key attributes (Love, Dutton, Foster, Jack, & Stentiford, 1994). It uses a 7-point scale on which participants indicate the extent to which they agree or disagree to statements that relate to each key usability attribute. The usability questionnaire employed in this experiment consists of 24 statements which allow 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 4.13)

<b>Usability Questionnaire Statements</b>	
<b>Cognitive</b>	I found interacting with this person confusing.
	I had to concentrate hard when interacting with this person.
	I got flustered when interacting with this person.
	I felt under stress while interacting with this person.
<b>Fluency</b>	I found it very frustrating when interacting with this person.
	I thought interacting with this person was complicated.
	I felt in control when interacting with this person.
	I thought this person was competent.
<b>Transparency</b>	I found it difficult to interact with his person.
	I thought this person spoke clearly.
	I understood the information I was given by this person.
<b>Quality</b>	I would be happy to interact with this person again
	I think the information supplied by this person is reliable.
	This person helped me feel engaged with the service.
	I thought that the service was efficient.
	I feel that this service needs a lot of improvement.
<b>Engagement</b>	I found this person friendly.
	I didn't like the voice of this person.
	I enjoyed interacting with this person.
	I thought this person was polite.
	I felt intimidated by this person.
	I would prefer to interact with a real person.
I found the appearance of this person distracting.	

**Table 4.13: Usability Questionnaire Summary**

The agent personality questionnaire items were 7-point Likert scale statements also presented in a randomised sequence via a laptop. The personality statements were based on the FFM and its descriptions relating specifically to the extroversion dimension. Adjective descriptions for an extrovert and an introvert were also included as many personality measurements based on the FFM employ this technique. Only statements relating to the extroversion dimension were included in the agent personality questionnaire as the agents were only assigned either an extrovert personality or an introvert personality (see Appendix 3 for agent personality questionnaire). In all questionnaires, statements were as balanced as possible regarding polarity (equal number of positively and negatively worded statements). After participants had experienced all four scenarios they were asked open-ended questions on their opinions regarding the interactions with each of the agents and asked to rate which they preferred overall as part of an exit interview. The ratings were recording via a 30cm ruler so that a numerical score could be placed on participants preferences (see Appendix 4 for exit interview). A short demographic questionnaire was administered at the end of the experiment (see Appendix 5 for fully formatted questionnaire).

The aim of the demographic questionnaire was to assess certain background characteristics thought to be pertinent in economic decisions. Items such as whether or not the participant had attended any type of higher education, how important four fundamental aspects of money; spending, saving, investing and giving. In an attempt to assess whether or not participants would be willing to use the ECA technology via a kiosk in a branch, a number of questions were asked regarding behaviour. (See Appendix 5).

### **4.3.1 Pecuniary Questionnaire Design**

The aim of the pecuniary questionnaire being developed as part of this research is to measure correlations between the responses to the questionnaire and the personality traits of a sample of the case banks customers. It takes a more psychographic approach as opposed to the more popular segmentation methodology which is largely based on demographic information that takes a one-dimensional structure concentrating on one variable at a time. A psychographic approach assesses basic personality characteristics, attitudes values and beliefs. Previous research has stressed the complex and multi-dimensional nature of the factors which could affect take-up and usage of financial services (Harrison, 1994). The pecuniary questionnaire has been divided into sections that focus on several different aspects of attitudes relating to money and finance. For example, it assessed a participant's attitudes towards saving and debt, as well as the temporal aspects of saving (for example whether they are forward thinking or just think for the present), their thinking and processing style and finally their attitude towards money itself. This could lead to further experiments that attempt to utilise any correlations between these responses and individuals' personalities in order to develop an ECA that will be personalised, and in turn aim to predict and/or influence customers' behaviour through their interaction with the ECA. In other words the pecuniary metric could allow for segmentation and targeting of customers financial attitudes, allowing for an ECA to provide tailored information about the most suitable products for that individual. By utilising the resources available to the Bank such as financial status and demographic information through which they would be able to infer an individual's position on the pecuniary scale, they would in turn be able to target specific attitudes through the tailored information provided by an ECA.

### 4.3.2 Saving and Debt

The pecuniary questionnaire created for this research (in the first instance) consists of an inventory of twenty 7-point Likert scale statements in which participants' rate to what extent they agree or disagree with each statement. The first group of statements in the pecuniary questionnaire are designed to assess individuals' attitudes towards the (general) concept of saving and debt. These were included because they will hopefully correlate with specific personality traits thereby indicating which types of people possess certain attitudes toward financial matters. This could in turn suggest who will be more (or less) likely to be susceptible to promotion or advertisements of certain financial products (through the use of an ECA). Although there are different forms of saving (Nyhus & Webley, 2001; Wärneryd, 1999), these statements apply to how an individual feels about saving in general because it is hypothesised that through the analysis of other sets of statements, some of these aspects will be addressed. The questions in this group were designed with previous research findings. Where for example it has been shown that people who held the attitude that being in debt meant that they were not in control of their finances, were less likely to save (Lunt & Livingstone, 1991).

The five statements in this group are:

- I think saving is a very sensible thing to do.
- I think it is important to save on a regular basis.
- I think people who can afford to save and choose not to are irresponsible.
- I think people who fall into debt are not managing their money properly.
- I think it is acceptable for people to be in debt these days.



### **4.3.3 Temporal Aspects**

A second group of statements relate to attitudes towards the temporal aspects of saving and borrowing (for example whether a person is forward thinking or prefers to think for the here and now). These statements were included to assess whether people consider it important to look to the future and act appropriately or, instead live for the here and now. This idea of temporality is fundamental to any attitude toward saving or debt. The definition of saving is, "*the difference between net worth at the end of the period and the net worth at the beginning of the period, which should equal the excess of income over consumption expenditure in the same period*" (Nyhus & Webley, 2001). Therefore people will differ in which period they choose and whether they believe planning for the future is important or not. This group also overlaps with the notion of whether people think it is important to have flexible or rigid plans.

The two statements in this group are:

- I think people shouldn't buy things on impulse.
- I think it is important for people to be aware of their financial position.

### **4.3.4 Information Processing Style**

The third group relates to participant's information processing style as this would seem to be inextricably linked to any sort of decision-making, including that of financial matters. Thinking and information processing can be divided into two different modes. The first is an intuitive, emotional, heuristic or experiential mode and the second is rational, analytical, objective, or logical mode (Epstein, Pacini, Denes-Raj, & Heier, 1996). The cognitive-experiential self theory proposes that these two modes work in parallel and are interactive (Epstein, 1998). Although some research on decision-

making and in particular financial decision-making has overlooked this theory somewhat, it would be wrong to consider economic and financial choices to only be rational (thus lacking the emotional processes). This theory also has implications for risk (seeking and aversion behaviour), which of course is a multi-dimensional concept (Zaleskiewicz, 2001). For example, people can plan such behaviour, or decide spontaneously (cognitive and experiential thinking styles respectively). The thinking style of an individual also affects what type of risk a person will take (if they are indeed a risk taker), for example an instrumental risk or a stimulating risk. The former accompanies a cognitive thinking style and is generally a risk of financial kind and the latter is usually taken as an adrenaline rush (for example extreme sports) and is associated with an expressive way of thinking. Such a distinction will therefore be analysed and included within the current questionnaire. The five statements in this group are:

- I believe it is important to think long and hard when making financial decisions.
- I believe people should think carefully about any financial advice they receive.
- I believe the risk of investing in stocks and shares is outweighed by the potential financial rewards.
- I think it is important to look around for the best deals when it comes to making financial decisions.
- I think it is important to go with gut feelings when making decisions about financial matters.

#### **4.3.5 Money Attitude Scale**

The fourth group of statements focuses on factors represented in the Money Attitude Scale (MAS) (Yamauchi & Templer, 1982), which is based on four factors, power-

prestige, retention-time, distrust, and anxiety. People who rate highly on the power-prestige factor tend to use money to impress and influence others and see it as a sign of success. The time-retention factor indicates that people feel the need to plan for the future, place great importance on preparation and accounting for their finances. Individuals who score highly on the distrust factor tend to be hesitant and suspicious. The anxiety factor relates to individuals who view money as a cause of anxiety, as well as a source of protection from anxiety. Previously this scale has only been tested with psychometric instruments such as the Machiavellianism scale (Mach IV), the Status-Concern scale (S-CS), the Paranoia subscale (*Pa*), (Yamauchi & Templer, 1982).

The eight statements in this group are:

- I believe that being wealthy is a sign of success.
- I believe you have to spend more to get the very best.
- I think it is important to put money aside for unexpected events.
- I think it is important for people to stick to a budget carefully.
- I believe that most banks take advantage of their customers.
- I think people should trust their bank to look out for their interests.
- I think it is unwise of people to spend money just to make themselves feel better.
- I think it is pointless to worry about money.

The pecuniary questionnaire was used to investigate the prediction that personality traits play an important role in financial and economic behaviour patterns as well as in possible consumption patterns. The first version of the metric used in this experiment is short (twenty items) thus allowing the opportunity of quick administration (See Appendix 6 for the full formatted pecuniary questionnaire and see Table 4.14 below for



summary). This therefore has the opportunity for the questionnaire to be administered also by post or email. In turn this would allow the Case Bank to analyse any correlations between people's financial information (held by the company), behaviour, personality (if possessed) and their attitudes; consequently allowing the company to attempt to influence their customers through personalisation of services that directly target their attitudes.

Table 4.15 presents a summary of the experimental design.

Pecuniary Questionnaire		
Main Concepts	Dimensions	Questionnaire Statements
Attitude	Save – Debt	I think saving is a very sensible thing to do.
		I think it is important to save on a regular basis.
		I think people who can afford to save and choose not to are irresponsible.
		I think people who fall into debt are not managing their money properly.
		I think it is acceptable for people to be in debt these days.
	Forward Thinking – Present	I think people should not buy on impulse.
		I think it is important for people to be aware of their financial position.
Thinking and Information Processing	Cognitive (Instrumental Risk) - Expressive (Stimulating Risk)	I believe it is important to think long and hard when making financial decisions.
		I believe people should think carefully about any financial advice they receive.
		I believe the risk of investing in stocks and shares is outweighed by the potential financial rewards.
		I think it is important to look around for the best deals when it comes to making financial decisions.
		I think it is important to go with gut feelings when making decisions about financial matters.
Money Attitude Scale Factors	Power	I think being wealthy is a sign of success.
		I believe you have to spend more to get the very best.
	Retention-Time	I think it is important to put money aside for unexpected events.
		I think it is important for people to stick to a budget.
	Distrust	I believe most banks take advantage of their customers.
		I think people should trust their bank to look after their interests.
	Anxiety	I think it is unwise of people to spend money just to make themselves feel better.
I think it is pointless to worry about money.		

**Table 4.14: Pecuniary Questionnaire Summary**

	<b>ECA: Preferences, personality and usability. Exp 1 Design Details</b>
<b>Experiment purpose:</b>	Experimental exploration of customer attitude and preference to 3D agents and their personality.
<b>Experiment hypotheses:</b>	<p>H<sub>1A</sub>: There will be significant differences between the usability for each of the agents</p> <p>H<sub>1B</sub>: There will be significant correlations between agent's personality and participant's personality</p> <p>H<sub>1C</sub>: There will be a preference shown for one of the personality portrayals</p> <p>H<sub>1D</sub>: There will be significant correlations between participants' personality and their financial attitudes</p> <p>H<sub>1E</sub>: There will be a preference shown for gender</p> <p>H<sub>1E</sub>: There will be significant differences between the satisfaction scores for the interaction between the different agents</p> <p>H<sub>1G</sub>: There will be a preference shown for the agents' appearance</p>
<b>Experiment design:</b>	8 possible versions of the agent, (2 for personality, 2 for gender, and 2 for appearance), each participant experiencing only 4, performing 3 tasks, in 4 cell, repeated measures, within-subjects design, and balanced exposure.
<b>Dependent variables:</b>	<p>Perceived usability and attitude toward agent</p> <p>Agent Personality</p> <p>Consumer Personality (NEO-FFI)</p> <p>Satisfaction of interaction rating data (30cm sliding scale) and Rank order (preference)</p> <p>Satisfaction with the agent rating data (30cm sliding scale) and Rank order (preference)</p>
<b>Other data:</b>	Demographic data. Exit questionnaire data. Pecuniary Questionnaire data.
<b>Independent variables:</b>	<p>Experiment - 8 treatments (2 personality, 2 gender, 2 appearance)</p> <p>Participant - Gender (2 genders, balanced), age group (2 groups, balanced)</p>
<b>Confounding variables:</b>	<p>Researcher bias (randomised)</p> <p>Experiment Room (randomised)</p> <p>Tasks (matched task sheets)</p>
<b>Cohort:</b>	<p>N = 64</p> <p>8 orders x 2 genders x 2 age groups = 32 x 2 = 64</p>
<b>Honorarium</b>	Personal cheque for £30
<b>Duration:</b>	90 minutes. Experiment to run over 4 weeks

**Table 4.15: Experiment Summary**

## 4.4 Experiment Results

### 4.4.1 Usability Questionnaire Results

#### Mean Usability Scores

The mean usability scores of the various ECA treatments are shown in Table 4.16.

ECA Personality Portrayal	Mean Usability Score
Extrovert Female (EF)	5.22
Extrovert Male (EM)	5.39
Introvert Female (IF)	4.87
Introvert Male (IM)	4.61
Overall Extrovert Portrayal	5.30
Overall Introvert Portrayal	4.74

**Table 4.16: Mean Usability Scores for the Four Different ECA Personality Portrayals**

The usability data were analysed by a series of repeated measure ANOVA<sup>9</sup> analyses. The Greenhouse-Geiser statistic was extracted to assess significance levels.

There was a highly significant effect of personality on the mean usability scores ( $p < 0.000$ ,  $F = 41.333$ ) (see Table 4.17). Pairwise comparisons (see Table 4.18) show the extrovert portrayals were rated significantly higher in terms of overall usability ( $M = 5.31$ ) on the 7-point response scale, indicating a good design in terms of usability, compared to the introvert portrayal ( $M = 4.73$ ).

---

<sup>9</sup> **ANOVA** - *analysis-of-variance*, a statistical model used to analyse data (usually categorical not continuous data). It determines the degree of difference or similarity between two or more groups of data. It is based on the comparison of the mean of a common component.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	16.851	1.000	16.851	30.751	.000
Personality * Gender	.652	1.000	.652	1.189	.284
Personality * Age Group	3.776	1.000	3.776	6.891	.013
Personality * Vord_cb	4.754	3.000	1.585	2.892	.051
Personality * Hair Colour	.808	1.000	.808	1.475	.233
Error (Personality)	17.535	32.000	.548		
Agent Gender	.152	1.000	.152	.357	.554
Agent Gender * Gender	6.96E-005	1.000	6.96E-005	.000	.990
Agent Gender * Age Group	.296	1.000	.296	.693	.411
Agent Gender * Vord_cb	1.366	3.000	.455	1.067	.377
Agent Gender * Hair Colour	.096	1.000	.096	.226	.638
Error (Agent Gender)	13.658	32.000	.427		
Personality * Agent Gender	2.849	1.000	2.849	6.858	.013
Error(Personality*Agent Gender)	13.295	32.000	.415		

**Table 4.17: Within Subjects Effects ANOVA for the Mean Usability Scores**

ECA Personality		Mean Difference	Std. Error	Sig. (a)
Extrovert (E)	Introvert (I)	0.572*	0.089	0.000
Introvert (I)	Extrovert (E)	-0.572*	0.089	0.000

Based on estimated marginal means

\* The mean difference is significant at the .05 level.

a Adjustment for multiple comparisons: Bonferroni.

**Table 4.18: Pairwise Comparisons for the ECA Personality Portrayals**

Table 4.17 also displays the other two within-subject interaction effects of Personality\*Age group ( $p=0.013$ ,  $F=6.891$ ) and Personality\*Agent Gender ( $p=0.013$ ,  $F=6.858$ ). The younger age group gave lower ratings for the introvert ECA portrayals ( $M=4.52$ ) than did the older group ( $M=5.01$ ), in terms overall usability. Both groups rated the extrovert similarly (<35 years  $M=5.31$ , >35 years  $M=5.29$ ). Overall, participants rated the introvert male as the least usable ( $M=4.63$ ) and the female extrovert as the most usable ( $M=5.38$ ).

There was one between-subjects effect of hair colour on the overall usability scores ( $p=0.02$ ,  $F=6.022$ ) (see Table 4.19). Participants rated the brown haired agents higher in terms of overall usability ( $M=5.20$ ) compared to the blonde haired agents ( $M=4.86$ ).

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	5984.092	1	5984.092	5261.593	.000
Gender	.441	1	.441	.388	.538
Age Group	3.144	1	3.144	2.764	.106
Vord_cb	.359	3	.120	.105	.956
Hair Colour	6.849	1	6.849	6.022	.020
Gender * Age Grp	.402	1	.402	.353	.556
Gender * Vord_cb	2.290	3	.763	.671	.576
Age Group * Vord_cb	3.000	3	1.000	.879	.462
Gender * Hair Colour	.285	1	.285	.251	.620
Age Group * Hair Colour	.612	1	.612	.538	.469
Vord_cb * Hair Colour	2.664	3	.888	.781	.513
Error	36.394	32	1.137		

**Table 4.19: Between-Subjects Effects ANOVA for the Mean Usability Scores**

Overall participants rated the extroverted agents as having higher usability, compared to the introverted agents (see Chart 1 for graphical display of individual attributes). From Chart 1 it can be seen that on all attributes except those of “Understood Information”, “Intimidating” and “Appearance Distracting” the extrovert portrayal scores significantly higher ( $p < 0.005$ ) than the introvert portrayal. In particular the extrovert portrayals were rated considerably higher ( $p < 0.001$ ) than the introvert portrayals on the attributes “frustration”, “difficult”, “spoke clearly” “interact again”, “friendly”, “don’t like voice” and “enjoy interaction”.

There was a significant within-subject interaction of agent gender\*personality ( $p = 0.011$ ,  $F = 6.932$ ), however subsequent analysis and pairwise comparisons revealed that there was no significant difference between the male and female versions of the extrovert portrayal. In other words participants did not rate the extrovert male ( $M = 5.39$ ) significantly higher than the extrovert female ( $M = 5.22$ ), although the overall mean does appear higher.

Chart 1: Overall Usability Scores for Extrovert Vs Introvert

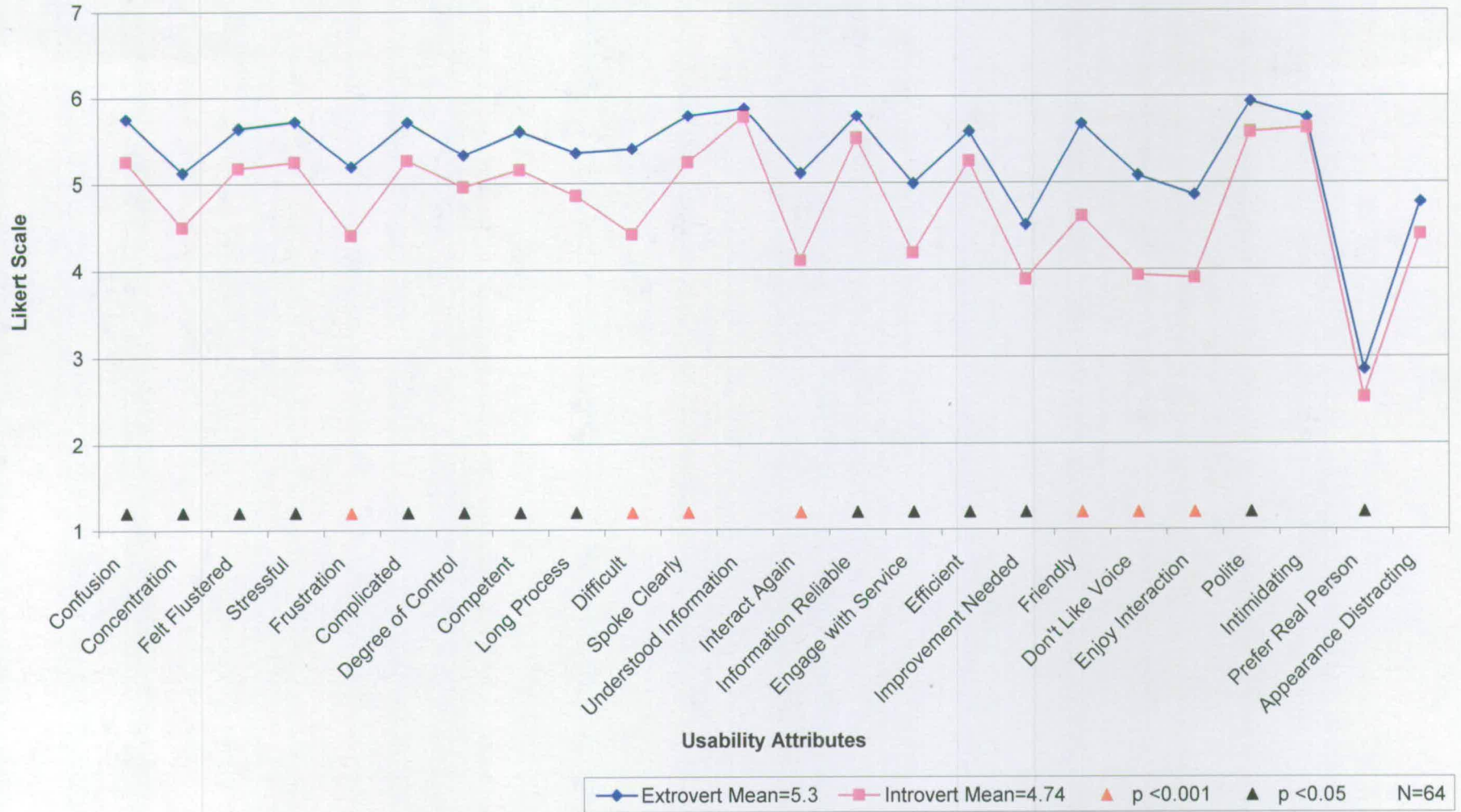


Chart 2: Usability Scores for Extrovert Female Vs Introvert Female

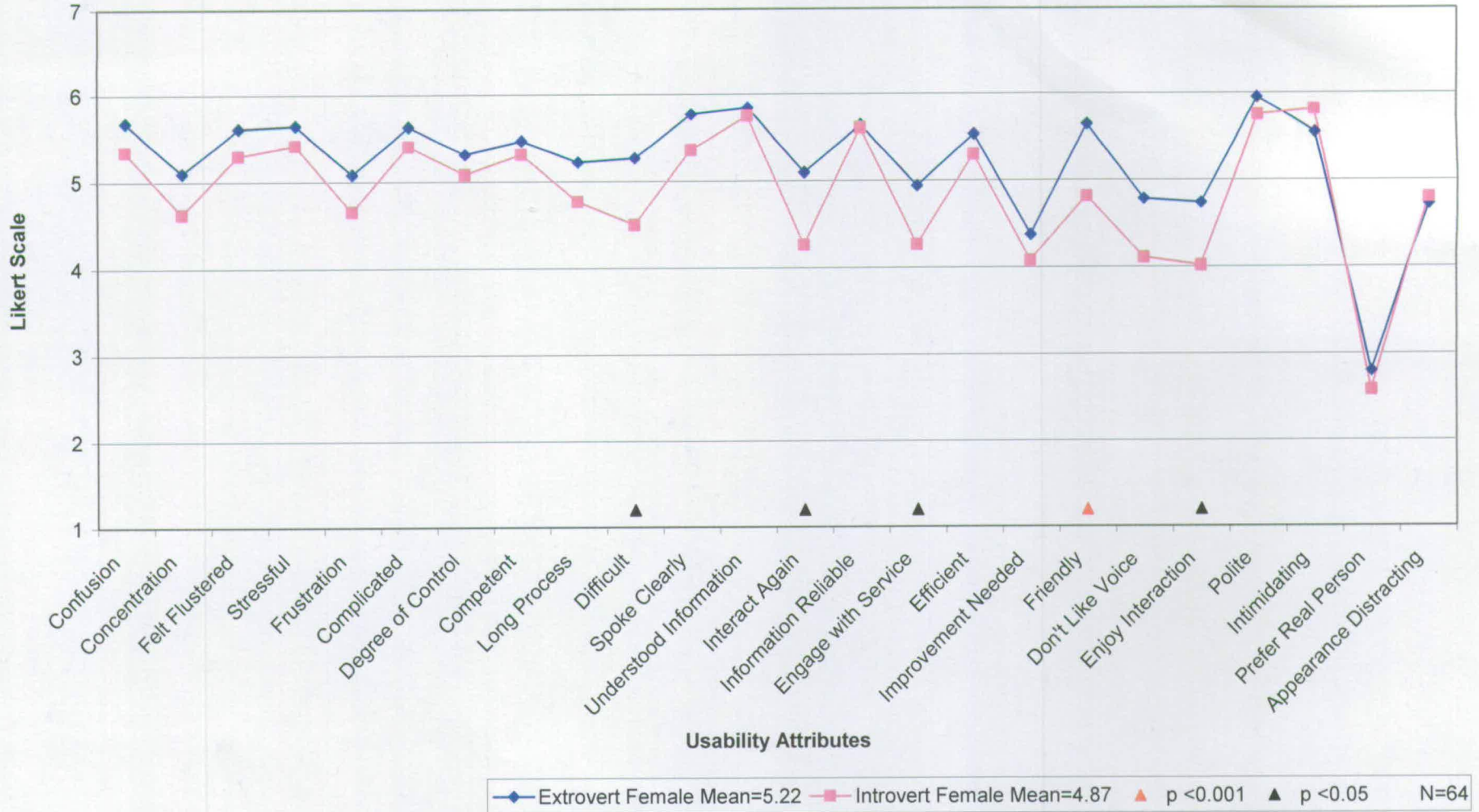




Chart 3: Usability Scores for Extrovert Female Vs Introvert Male



Chart 4: Usability Scores for Extrovert Male Vs Introvert Female

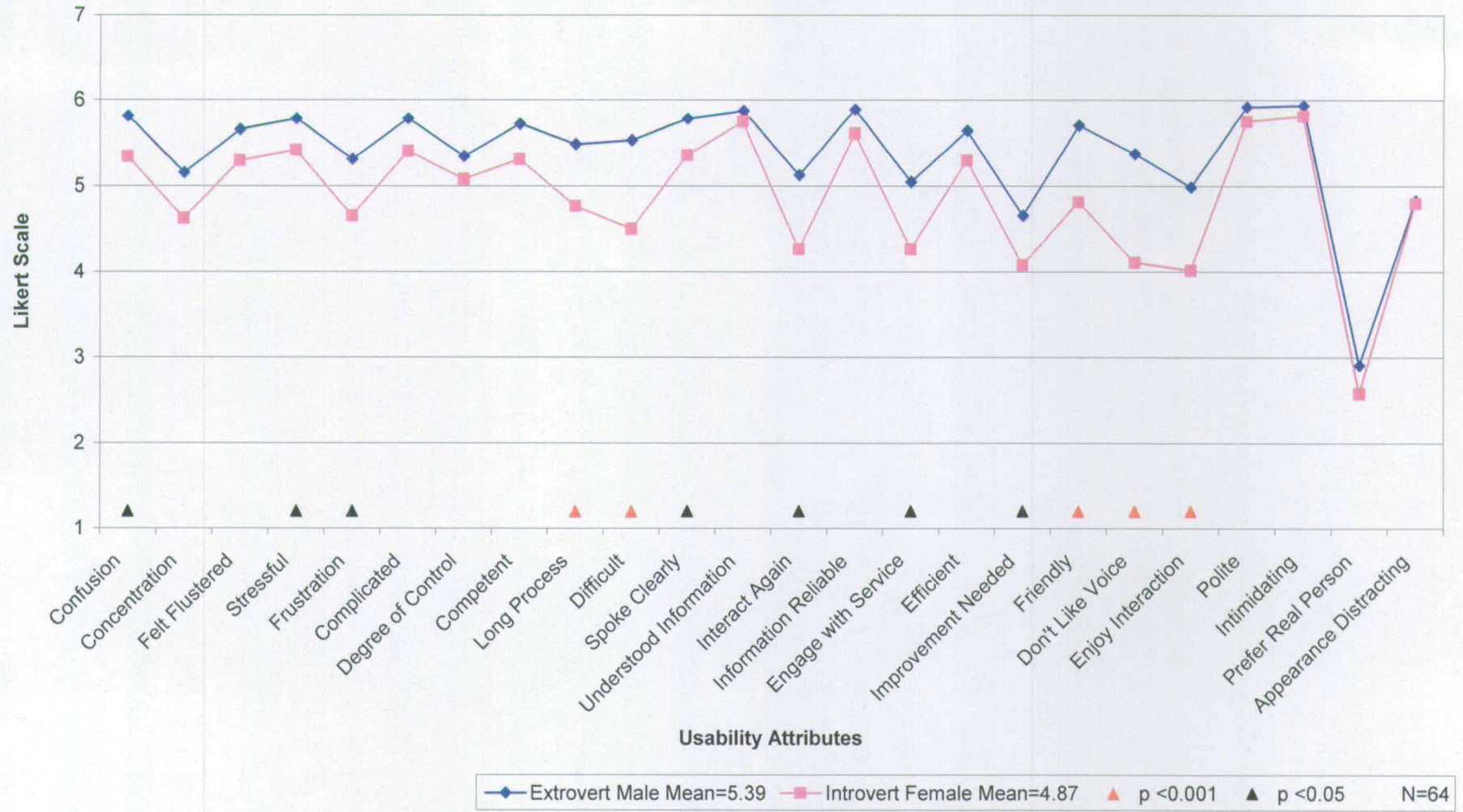


Chart 5: Usability Scores for Extrovert Male Vs Introvert Male

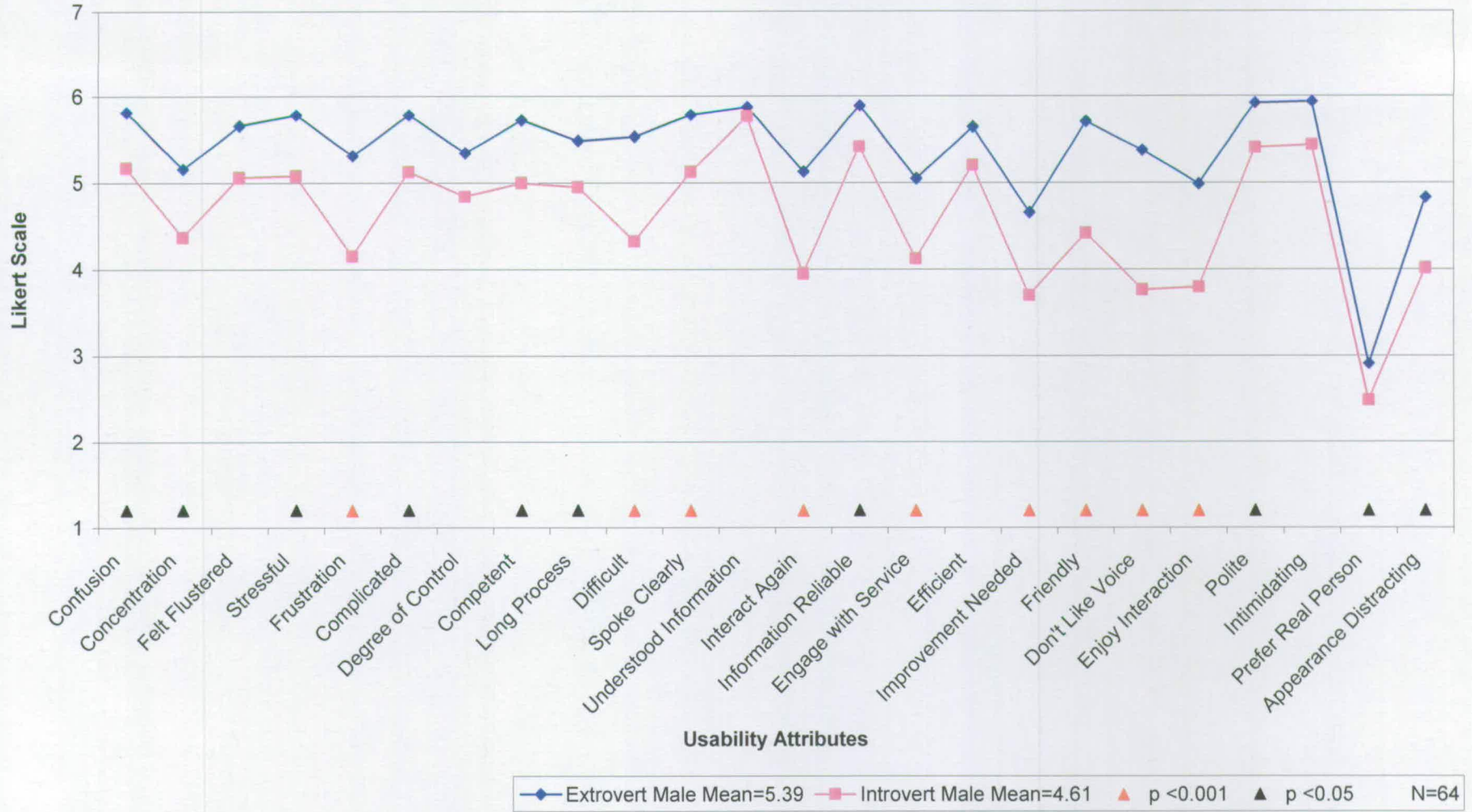


Chart 6: Usability Scores for Introvert Female Vs Introvert Male

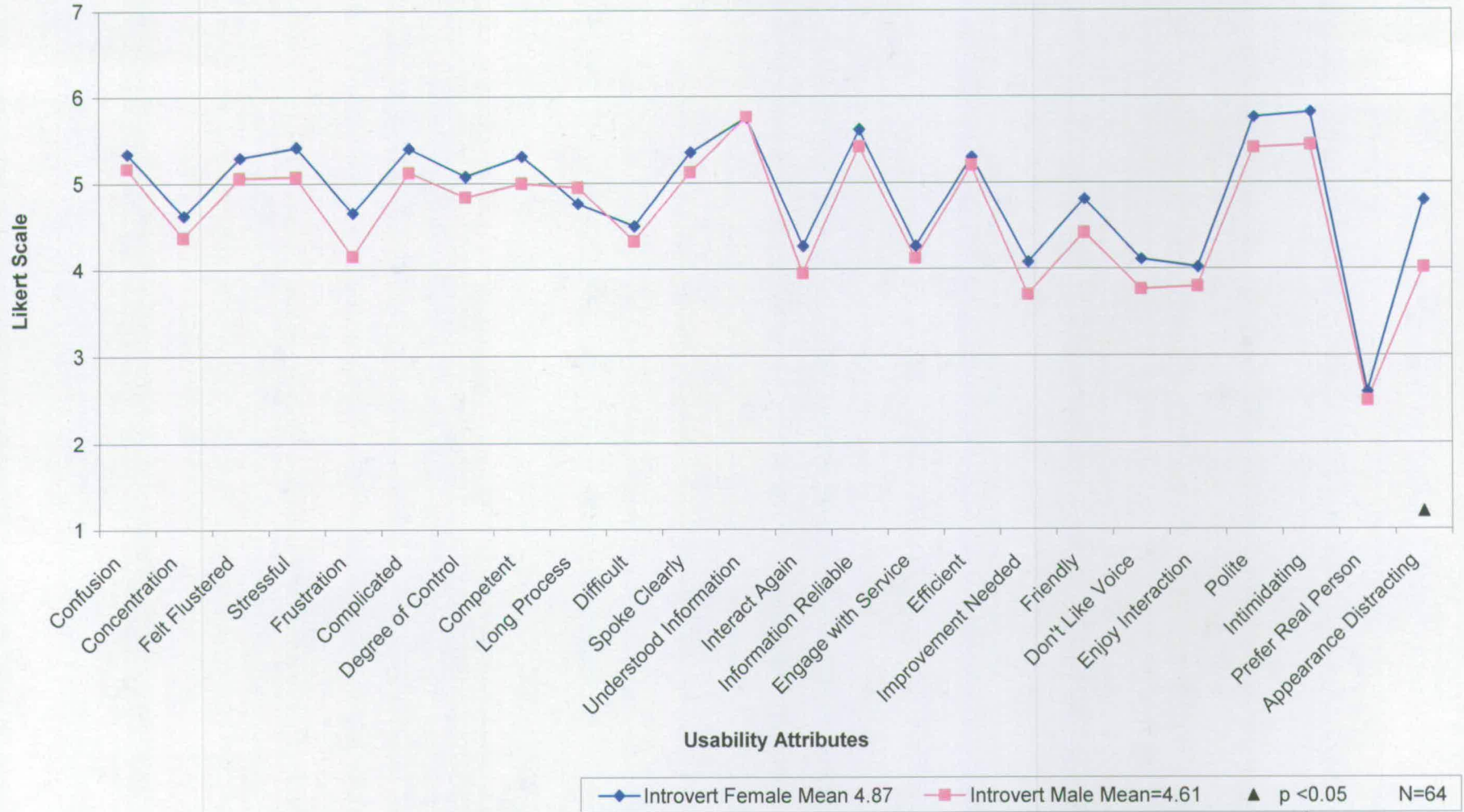
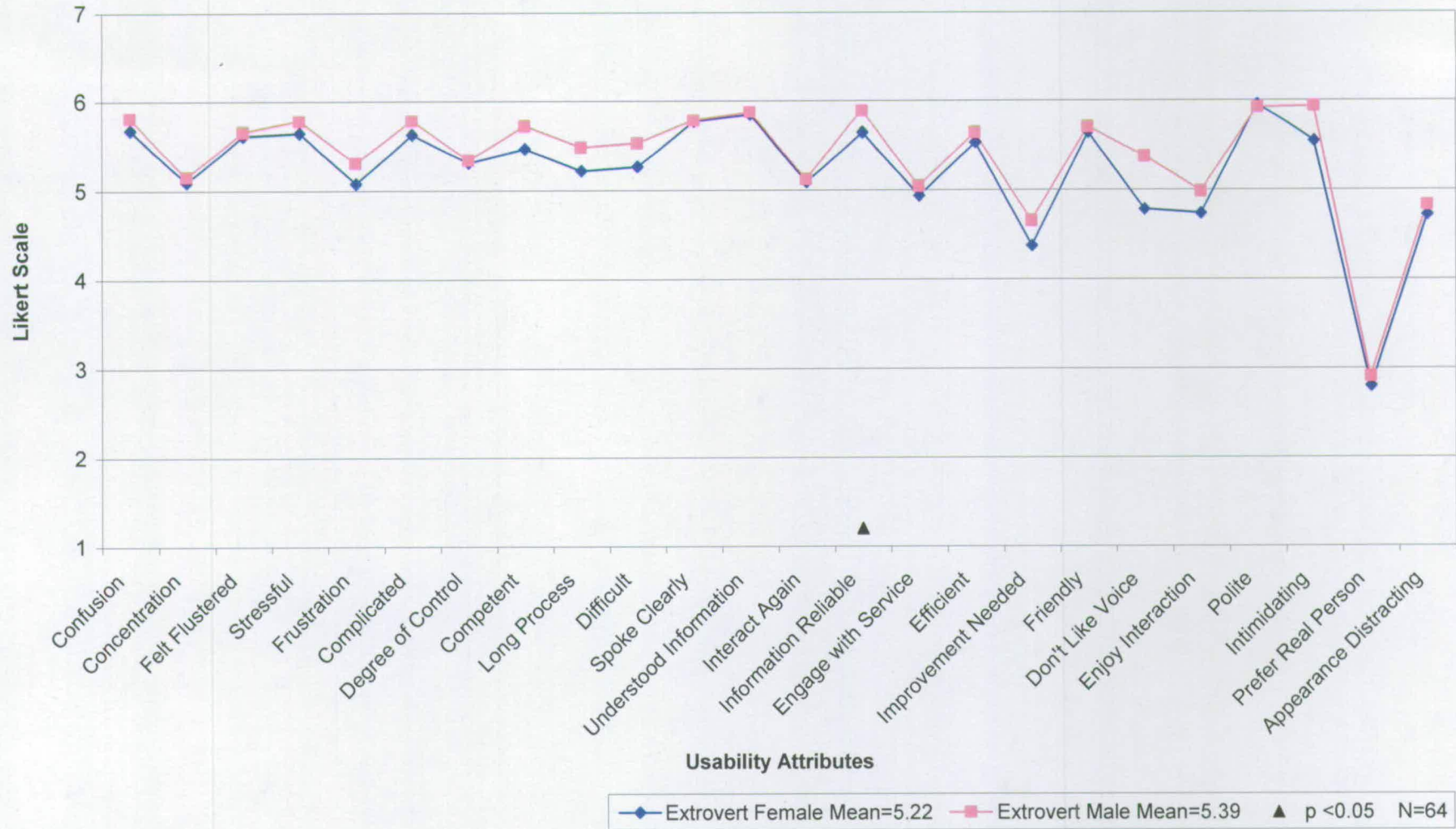


Chart 7: Usability Scores for Extrovert Female Vs Extrovert Male



There was statistically significant within-subject effect of personality\*age group interaction on the mean usability score ( $p=0.005$ ,  $F=8.665$ ). In general the older participants gave higher ratings for the introverted ECA ( $M=4.98$ ) on the usability response scale compared to the younger age group ( $M=4.49$ ). Both age groups rated the extrovert agents similarly ( $<35\text{years } M=5.32$ ,  $>35\text{years } M=5.29$ ).

In each of the four versions there were notably low scores for the usability attribute “prefer human” (extroverted female  $M=2.87$ , extroverted male  $M=2.95$ , introverted female  $M=2.63$ , and introverted male  $M=2.53$ ).

Charts 2 through to 7 compare the mean usability scores of individual attribute scores for all four agent versions (extrovert female, extrovert male, introvert female and introvert male) against each other. It can be seen that the most significant differences occur between the extrovert female and the introvert male (Chart 3) and the extrovert male and the introvert female (Chart 4), but the most significant differences by far can be seen between the male (extrovert male and introvert) versions (Chart 5). The female (extrovert and introvert) versions did not differ quite as much in comparison (Chart 2), the only highly significant difference ( $p<0.05$ ) occurred on the attribute “friendly”. In other words the only significant difference between the female versions was participants felt the extrovert portrayal was friendlier than the introvert portrayal. Chart 7 displays the mean usability scores for both the extrovert agents (male and female). The only significant difference between these agent portrayals occurred on the attribute “information reliable” ( $p<0.005$ ).

Chart 3 displays the mean usability scores for the extrovert female and introvert male ECAs. It can be seen from this that the most highly significant differences occur on the attributes “interact again”, “friendly” and “enjoy interaction” ( $p < 0.001$ ). Participants felt that the portrayal of the extrovert female was much friendlier thus making them enjoy the interaction more and wanting to interact with that ECA again. See Section 4.5 for more in-depth attribute analysis.

Chart 4 displays the mean usability scores for the extrovert male and introvert female ECAs. It is clear from the chart that participants felt that the extrovert male was better in terms of usability than the female introvert, as it was rated significantly higher on the attributes “long process”, “difficult”, “friendly”, “didn’t like voice” and “enjoy interaction” ( $p < 0.001$ ). Interestingly participants felt that the process took longer with the introvert female compared to the extrovert male, as well as finding the interaction less enjoyable and more difficult. Participants also preferred the voice of the extrovert male. For further analysis of the attributes see Section 4.5.

Chart 5 displays the mean usability scores for the extrovert male and introvert male ECAs. It is clear that participants felt that the extrovert male should be scored significantly higher in terms of usability than the introvert male. Participants felt significantly more frustrated with the introvert male, felt he was less friendly, spoke less clearly and in general didn’t like his voice ( $p < 0.001$ ) compared to that of the extrovert male. Participants also felt the process took too long, was more difficult, needed more improvement and that the information provided was less reliable ( $p < 0.001$ ) and were thus less likely to want to interact with him again compared to the extrovert male. For more in-depth attribute analysis see Section 4.5.

Chart 6 displays the mean usability scores for the introvert female and introvert male ECAs. There is only one significant difference between the introvert portrayals and that occurred on the attribute “appearance distracting” ( $p < 0.005$ ). Participants felt that the introvert male’s appearance was more distracting than that of the introvert female.

Chart 7 displays the mean usability scores for the extrovert female and introvert male ECAs. Similar to Chart 6, Chart 7 reveals only one significant difference between the extrovert portrayals on the attribute “information reliable” ( $p < 0.005$ ). Participants felt that the extrovert female provided slightly less reliable information than the extrovert male.



## **4.4.2 Individual Attribute Analysis**

### **Usability Attribute – “Confusion”**

There is a significant difference between the different ECA personalities for the usability attribute “confusion” ( $p=0.001$ ,  $F=13.282$ ) (see Table 4.20 in Appendix 7). The extroverted agents ( $M=5.75$ ) were rated less confusing than the introverted agents ( $M= 5.25$ ).

There was no significant between-subjects effect of version order, age group or gender on the usability attribute “confusion”.

### **Usability Attribute – “Concentration”**

There is a significant within-subjects difference between the different ECA personalities for the usability attribute “concentration” ( $p=0.002$ ,  $F=11.901$ ) (see Table 4.21 in Appendix 7). The introverted agents ( $M=4.55$ ) needed more concentration than the extroverted agents ( $M= 5.1$ ).

There was no significant between-subjects effect of version order, age group or gender on the usability attribute “concentration”.

### **Usability Attribute – “Flustered”**

There is a significant difference between the different agent personalities for the usability attribute “flustered” ( $p=0.014$ ,  $F=6.73$ ) (see Table 4.22 in Appendix 7). Participants did not feel particularly flustered during any of the interactions with the

agents however participants did feel more flustered with the introverted agents (M=5.2) than the extroverted agents (M=5.63).

There was no significant between-subjects effect of version order, age group or gender on the usability attribute “flustered”.

#### **Usability Attribute – “Stress”**

There is a significant difference between the different agent personalities for the usability attribute “stress” ( $p=0.001$ ,  $F=14.115$ ) (see Table 4.23 in Appendix 7). Participants did not feel particularly stressed during any of the interactions with the agents however participants did find the experience with the introverted agents more stressful (M=5.26) than with extroverted agents (M=5.71).

There was no significant between-subjects effect of version order, age group or gender on the usability attribute “stress”.

#### **Usability Attribute – “Frustration”**

There is a significant difference between the different agent personalities for the usability attribute “frustration” ( $p<0.000$ ,  $F=17.049$ ) (see Table 4.24 in Appendix 7). Participants did not feel particularly frustrated during any of the interactions with the agents however participants did feel more frustrated with the introverted agents (M=4.42) than with the extroverted agents (M=5.21).

There is also a significant within-subject effect of the personality\*age group interaction ( $p=0.001$ ,  $F=13.426$ ) (see Table 4.24 in Appendix 7). Younger participants rated the

interactions with the agents as more frustrating, in particular with the introverted agent (M=3.8) than the older participants (M=5.04).

There is also a significant within-subject effect of the personality\*agent gender interaction ( $p=0.022$ ,  $F=5.780$ ) (see Table 4.24 in Appendix 7). Participants felt the most frustrated with the introverted male agent (M=4.15) and the least frustrated with the extroverted male agent (M=5.33). Participants scored the female agent fairly similar on this attribute (extrovert M=5.08, introvert M= 4.69).

There were two between-subject effects on the usability attribute “frustration”, age group ( $p=0.04$ ,  $F=4.442$ ) and hair colour ( $p=0.015$ ,  $F=6.648$ ) (see Table 4.25 in Appendix 7). Younger participants found the interactions with the agents in general more frustrating (M=4.54) than the older participants (M=5.08). The unexpected effect of hair colour can be seen through participants who experienced the blonde extroverted agent and brown haired introvert being more frustrated (M=5.08) than the participants who experienced the brown haired extrovert and the blonde haired introvert (M=4.55).

### **Usability Attribute – “Complication”**

There is a significant difference between the different agent personality portrayals for the usability attribute “complication” ( $p=0.002$ ,  $F=10.850$ ) (see Table 4.26 in Appendix 7). Participants did not feel that any of the interactions with the agents were particularly complicated, however participants did feel the interactions with the introverted agents (M=5.27) were more complicated than with the extroverted agents (M=5.69).

There was no significant between-subjects effect of version order, age group or gender on the usability attribute “complication”.

### **Usability Attribute – “In Control”**

There is a significant difference between the different agent personalities for the usability attribute “in control” ( $p=0.028$ ,  $F=5.313$ ) (see Table 4.27 in Appendix 7). Participants did not feel particularly out of control during any of the interactions with the agents, however participants did feel the most out of control during the interaction with the introverted agents ( $M=5.01$ ) compared to the extroverted agents ( $M=5.33$ ).

There was no significant between-subjects effect of version order, age group or gender on the usability attribute “In Control”.

### **Usability Attribute – “Competency”**

There is a significant difference between the different agent personalities for the usability attribute “competency” ( $p=0.015$ ,  $F=6.642$ ) (see Table 4.28 in Appendix 7). Participants did not feel that any of the agents were particularly incompetent, however participants did feel that the most incompetent agents were the introverted agents ( $M=5.17$ ) compared to the extroverted agents ( $M=5.59$ ).

There is also a significant effect of the personality\*agent gender interaction on the usability attribute “competency” ( $p=0.016$ ,  $F=6.532$ ) (see Table 4.28 in Appendix 7). Participants rated both the male and female introverted agents less competent ( $M=5.02$ ,  $M=5.33$ , respectively) than both the male and female extroverted agents ( $M=5.72$ ,  $M=5.45$ , respectively).

There was no significant between-subjects effect on the usability attribute “competency”.

### **Usability Attribute – “Speed”**

There is a significant difference between the different agent personalities for the usability attribute “speed” ( $p=0.003$ ,  $F=10.735$ ) (see Table 4.29 in Appendix 7). Participants did not feel in general that any of the interactions with the agents took too long, however participants did feel that the introverted agents ( $M=4.84$ ) agents took longer than the extroverted agents ( $M=5.32$ ).

There is also a significant between-subject effect of age group on the usability attribute “speed” ( $p=0.014$ ,  $F=6.802$ ) (see Table 4.30 in Appendix 7). Pairwise comparisons reveal that younger participants felt that the interactions with the agents took too long (>35years,  $M=4.74$ ), compared to the older group (>35years,  $M=5.42$ ). There was also a surprising significant between-subject effect of hair colour on the attribute “speed” ( $p=0.039$ ,  $F=4.631$ ). Participants felt that the interaction with the blonde haired extrovert and brown haired introverts took more time ( $M=5.36$ ) than participants who experienced brown haired extroverts and blonde haired introverts ( $M=4.79$ ).

### **Usability Attribute – “Ease of Use”**

There is a significant difference between the different agent personalities for the usability attribute “ease of use” ( $p<0.000$ ,  $F=24.259$ ) (see Table 4.31 in Appendix 7). Participants did not feel in general that any one of the agents were difficult to interact with, however participants did feel that the extroverted agents ( $M=5.41$ ) was easier to interact with than the introverted agents ( $M=4.45$ ).

There was no significant between-subjects effect for the usability attribute “ease of use”.

### **Usability Attribute – “Voice Clarity”**

There is a significant difference between the different agent personalities for the usability attribute “voice clarity” ( $p < 0.000$ ,  $F = 16.247$ ) (see Table 4.32 in Appendix 7). Participants in general felt that all the agents spoke clearly, however participants did feel that the extroverted agents ( $M = 5.75$ ) spoke clearer than the introverted agents ( $M = 5.24$ ).

There was also a significant interaction effect of agent gender\*version order ( $p = 0.002$ ,  $F = 6.090$ ) on the usability attribute “voice clarity” (see Table 4.32 in Appendix 7). Pairwise comparisons show that participants who experienced the first version order (female, male, female, male) rated the female agent’s voice as the clearest ( $M = 5.79$ ). However participants who experienced the second version order (male, male, female, female) rated the male’s voice as the clearest ( $M = 5.76$ ). Participants who experienced the third version order rated the male agent’s voice as the most unclear ( $M = 4.81$ ). This was the lowest score for the male’s voice compared to any of the other version orders ( $M = 5.43$ ,  $M = 5.79$ ,  $M = 5.64$ ). This interaction however does not explain much in terms of why participants may have rated this attribute as it does not consider the personality of the agents.

There were no significant between subject effects on the usability attribute “voice clarity”.

### **Usability Attribute – “Understood Information”**

There were no significant within-subject effects on the usability attribute “understood information”. Participants understood the information from each of the interactions with the agents as fairly high; extroverted female (M=5.84), extroverted male (M=5.93), introverted female (M=5.68), and introverted male (M=5.79).

There no between-subject effects on the usability attribute “understood information”.

### **Usability Attribute – “Use again”**

There were three significant within-subject effects on the usability attribute “use again”. Personality ( $p < 0.000$ ,  $F = 28.003$ ), the interaction between personality\*age group ( $p = 0.018$ ,  $F = 6.245$ ), and personality\*version order ( $p = 0.003$ ,  $F = 5.765$ ) (see Table 4.33 in Appendix 7). Participants in general said they would be happy to interact with the agents again, however participants felt happier to interact with the extroverted agents (M=5.12) again in comparison to the introverted agents (M=4.18).

Although both age groups would be less happy to interact with the introverted agents again, the younger participant gave a lower response (M=3.66) than the older participants (M=4.7).

Participants who experienced the second version order (extrovert, introvert, extrovert, introvert) rated the introverted agent as the agent they would least likely want to interact with again (M=3.53). These participants (who experienced the second version order) also were more inclined to want to interact with the extroverted agent again (M=5.46) than any of the other participants.

There was also a between-subject effect of age group on the usability attribute “use again” ( $p=0.021$ ,  $F=5.847$ ) (see Table 4.34 in Appendix 7). Older participants said they were generally more likely to use the service again ( $M=4.95$ ) compared to the younger participants ( $M=4.35$ ).

### **Usability Attribute – “Reliability”**

There is a significant within-subject effect of personality on the usability attribute “reliability” ( $p=0.020$ ,  $F=5.962$ ) (see Table 4.35 in Appendix 7). Participants in general felt that all the information supplied by the agents was reliable, however participants did feel the extroverted agents ( $M=5.74$ ) provided more reliable information than the introverted agents ( $M=5.51$ ). This attribute in particular is important as one of the aims in investigating ECA technology is so that an ideal design can be developed which can in turn motivate and persuade customers through relational strategies such as trust and personality similarity.

There was a second within-subject effect of personality\*agent gender interaction ( $p=0.003$ ,  $F=10.251$ ) (see Table 4.35 in Appendix 7). Participants scored the information from the extroverted male agent as the most reliable ( $M=5.9$ ) and information from the introverted male agent as the least ( $M=5.41$ ). From this it is clear in terms of reliability of information provided (which relates to trust) that the male extrovert ECA is the most favorable design.

There were no significant between-subject effects for the usability attribute “reliability”.



### **Usability Attribute – “Engaged”**

There is a significant within-subject effect of personality on the usability attribute “engaged” ( $p=0.001$ ,  $F=14.804$ ) (see Table 4.36 in Appendix 7). Participants in general felt that all the agents helped them feel engaged with the service, however participants did feel extroverted agents ( $M=4.99$ ) helped them feel more engaged with the service than the introverted agents ( $M=4.23$ ).

There was also a significant within-subject interaction of personality\*age group on the usability attribute “engage” ( $p=0.09$ ,  $F=7.616$ ) (see Table 4.36 in Appendix 7). The younger age group felt more strongly that the introverted agents did not help them feel engaged with the service ( $M=3.76$ ), than the older group ( $M=4.71$ ). Both the age groups felt that the extroverted agents helped them feel engaged with the service (<35years  $M=5.05$ , >35years  $M=4.72$ ).

There was one significant between-subject effect of hair colour on the usability attribute “engaged” ( $p=0.025$ ,  $F=5.513$ ) (see Table 4.37 in Appendix 7). Participants felt slightly more engaged with the service when they experienced the blonde haired agent ( $M=4.89$ ) compared to the brown haired agent ( $M=4.33$ ).

### **Usability Attribute – “Efficient”**

There is a significant within-subject effect of personality on the usability attribute “efficient” ( $p=0.022$ ,  $F=5.821$ ) (see Table 4.38 in Appendix 7). Participants in general felt that all the agents were efficient. Participants felt that overall the extroverted agents ( $M=5.57$ ) were more efficient than the introverted agents ( $M=5.25$ ).

There was also a significant within-subject interaction of personality\*age group on the usability attribute “efficient” ( $p=0.010$ ,  $F=7.507$ ) (see Table 4.38 in Appendix 7). The younger age group felt the introverted agent were less efficient ( $M=4.87$ ) than the older group ( $M=5.65$ ), but felt very similar for the extroverted agents (<35years  $M=5.53$ , >35years  $M=5.6$ ).

There was a significant interaction effect of personality\*version order for the usability attribute “efficient” ( $p=0.037$ ,  $F=3.507$ ) (see Table 4.38 in Appendix 7). The main result from inspecting the pairwise comparisons is that the participants who experienced the second version order scored the two personality traits the most differently. Extrovert agents scored  $M=5.78$  and the introvert agents  $M=4.91$ . However overall the different personalities were rated similarly, for example, most felt that they were slightly efficient.

There was a significant between-subject effect of age group on the usability attribute “efficient” ( $p=0.015$ ,  $F=6.397$ ) (see Table 4.39 in Appendix 7). Overall the younger age group felt that the introverted agents were less efficient ( $M=5.2$ ) than the older group ( $M=5.63$ ).

#### **Usability Attribute – “Needs improvement”**

There is a significant within-subject effect of personality on the usability attribute “needs improvement” ( $p=0.001$ ,  $F=13.550$ ) (see Table 4.40 in Appendix 7). Participants in general felt fairly neutral whether the service needed improvement, however participants felt that the services in which they experienced one of the extroverted

agents needed less improvement ( $M=4.53$ ) than the services with the introverted agents ( $M=3.9$ ).

There was also a significant interaction effect of personality\*age group on the usability attribute “needs improvement” ( $p=0.021$ ,  $F=5.873$ ) (see Table 4.40 in Appendix 7). The younger age group felt that the services with the introverted agents needed more improvement ( $M=3.42$ ) than the older age group ( $M=4.39$ ).

There was also a significant interaction effect of personality\*version order on the usability attribute “needs improvement” ( $p=0.018$ ,  $F=3.851$ ) (see Table 4.40 in Appendix 7). Participants who experienced the introverted male last felt that that service needed the most improvement ( $M=3.62$ ). Participants who experienced the introverted female last felt that that service needed the most improvement ( $M=3.07$ ) compared to those who experienced it first ( $M=3.89$ ). Participants who experienced the extroverted male third rated that service as needing the most improvement ( $M=3.92$ ).

There is an interaction effect of personality\*agent gender on the usability attribute “needs improvement” ( $p=0.002$ ,  $F=11.322$ ). Participants scored the Introverted male as the needing the most improvement ( $M=3.68$ ) and scored the rest of the agents neutral.

There was one significant between-subject effect for the usability attribute “needs improvement” of hair colour ( $p=0.008$ ,  $F=8.062$ ) (see Table 4.41 in Appendix 7). Participants felt that the agent with the blonde hair needed more improvement ( $M=3.77$ ) compared to the brown haired agent ( $M=4.66$ ). Further investigation of the exit interview comments showed that the blonde hair looked “unnatural”.

### **Usability Attribute – “Friendly”**

There is a significant within-subject effect of personality on the usability attribute “friendly” ( $p < 0.000$ ,  $F = 36.370$ ) (see Table 4.42 in Appendix 7). Participants in general felt all the agents were friendly, however participants did feel that the extroverted agents were friendlier ( $M = 5.69$ ) than the introverted agents ( $M = 4.67$ ).

There was also a significant interaction effect of personality\*age group on the usability attribute “friendly” ( $p = 0.028$ ,  $F = 5.325$ ) (see Table 4.42 in Appendix 7). The younger age group felt that the introverted agents were less friendly ( $M = 4.4$ ) than the older age group ( $M = 4.93$ ). The younger age group also felt that the extroverted agents were friendlier ( $M = 5.82$ ) than the older participants ( $M = 5.56$ ).

There was also a significant interaction effect of personality\*version order on the usability attribute “friendly” ( $p = 0.022$ ,  $F = 3.672$ ) (see Table 4.42 in Appendix 7). Participants who experienced the first version order (extrovert, extrovert, introvert, introvert) felt that the extroverted agent was the friendliest agent ( $M = 5.81$ ) compared to the rest of the participants. Participants who experienced the second version order (extrovert, introvert, extrovert, introvert) felt that the introverted agent was the least friendly agent ( $M = 3.48$ ) compared to those who experienced a different version order ( $M = 5.12$ ,  $M = 4.74$ ,  $M = 5.09$ ).

The final interaction effect was personality\*agent gender ( $p = 0.044$ ,  $F = 4.38$ ) on the usability attribute friendly (see Table 4.42 in Appendix 7). Participants scored all agents

above neutral on this attribute. The female extrovert agent was rated as the most friendly ( $M=5.74$ ) and the male introverted agent as the least friendly ( $M=4.49$ ).

There was one significant between-subject effect of version order on the usability attribute “friendly” ( $p=0.021$ ,  $F=3.710$ ) (see Table 4.43 in Appendix 7). Participants who experienced the second version order (extroverted male, introverted male, extroverted female, introverted female) rated the agents overall the least friendly agents ( $M=4.75$ ). Participants who experienced the first version order (extroverted female, extroverted male, introverted female, introverted male) rated the agents overall the friendliest ( $M=5.46$ ).

#### **Usability Attribute – “Liked Voice”**

There is a significant within-subject effect of personality on the usability attribute “liked voice” ( $p<0.000$ ,  $F=32.693$ ) (see Table 4.44 in Appendix 7). Participants in general liked all the agents’ voices, apart from the introverted male’s voice. Participants preferred the extroverted agents voice ( $M=4.93$ ) to the introverted agents voice ( $M=3.97$ ).

There was also a significant within-subject interaction of personality\*agent gender on the usability attribute “liked voice” ( $p =0.007$ ,  $F=8.405$ ) (see Table 4.44 in Appendix 7). Participants preferred the voice of the extroverted male agent the best ( $M=5.36$ ) compared to the introverted male agents voice ( $M=3.78$ ). The female agents voices were rated similarly (extrovert  $M=4.7$ , introvert  $M=4.16$ ).

There were no significant between-subject effects on the usability attribute “liked voice”.

### **Usability Attribute – “Enjoyment”**

There is a significant within-subject effect of personality on the usability attribute “enjoyment” ( $p < 0.000$ ,  $F = 33.824$ ) (see Table 4.45 in Appendix 7). Participants did enjoy the interaction with the extroverted agents ( $M = 4.86$ ) more, than the interactions with the introverted agents ( $M = 3.97$ ).

There was also a significant interaction effect of personality\*age group on the usability attribute “enjoyment” ( $p = 0.003$ ,  $F = 10.660$ ) (see Table 4.45 in Appendix 7). The younger age group enjoyed the introverted agents ( $M = 3.46$ ) less than the older age group ( $M = 4.49$ ). Both age groups enjoyed the interactions with the extroverted agents about the same amount ( $< 35$  years  $M = 4.85$ ,  $> 35$  years  $M = 4.89$ ).

There was also a significant interaction effect of personality\*version order on the usability attribute “enjoyment” ( $p = 0.003$ ,  $F = 5.840$ ) (see Table 4.45 in Appendix 7). Participants who experienced the first version order (extrovert, extrovert, introvert, introvert) and the second version order (extrovert, introvert, extrovert, introvert) felt that the extroverted agent was the friendliest agent ( $M = 5.23$ ) compared to those participants the third and fourth version orders. Participants who experienced the second version order (extrovert, introvert, extrovert, introvert) felt that the introverted agents were the least enjoyable ( $M = 3.34$ ) out of all the participants. This interaction is somewhat limited in its use and will therefore its data will be used with caution.

There were two significant between-subject effects of age group ( $p=0.044$ ,  $F=4.403$ ) and hair colour ( $p=0.012$ ,  $F=7.153$ ) on the usability attribute “enjoyment” (see Table 4.46 in Appendix 7). The younger age group overall enjoyed the interactions less ( $M=4.15$ ) than the older group ( $M=4.69$ ).

The participants who experienced the interaction with the blonde extroverted agent and the brown haired introverted agent more ( $M=4.76$ ) than those who experienced the brown haired extrovert and the blonde haired introvert ( $M=4.08$ ).

#### **Usability Attribute – “Polite”**

There is a significant within-subject effect of personality on the usability attribute “polite” ( $p=0.005$ ,  $F=9.063$ ) (see Table 4.47 in Appendix 7). Participants in general thought all the agents were polite. Participants did feel however that the extroverted agents were more polite ( $M=5.87$ ) than the introverted agents ( $M=5.56$ ).

There was also a significant within-subject interaction of personality\*agent gender on the usability attribute “polite” ( $p=0.041$ ,  $F=4.533$ ) (see Table 4.47 in Appendix 7). Participants felt the extroverted agents were the most polite ( $M=5.87$ ), and that the introverted agents were the least polite ( $M=5.69$ ).

There were no significant between-subject effects on the usability attribute “polite”.

#### **Usability Attribute – “Intimidating”**

There are two significant within-subject effects on the usability attribute “intimidating”, agent gender\*age group interaction ( $p=0.01$ ,  $F=7.548$ ) and personality\*agent gender

interaction ( $p=0.003$ ,  $F=10.624$ ) (see Table 4.48 in Appendix 7). Participants in general were not intimidated at all by the agents.

The younger age group (<35 years) scored the male agents as less intimidating ( $M=5.94$ ) than the older group (>35 years) ( $M=5.51$ ). Both groups scored the female agent similarly, (<35 years  $M=5.68$ , >35 years  $M=5.66$ ). These scores indicate that neither group felt that the agents were particularly intimidating.

Pairwise comparisons reveals that the least intimidating agent was the extroverted male agent ( $M=5.95$ ), the second least intimidating agent was the introverted female ( $M=5.81$ ). The introverted male and extroverted female agents were the most intimidating ( $M=5.49$ ,  $M=5.53$ , respectively).

There were no significant between-subject effects on the usability attribute “intimidating”.

#### **Usability Attribute – “Prefer human”**

There is a significant within-subject effect of personality on the usability attribute “prefer human” ( $p=0.007$ ,  $F=8.157$ ) (see Table 4.49 in Appendix 7). Participants would prefer to interact with a human in general, however participants would be less inclined to interact with a human after interacting with the extroverted agents ( $M=2.91$ ), compared to the introverted male agent ( $M=2.58$ ).

There was also a significant interaction effect of personality\*age group on the usability attribute “prefer human” ( $p=0.014$ ,  $F=6.700$ ) (see Table 4.49 in Appendix 7). The



younger age group said they would most prefer to interact with a human instead after interacting with the introverted agent ( $M=2.23$ ), compared to both the older age group and after interacting with the extroverted agent ( $M=2.87$ ). The older age group were less likely to respond that they would prefer to interact with a human overall (extroverted agent  $M=3.96$ , introverted agent  $M=2.93$ ).

There are no significant between-subject effects for the usability attribute “prefer human”.

### **Usability Attribute – “Appearance Distracting”**

There is a significant within-subject effect of agent gender on the usability attribute “appearance distracting” ( $p=0.020$ ,  $F=6.000$ ) (see Table 4.50 in Appendix 7). Participants in general felt fairly neutral about the agents’ appearance. Participants did feel however that the female’s appearance was more distracting ( $M=4.79$ ) than the male agents ( $M=4.36$ ).

There was also a significant within-subject interaction of personality\*agent gender on the usability attribute “appearance distracting” ( $p=0.007$ ,  $F=8.448$ ) (see Table 4.50 in Appendix 7). Participants felt that the introverted male’s appearance was the most distracting ( $M=3.99$ ). Participants rated the rest of the agents similarly, as not distracting (extroverted female  $M=4.7$ , extroverted male  $M=4.73$ , introverted female  $M=4.83$ ).

There are no between-subject effects for the usability attribute “appearance distracting”.

Recalling hypothesis A relating to the perceived usability of the four different agents:

**H<sub>0A</sub>:** There will be no significant differences between the usability for each of the ECAs experienced.

**H<sub>1A</sub>:** There will be significant differences between the usability for each of the ECAs experienced.

There is significant evidence to refute the null hypothesis since significant differences were found between the four different agent portrayals on many of the usability attributes, as well as a significantly higher mean usability score for the extrovert portrayal ( $p < 0.000$ ,  $F = 30.751$ ).

#### **4.4.3 Agent Personality and Agent-Participant Personality Congruence**

##### **Overall Agent Personality Scores**

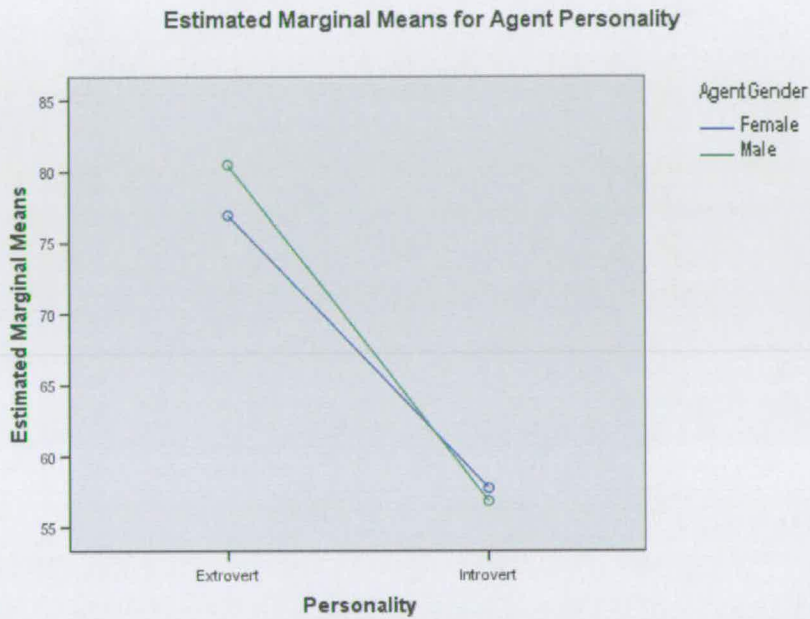
The overall mean personality scores for the four agent portrayals are shown in Table 4.51:

<b>Personality</b>	<b>Agent Gender</b>	<b>Mean</b>
<b>Extrovert</b>	Female	76.95
	Male	80.49
<b>Introvert</b>	Female	57.76
	Male	56.83

**Table 4.51: Descriptive Statistics for Agent Personality and Gender**

Pairwise comparisons revealed that the introvert and extrovert portrayals were not only correctly identified but were seen to be significantly different from each other ( $p < 0.000$ ). More specifically, the extrovert female and male agents were rated significantly more extroverted than the introvert female and male agents. Interestingly participants scored the extrovert male agent as more extrovert than the female extrovert agent, however this difference was not significant ( $p = 0.073$ ).

A graphical display of the estimated marginal means for the agents' personality scores can be seen in Figure 4.5 below.



**Figure 4.5: Estimated Marginal Means for Agent Personality**

#### 4.4.4 Correlations

After completing Pearson's correlations on the extroversion and introversion attributes of the avatar personality questionnaire it was revealed that there are consistent and strong correlations between all attributes, except that of 'caution'. This statement related to whether participants thought the agent they had just interacted with "could be described as being cautious, thoughtful, contained and independent." There may be several reasons for the lack of correlations with this statement. One possible explanation could be that this statement contained several adjectives that relate to slightly different aspects of a person's personality. The question was devised to mirror that of many personality assessment questionnaires and related to the introverted

characteristics as described by the adjective list from the FFM. The equivalent extroverted question “I think this person can be described as being lively, enthusiastic and friendly” can be judged to be easier to interpret as the adjectives are more closely related. Therefore indicating a possible reason why participants did not show any difficulty in responding to that statement.

There were differences noticed between the male and female versions of the extroverted and introverted avatar personality portrayals, however these differences were small and minor.

#### **4.4.5 Agent Personality-Participant Personality Congruence**

From Table 4.52 below it can be seen that there is only one significant correlation between the participants’ personality and the agents’ personality ( $p=0.004$ ,  $r= -0.357$ ), namely a negative correlation between the introverted female agent and participants’ extroversion score. Cross tabulations indicate the negative correlation is a product of the relationship between the high participant scores on the NEO-FFI extroversion scale and the low scores they gave the introverted female agent on the agent extroversion scale, in other words the more introverted they thought the introverted agent was. This therefore indicates that to some extent the perceived personality of the agent is independent of the participants’ own personality.

		Total Score Extrovert Female	Total Score Extrovert Male	Total Score Introvert Female	Total Score Introvert Male	Participant Extrovert Score
Total Score Extrovert Female	Pearson Correlation	1	.464(**)	-.002	-.271(*)	-.013
Total Score Extrovert Male	Pearson Correlation	.464(**)	1	-.173	-.051	.098
Total Score Introvert Female	Pearson Correlation	-.002	-.173	1	.415(**)	-.364(**)
Total Score Introvert Male	Pearson Correlation	-.271(*)	-.051	.415(**)	1	-.097
Participant Extrovert Score	Pearson Correlation	-.013	.098	-.364(**)	-.097	1

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

**Table 4.52: Agent Personality-Participant Personality Correlations**

Recalling hypothesis B relating to the possible correlations between the ECAs personality and the participants' personality:

**H<sub>0B</sub>:** There will be no significant correlations observed between the ECA personality portrayals and the participant's personality.

**H<sub>1B</sub>:** There will be significant correlations between the ECA personality portrayals and the participant's personality.

The null hypothesis cannot be discarded completely as although there were not correlations between all the different personality portrayals and participant's personality, there was one significant relationship between the mean score for the introverted female agent and the participants' extroversion score. This therefore would indicate some kind of relationship between the personality the participants perceived and their own.

However it would be more useful to look at the correlations between the personality of the preferred agent and the participants' personality (see Table 4.53 below).

Surprisingly there are no significant correlations ( $p=0.822$ ) between participants' extroversion score and the overall satisfaction with specific personality portrayals. The correlation is positive therefore indicating that if the participant scored average to high on the extroversion scale they were more likely to rate the overall interaction with the extroverted agent highest. This can be seen more clearly from the crosstabulations below (see Table 4.54 below). The correlation is weak as indicated by  $r=0.029$ , which is fairly close to zero. This would seem therefore not to support the 'similarity-attraction' hypothesis that many other HCI studies have claimed (for example Nass et al., 1995). However from the crosstabulations (Table 4.54) it can be seen that this result could be due to a similar amount of participants who scored either average or high on the NEO-FFI extroversion scale, both scoring the extroverted agent as the highest/best. It should also be noted that there was not an equal spread on extroversion and introversion amongst the participants which will affect this result. There were slightly more extroverts tipping the balance in favor of their scores.

There are also 13 participants who scored average to high on the extroversion scale and rated the introverted agents as the best, however this pattern is not strong enough to support the 'complementarity' hypothesis. This result indicates that participants in general prefer an ECA to possess an extrovert personality. This may be due to the service being provided by the ECA, namely a mortgage application service. Participants may prefer an extrovert to an introvert because it corresponds with their expectations of a mortgage advisor; assertive, friendly, enthusiastic and/or assertive.

		Highest Rated Agent	Extrovert
Highest Rated Agent	Pearson Correlation	1	.029
	Sig. (2-tailed)		.822
	Pearson Correlation	.029	1
Extrovert	Sig. (2-tailed)	.822	

**Table 4.53: Correlations between Participants' Personality and Their Preferred Agent**

	(Participant) Extroversion Scale			Total
	Low	Average	High	
Rated Introvert Highest	2	7	10	19
Rated Extrovert Highest	5	16	24	45
Total	7	23	34	64

**Table 4.54: Highest Rated Personality \* Extroversion Scale Crosstabulations**

Recalling hypothesis C relating to participants' preference for one of the ECAs personality portrayals:

**H<sub>0C</sub>:** There will be no preference shown for one the ECAs personality portrayals.

**H<sub>1C</sub>:** There will be a preference shown for one of the ECAs personality portrayals.

There is evidence to refute the null hypothesis in that there was a significant difference between the personality type of the agents that participants rated as the highest ( $p < 0.000$ ).

ECA Portrayal	Average Percentage
Extrovert Female	63.47%
Extrovert Male	66.87%
Introvert Female	47.5%
Extrovert Male	45.47%

**Table 4.55: Preference Percentage Rates for Each ECA Portrayal**

#### 4.4.5 Pecuniary Questionnaire

#### 4.4.6 Reliability of Scale

After running reliability analysis on the 20 items of the Pecuniary Questionnaire a Cronbach's alpha<sup>10</sup> coefficient of 0.6 was produced which is 0.1 below the recommended alpha value of 0.7 which is deemed the minimum value for reliability. Therefore if no items were removed then this scale has a Cronbach's alpha coefficient that is too low to ensure reliability. However from Table 4.56 below it can be seen that there is one item ("Spend to feel better") that when deleted results in a Cronbach's alpha value of 0.65, which is close enough to the recommended alpha value of 0.7, therefore allowing further analysis to be completed on these data. It is also worth noting that some researchers feel that when dealing with complex psychological constructs a Cronbach's alpha of below 0.7 can also be acceptable due to the diversity of the concepts being measured (Kline, 1999).

---

<sup>10</sup> **Cronbach's alpha**- first named by Cronbach in 1951 is a statistic used as a measure of reliability for psychometric instruments. It is a coefficient of consistency and measures how well a set of variables or items measures a single, unidimensional latent construct.



Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Saving Sensible	93.55	65.045	.507	.531
Save Regularly	93.95	65.442	.497	.534
Choose Not Save	95.36	61.091	.334	.530
Fall into Debt	95.55	62.823	.238	.548
Acceptable to be in Debt	95.97	63.555	.185	.559
Not Buy on Impulse	95.06	65.806	.156	.562
Financial Position	93.52	67.968	.281	.553
Think Long and Hard	93.63	67.921	.277	.553
Think Carefully	93.59	68.182	.354	.551
Risk Reward	95.31	65.679	.145	.565
Look Best Deals	93.58	66.121	.477	.538
Gut Feelings	95.16	63.658	.240	.548
Success	96.14	65.996	.080	.582
Spend to get Best	95.30	66.434	.108	.572
Money Aside	93.75	64.413	.571	.526
Budget	94.03	65.364	.411	.536
Banks Take Advantage	95.17	68.240	.045	.582
Trust Bank	95.89	65.623	.142	.566
Spend to Feel Better	96.09	78.309	-.334	<b>.645</b>
Pointless to Worry	94.36	63.313	.311	.537

**Table 4.56: Pecuniary Item-Total Statistics**

#### 4.4.7 Factor Analysis

Since the Cronbach's alpha was deemed acceptable (due to the complex nature of the attitudes being assessed), factor analysis was conducted. The remaining 19 items of the Pecuniary Questionnaire were subjected to principal components analysis (PCA) using SPSS<sup>11</sup>. Prior to performing PCA the suitability of data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above. The Kaiser-Meyer-Okin value was 0.687, exceeding the recommended

---

<sup>11</sup> SPSS (originally, Statistical Package for the Social Sciences) – allows the user to carry out statistical analysis, data management and data documentation these include descriptive statistics, t-tests, ANOVA's, correlations, nonparametric tests, regressions and so on.

value of 0.6 (H. Kaiser, 1970; H. Kaiser, 1974) and the Bartlett's Test of Sphericity (Bartlett, 1954) reached statistical significance, supporting the factorability of the correlation matrix.

Principal component analysis revealed the presence of seven components with eigenvalues exceeding 1 (4.69, 2.15, 1.59, 1.44, 1.34, 1.18, 1.02), explaining 70.49% of the variance. An inspection of the screeplot revealed a break after the third component. Using Catell's (Catell, 1966) scree test, two components were retained for further investigation. To aid in interpretation of these two components, Varimax rotation was performed. The rotated solution presented in Table 4.57 (below) revealed the presence of simple structure (Thurstone, 1947), with each component showing a number of strong loadings, and most variables mainly loading substantially on only one component. The two factor solution explained a total of 35.95% of the variance, with Component 1 contributing 24.26% and Component 2 contributing 11.04%. From Table 4.57 it can be seen that the MAS items are bundled together and are weighted on a separate component to the rest indicating that these do in fact assess separate attitudes. The items from the other two main aspects of the questionnaire (attitudes and thinking and information processing style) however are intermixed on the first component suggesting further development of the questionnaire structure is needed. The results of the factor analysis should be taken with caution however as the sample size is only 64 (far lower than recommended for factor analysis), therefore the factors obtained here would not generalise well to the general population.

	Component	
	1	2
Save Regularly	.740	
Money Aside	.729	
Saving Sensible	.698	.317
Budget	.668	
Look Best Deals	.629	
Think Carefully	.618	
Think Long and Hard	.616	-.365
Financial Position	.580	
Not Buy on Impulse	.563	
Choose Not Save	.472	
Pointless to Worry	.429	
Acceptable to be in Debt	.413	
Fall into Debt	.359	
Gut Feelings	.331	
Spend to get Best		.670
Banks take Advantage		.596
Trust Bank		.574
Risk Reward		.544
Success		.325

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.  
 a. Rotation converged in 3 iterations.

**Table 4.57: Varimax Rotation of Two Factor Solution for Pecuniary Items**

#### 4.4.8 Correlations between Questionnaire Items

##### Saving-Debt Dimension

From Table 4.58 it can be seen that although there are a number of correlations between dimension items there does not appear to be as many as expected.

	Saving Sensible	Save Regularly	Choose Not Save	Fall into Debt	Acceptable to be in Debt
Saving Sensible	1	r=.576 p=.000	r=.357 p=.004		r=.263 p=.036
Save Regularly	r=.576 p=.000	1		r=.330 p=.008	r=.340 p=.006
Choose Not Save	r=.357 p=.004		1		r=.255 p=.042
Fall into Debt		r=.330 p=.008		1	
Acceptable to be in Debt	r=.263 p=.036	r=.340 p=.006	r=.255 p=.042		1

**Table 4.58: Correlations for Saving-Debt Dimension**

Due to the lack of significant correlations between certain items of the pecuniary questionnaire crosstabulations were conducted to try and gain some insight in to the patterns of responses.

No correlation was found between participants' response to the statement "I think saving is a very sensible thing to do" and "I think people who fall into debt are not managing their money properly." Crosstabulations (see Table 4.59) show that the majority of participants who think saving is a very sensible thing to do also think that people who fall into debt are not managing their money properly, in other word these participants would score highly on the saving dimension. However it also has to be noted that there is a fairly even spread of answers for participants who answered that they strongly agree that saving and debt is a very sensible thing to do, between disagreeing and agreeing with the statement "I think people who fall into debt are not managing their money properly".

		Fall into Debt							Total
		1	2	3	4	5	6	7	
Saving Sensible	4	0	1	0	1	0	0	0	2
	5	1	1	2	1	1	0	0	6
	6	0	6	5	3	6	14	0	34
	7	0	5	4	3	4	5	1	22
Total		1	13	11	8	11	19	1	64

**Table 4.59: Saving Sensible \* Fall into Debt Crosstabulations**

There was also no correlation between the statements "I think people who can afford to save and choose not to are irresponsible" and "I think people who fall into debt are not managing their money properly." This is surprising as it was expected that participants would consistently score high on the saving dimension. However, it can be seen from the crosstabulations below (Table 4.60) that, participants who scored highly on the saving dimension by agreeing with the statement that people who choose not to save are

irresponsible also scored low on the dimension by disagreeing with the statement relating to falling into debt.

		Fall into Debt							Total
		1	2	3	4	5	6	7	
Choose Not Save	1	0	0	0	0	0	1	0	1
	2	0	2	2	2	0	2	0	8
	3	1	2	2	2	1	5	0	13
	4	0	1	1	0	2	3	1	8
	5	0	5	2	2	4	2	0	15
	6	0	3	4	2	4	3	0	16
	7	0	0	0	0	0	3	0	3
Total		1	13	11	8	11	19	1	64

**Table 4.60: Choose Not Save \* Fall into Debt Crosstabulations**

There was also no correlation between the statements “I think it is acceptable for people to be in debt these days” and “I think people who fall into debt are not managing their money properly.” This is somewhat surprising. It was expected that participants who believe it is not acceptable for people to be in debt these days (thus scoring low on the saving dimension) also thinking that people who fall into debt are not managing their money properly. From the crosstabulations below (Table 4.61) it can be seen that there is a fairly even spread of participants who feel that it is not acceptable to be in debt these days but also think the reason that people fall into debt these days is not necessarily because they’re not managing their money properly. This indicates in the same individuals are scoring high on some items of the saving dimension as well as low on others (i.e. hold a more positive attitude towards debt). One reason for observing this pattern may be the wording, in particular the negative wording. Another reason could be the choice of words may have confused the participants or created some dubiety over the meaning of the statement. For example, what is meant by “acceptable” or “debt”?

		Fall into Debt							Total
		1	2	3	4	5	6	7	
Acceptable to be in Debt	1	0	0	0	1	1	0	0	2
	2	0	5	3	1	3	5	0	17
	3	1	4	4	1	2	5	0	17
	4	0	1	1	3	0	0	0	5
	5	0	1	1	1	2	2	0	7
	6	0	1	2	1	2	6	1	13
	7	0	1	0	0	1	1	0	3
Total		1	13	11	8	11	19	1	64

**Table 4.61: Acceptable to be in Debt \* Fall into Debt Crosstabulations**

The last correlation that would have been expected in this dimension is between the statements “I think it is important to save on a regular basis.” And “I think people who can afford to save and choose not to are irresponsible”. Crosstabulations (see Table 4.62 below) revealed that instead of people who agree with the first statement also agreeing with the second and thus scoring consistently high on the dimension, there is a pretty even spread of people who agree with the first statement about saving regularly, who also slightly disagree with the second, therefore seemingly to score inconsistently on the dimension.

		Choose Not Save							Total
		1	2	3	4	5	6	7	
Save Regularly	4	0	1	1	0	0	0	0	2
	5	1	3	3	1	6	4	0	18
	6	0	3	9	3	9	11	1	36
	7	0	1	0	4	0	1	2	8
Total		1	8	13	8	15	16	3	64

**Table 4.62: Save Regularly \* Choose Not Save Crosstabulations**

### Forward Thinking - Present

There were no significant correlations observed between the two items in the temporal dimension of saving. However the crosstabulations (see Table 4.63) show that although

the correlation wasn't significant, those who feel it is important to be aware of their financial position also feel that people should not buy on impulse. This would indicate that these participants score consistently highly on the temporal aspect of saving.

		Financial Position				Total
		3	5	6	7	
Not Buy on Impulse	1	0	0	1	0	1
	2	0	1	2	1	4
	3	0	0	8	5	13
	4	0	0	3	0	3
	5	1	2	14	6	23
	6	0	0	10	6	16
	7	0	0	2	2	4
Total		1	3	40	20	64

**Table 4.63: Not Buy on Impulse \* Financial Position Crosstabulations**

#### **Cognitive (Instrumental Risk) – Expressive (Stimulating Risk)**

The Cognitive-Expressive dimension items are consistently correlated with each other, all except the “risk reward” attribute. This item correlated with no other items in the pecuniary questionnaire. “Thinking long and hard” was strongly correlated with “thinking carefully” ( $r=0.519, p<0.000$ ) and “look around for the best deals” ( $r=0.456, p<0.000$ ) as expected. It was also correlated with the attribute “gut feelings” ( $r=0.276, p=0.027$ ). The crosstabulations revealed that people who feel it is important to think long and hard when making financial decisions were divided on whether or not it is important to go with gut feelings when decisions about financial matters. This is somewhat surprising as it means that some participants are scoring highly on the cognitive thinking style dimension as well as scoring low (in other words also have an expressive thinking style). The second correlation with the “gut feelings” attribute is with the “look around for the best deals” attribute ( $r=0.333, p=0.007$ ). This correlation is less surprising as the majority of people who feel it is important to look around for

the best deals also feel that people should not follow their gut feelings, thus scoring consistently high on the cognitive thinking style dimension.

### Power Dimension (MAS)

The two items in the power dimension are significantly correlated ( $r=0.338$ ,  $p=0.006$ ) as expected as these were derived from the already validated MAS (see Table 4.64). In other words people who feel that money is a sign of success also feel that you have to spend more to get the very best.

	Success	Spend Best
Success	1	$r=.338$ $p=.006$
Spend Best	$r=.338$ $p=.006$	1

**Table 4.64: Correlations for Power Dimension**

### Retention-Time Dimension (MAS)

The two retention-time items were also significantly correlated ( $r=0.309$ ,  $p=0.013$ ) which again is unsurprising as they too are based on the factors from the money attitudes scale (Table 4.65). Participants who feel that it is important to put money aside for unexpected events also feel that it important for people to stick to a budget.

	Money Aside	Budget
Money Aside	1	$r=.309$ $p=.013$
Budget	$r=.309$ $p=.013$	1

**Table 4.65: Correlations for Retention-Time Dimension**

### Distrust Dimension (MAS)

The distrust items were also correlated significantly ( $r=0.542$ ,  $p<0.000$ ) and also based on factors from the money attitude scale (see Table 4.66). The surprising factor is that it is a positive correlation which indicates that people who believed that most banks take



advantage of their customers also think that people should trust their banks to look after their interests. These are clearly conflicting views but may highlight the intricate nature of the complicated relationships customers experience with their bank.

	Banks Advantage	Trust Bank
Banks Advantage	1	$r=.542$ $p=.000$
Trust Bank	$r=.542$ $p=.000$	1

**Table 4.66: Correlations for Distrust Dimension**

#### **Anxiety Dimension (MAS)**

No correlations could be performed for this dimension because after the reliability analysis one item had to be removed, only leaving one item.

#### **4.4.9 Pecuniary Questionnaire Items and Personality Traits**

There were surprisingly few correlations between participants' personality traits and their attitudes towards financial matters. There were three significant correlations between the trait conscientiousness and the attributes "saving sensible" ( $r=0.254$ ,  $p=0.043$ ), "financial position" ( $r=0.288$ ,  $p=0.021$ ) and "think carefully" ( $r=0.289$ ,  $p=0.021$ ). The fourth correlation occurred between the openness trait and the attribute "think carefully" ( $r=0.261$ ,  $p=0.037$ ).

Recalling hypothesis D relating to possible correlations between participants' personality and their financial attitudes:

**H<sub>0D</sub>:** There will be no significant correlations between participants' personality and their financial attitudes.

**H<sub>1D</sub>:** There will be significant correlations between participants' personality and their financial attitudes.

There is sufficient evidence to refute this null hypothesis because although the volume of correlations expected was not found, there were four significant correlations between participants' personalities and their attitudes towards three different financial matters. Significant correlations were found mostly for the Conscientious trait. Participants who scored highly on the conscientious trait felt that saving is a very sensible thing to do ( $r=0.254$ ,  $p=0.043$ ), as well as that people should be aware of their financial position ( $r=0.288$ ,  $p=0.021$ ) and that people should think carefully about any financial advice they receive ( $r=0.289$ ,  $p=0.021$ ). The only other correlation was between participants who scored highly on the openness trait was that of people who were rated as open also believe that people should think carefully about any financial advice they receive. It should also be noted that some interesting and useful correlations were found between participants' demographic data and their financial attitudes.

This result could be due to the design of the questionnaire which clearly needs revising as the inter-item correlations were weak. Alternatively, this lack of correlations between personality traits and certain financial attitudes could be an indicator of a more complex issue. For example, the fact that only superficial demographic questions were taken into account such as higher education, job, age, gender may go some way to explain the lack of significant correlations. There are many economic factors that affect a person's economic behaviour and attitudes, other than those already mentioned. It would seem reasonable in future attempts to consider these factors in conjunction with such a study.

#### 4.5.0 Inter-Item Correlations

Saving is a very sensible thing to do and people thinking it is important to save on a regular basis is correlated with almost all other attributes in the pecuniary questionnaire, such as it is important to stick to a budget, people should think carefully about financial advice they receive, that its important to put money aside on a regular basis. This is not a surprise as these are fundamental aspects of money and personal finances. Probably more surprising is the fact that the other items that were designed to investigate the same dimension, such as choose not to save, fall into debt and acceptable to be in debt are not correlated consistently with other items. There were however a few interesting relationships. People who felt that those who fall into debt are not managing their money properly also felt that it is important to think long and hard about any financial decisions ( $r=0.292$ ,  $p=0.019$ ). People who feel that it is important to be aware of their financial position also feel it is acceptable to be in debt these days ( $r=0.318$ ,  $p=0.011$ ). These relationships may relate to a “type” [of person] who don’t view debt as one negative entity but instead accept it as part of modern life.

Both the attributes “not buy on impulse” and “be aware of their financial position” are correlated with most other attributes from the pecuniary questionnaire, such as “saving sensible”, “saving regular”, “thinking long and hard”, “important to think carefully”, “important to look around for the best deals”, “stick to a budget”, and “pointless to worry about money”. These items were designed to look at the temporal aspect of saving, therefore if people scored highly on this dimension they would be classed as “forward thinking”. Consequently it would seem that this particular aspect has in fact deep routes and is inter-linked with the idea that people should think carefully about financial decisions. This indicates that people with a cognitive thinking style also feel

people should not buy on impulse (in other words not go with their emotions which corresponds to the thinking and information processing theory) and be aware of their financial position.

The four dimensions from The Money Attitude Scale had some interesting correlations amongst the other items of the pecuniary questionnaire. The retention-time dimension items; “important to put money aside for unexpected events” and “important to stick to a budget” were correlated with most of the saving-debt dimension and the temporal dimension, which is not surprising as the temporal dimension and the retention-time dimension contain very similar ideas. There was only one correlation with the power dimension item, “people who feel that wealth is a sign of success” also felt that “people who can afford to save and choose not to are irresponsible” ( $r=0.272$ ,  $p=0.029$ ). People who scored low on the Distrust dimension also felt that it is important to think long and hard when it comes to making financial decisions, in other words people who have cognitive thinking styles also feel that people should trust their banks (“banks take advantage”  $r=-.276$ ,  $p=0.027$ , “trust their bank”  $r=-.251$ ,  $p=0.046$ ). There was only one item left in the anxiety dimension after the reliability analysis “it is pointless to worry about money”. People who agreed with this statement also agreed that “people should not buy on impulse”, “that people should think long and hard when making financial decisions”, as well as “look around for the best deals” ( $r=0.34$ ,  $p<0.000$ ) and “feel people shouldn’t go with gut feelings when making financial decisions” ( $r=0.447$ ,  $p<0.000$ ). Therefore it would seem people who have a cognitive thinking style also score high on the anxiety dimension.

This analysis sees beginning of some pecuniary factors emerging. Although it can be seen that the factors do not mirror those theorised (Saving and Debt Attitudes, Thinking Information Processing, and MAS) they do in fact generate logical and inclusive factors. This preliminary analysis suggests that it would be worth continuing the development of this metric.

#### **4.5.1 Further Analysis**

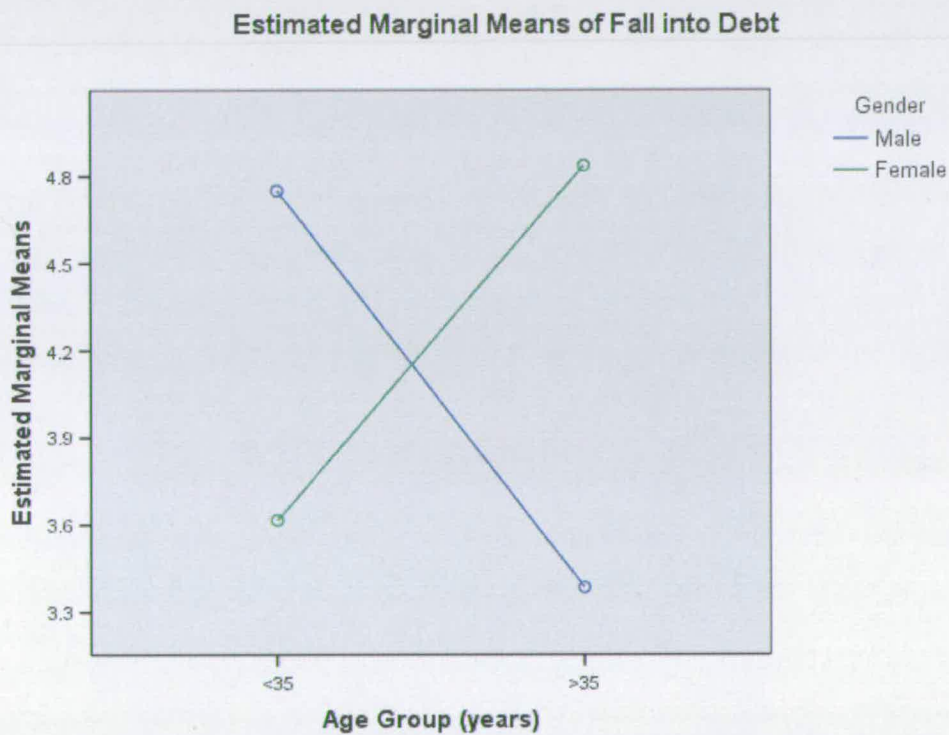
##### **Saving-Debt Dimension**

Further analysis produces several significant between-subjects' effects (see Table 4.67 in Appendix 7). There is a significant effect ( $p=0.003$ ,  $F=9.457$ ) of age group on whether participants thought it was acceptable to be in debt or not. Participants who were 34 or under felt that it was less acceptable to be in debt, compared to the 35's and over who felt more neutral about that statement.

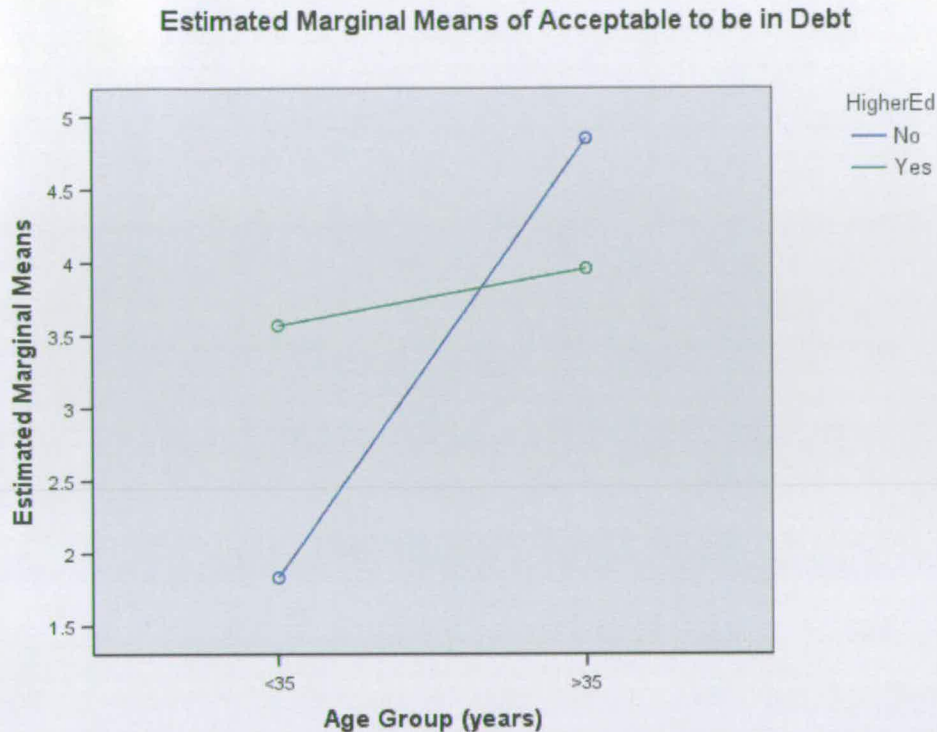
There was also a significant interaction of age group\*gender ( $p=0.018$ ,  $F=5.933$ ) on whether or not participants think that people who fall into debt are not managing their money properly (Table 4.67 in Appendix 7). Younger females are more likely to disagree with that statement ( $M=3.62$ ) than the younger males ( $M=4.75$ ). Older females are more likely to slightly agree ( $M= 4.84$ ) with that statement compared to the older males who were more likely to disagree with it ( $M=3.38$ ) (See Figure 4.6 for a graphical display of this interaction).

There is another significant interaction between age group\* higher education ( $p=0.021$ ,  $F=5.62$ ) on whether participants thought it was acceptable to be in debt or not (Table 4.67 in Appendix 7). Younger participants who had no higher education felt very

strongly that it is not acceptable for people to be in debt ( $M=1.83$ ) compared to the younger participants who had had higher education ( $M=3.57$ ). The older participants who had had no higher education felt that it was kind of acceptable to be in debt ( $M=4.9$ ) compared to the participants who had had higher education, who felt fairly neutral ( $M=4.0$ ) (See Figure 4.7 for a graphical display of this interaction).



**Figure 4.6: Estimated Marginal Means for the Attribute “Fall into Debt”**



**Figure 4.7: Estimated Marginal Means for the Attribute “Acceptable to be in Debt”**

**Forward Thinking – Present Dimension**

There were no significant between-subject effects for age group, gender or higher education on whether or not people should not buy on impulse or whether they think it’s important for people to be aware of their financial position.

**Cognitive – Expressive Dimension**

Further analysis revealed no main effects for age, gender or higher education. However there were three significant between-subject interactions between age group\*gender for attribute “Think Long and Hard” ( $p=0.02$ ,  $F=5.76$ ), age group\* higher education for the attributes “Risk Reward” ( $p=0.018$ ,  $F=5.951$ ) and “Gut Feelings” ( $p=0.025$ ,  $F=5.288$ ) (See Table 4.68 in Appendix 7).

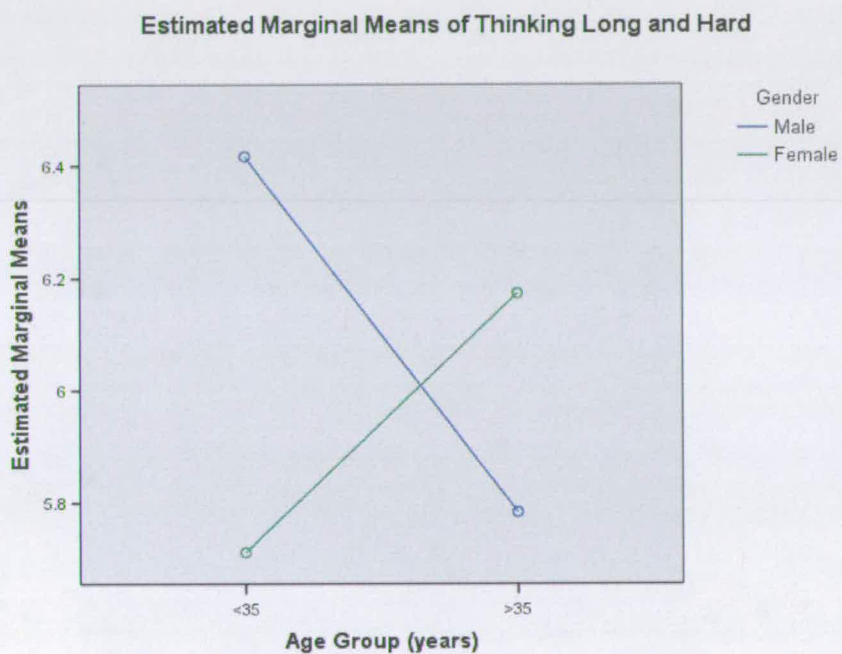
The interaction of age group\*gender results in younger females believing that it is important to think long and hard when making financial decisions (M=5.71), however young males feel even stronger that this is important (M=6.42). However female participants over 35 years felt it was very important to think long and hard when making financial decisions (M=6.17), however males over 35 years felt it was slightly less important (M=5.78) than the older females (See Figure 4.8 for graphical display of the interaction).

The second significant interaction between age group\* higher education can be seen from the younger participants without higher education believing that the risk of investing in stocks and shares is not outweighed by the potential financial rewards (M=3.75), compared to the younger participants who do have some kind of higher education who were more likely to agree slightly that the risks were outweighed by the potential rewards (M=4.65). Participants who do not have any type of higher education and are over 35 years old felt that the risks were outweighed by the potential rewards (M=5.6), compared to those who do have some kind of higher education (M=3.99) (See Figure 4.9 for graphical display of the interaction).

The final interaction of age group\*higher education on the attribute “Gut Feelings” is illustrated by the fact that participants who were 35 years old and under and who had higher education felt fairly neutral about whether or not they felt it was important to go with gut feelings when making decisions about financial matters (M=3.92), compared to those who do not have higher education who felt it was important (M=5.17). However the older group of participants who have higher education felt that it is



important to go with gut feelings when making decisions about financial matters (M=5.29), compared to those who do not have higher education who felt it was not so important (M=4.4) (See Figure 4.9.1 for graphical display of the interaction).



**Figure 4.8: Estimated Marginal Means for the Attribute “Think Long and Hard”**

Estimated Marginal Means of Risk Reward

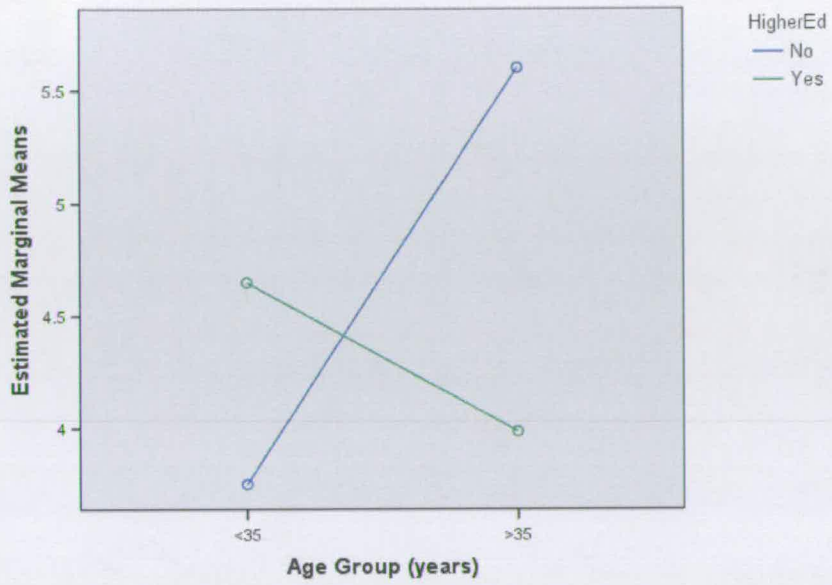


Figure 4.9: Estimated Marginal Means for the Attribute "Risk Reward"

Estimated Marginal Means of Gut Feelings

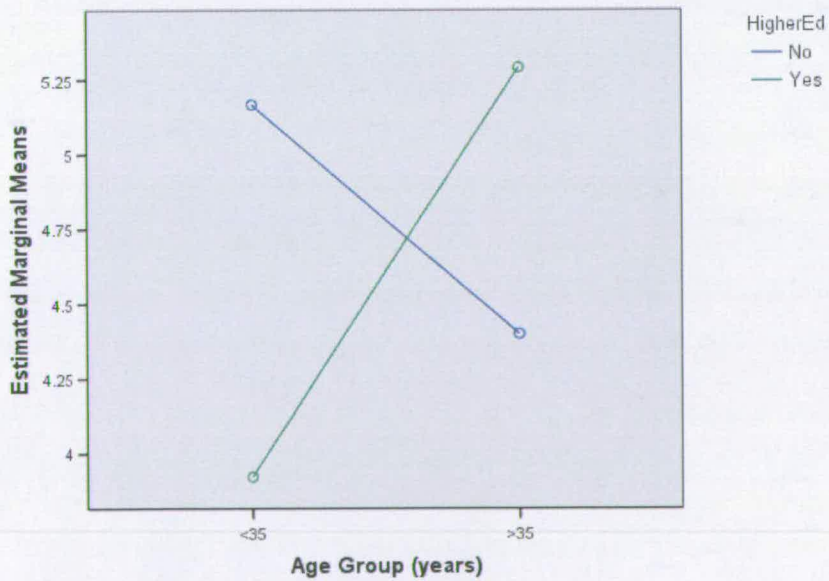


Figure 4.9.1: Estimated Marginal Means for the Attribute "Gut Feelings"

### **Power Dimension**

Further analysis shows that there is only one significant between-subjects effect of age group on whether participants felt that being wealthy was a sign of success or not ( $p=0.01$   $F=7.188$ ). In general the over 35 years age group do not feel that being wealthy is a sign of success ( $M=3.05$ ) whereas the 35 and under group were more likely to slightly agree with that statement ( $M=4.62$ ). See Table 4.69 in Appendix 7.

### **Retention – Time Dimension**

Further analysis reveals one significant between-subject effects of gender on the statement “I think it is important for people to stick to a budget” ( $p=0.046$ ,  $F=4.180$ ). Males felt it was much more important to stick to a budget ( $M=6.07$ ) than women ( $M=5.52$ ). See Table 4.69 in Appendix 7.

### **Distrust Dimension**

Further analysis shows that there is only one significant between-subjects effect of gender on whether or not participants felt that most banks take advantage of their customers ( $p=0.001$   $F=13.445$ ). Males were generally more distrustful ( $M=5.29$ ) than females ( $M=3.59$ ) believing that most banks will take advantage of its customers. See Table 4.69 in Appendix 7.

### **Anxiety Dimension**

Further analysis revealed no significant between-subjects effect of age group, gender or higher education on whether or not participants think it is unwise to spend money just to make them feel better.

#### 4.5.2 Exit Questionnaire

Recalling hypothesis E which relates to participants' preference for a particular ECA gender:

**H<sub>0E</sub>:** There will be no preference shown for ECA gender.

**H<sub>1E</sub>:** There will be a preference shown for ECA gender.

After completing a one sample t-test a significant difference between the overall ratings for the male and female agents ( $p < 0.000$ ) was revealed. The male ECA was rated significantly higher than the female ECA therefore evidence exists that the null hypothesis can be rejected.

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Highest Rated Gender	24.665	63	.000	1.547	1.42	1.67

**Table 4.70: One Sample T-Test on Agent Gender**

There was no significant correlation between participants' gender and the gender of the agent they rated as the best.

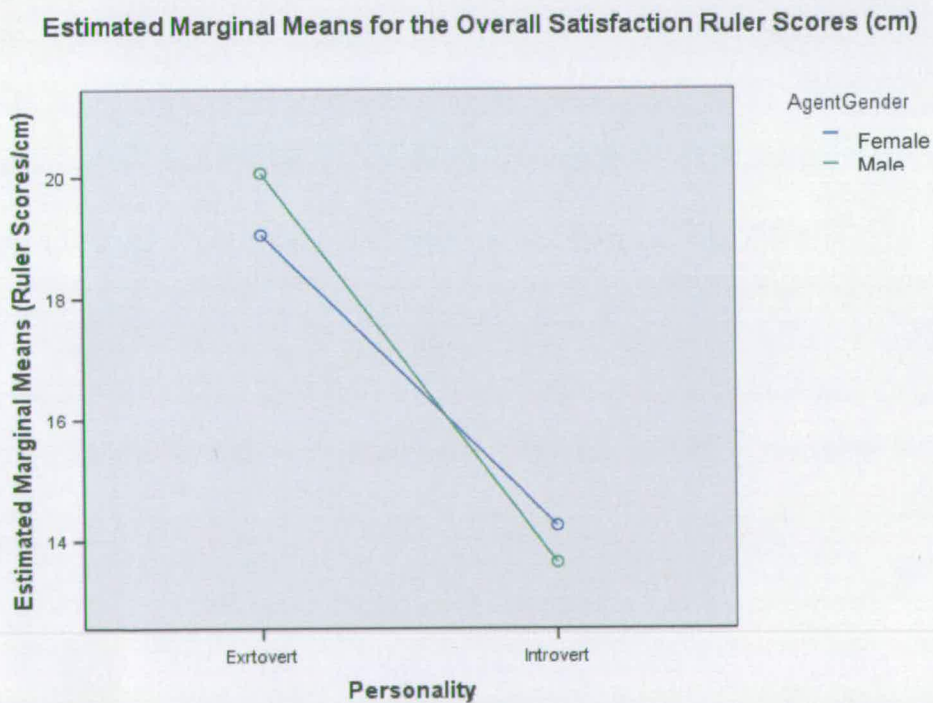
Recalling hypothesis F which relates to participants' satisfactions scores for the interactions with the different ECA's:

**H<sub>0F</sub>:** There will be no significant differences between the satisfaction scores for the interaction between the different agents.

**H<sub>1F</sub>:** There will be significant differences between the satisfaction scores for the interaction between the different agents.

Post hoc analysis was performed on participants' satisfaction levels with the different ECA designs. It was hypothesised that there would be no significant differences between the satisfaction levels for the different interactions experienced.

There is a significant difference between the overall satisfaction levels participants experienced with the different ECAs. Participants were most satisfied with the extrovert agents overall ( $p < 0.000$ ,  $F = 22.382$ ). See Figure 4.9.2 below for a graphical display of the scores the different ECA designs received. Therefore evidence exists that the null hypothesis can be rejected in favour of the alternative: There is significant difference between participants' satisfaction levels with the different ECA designs.



**Figure 4.9.2: Estimated Marginal Means for the Overall Satisfaction Ratings (cm)**

There was also a significant between-subject effect of participant gender on the overall satisfaction ratings for the ECAs ( $p=0.014$ ,  $F=6.422$ ), in particular the overall satisfaction with different ECAs personality (see Table 4.71 below). Participants were most satisfied with the extrovert male ECA and least satisfied with the female introvert ECA (although the difference between the male and female extrovert portrayals was not significant).

Participant Gender	Personality	Mean (%)
Male	Extrovert	67.25%
	Introvert	35.27%
Female	Extrovert	63.13%
	Introvert	40.57%

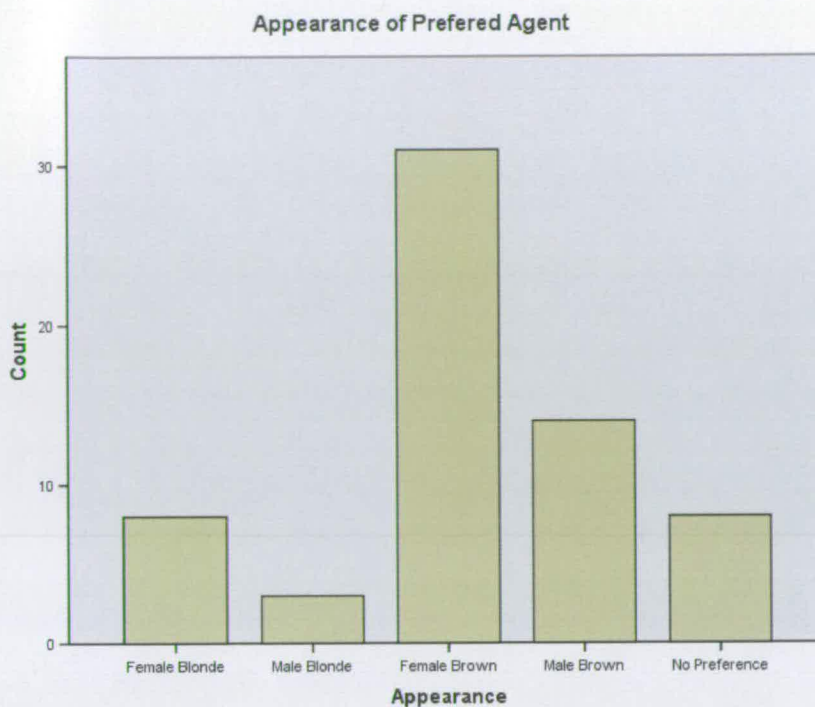
**Table 4.71: Means for Gender \* Personality Interaction**

Recalling hypothesis G which relates to the ECAs appearance:

**H<sub>0G</sub>: There will be no preference shown for the ECAs appearance.**

**H<sub>1G</sub>: There will be a preference shown for the ECAs appearance.**

Evidence exists to refute the null hypothesis since there is a significant difference between the appearance participants preferred the most ( $p<0.000$ ). Figure 4.9.3 shows which appearance participants preferred the most, the female agent with brown hair.



**Figure 4.9.3: The Number of Counts for the Appearance of the Preferred Agent**

Although there was a significant difference observed between the agents for their appearance the only main affect of appearance on the dependant variables was an interaction effect of hair colour\*version order on usability. The significant effect observed was the blonde haired extroverts and brown haired introverts were rated as having the highest overall usability score. This result could be explained by stereotypes however (Krueger & Rothbart, 1988). For example, the ECAs blonde hair could be considered bright and brash and participants often commented on it as being “unnatural” and “fake”. On the other hand the brown haired ECAs were perceived as being the most “natural” in appearance. This choice of colouring used in the experiment may have triggered a representative heuristic in the participants, activating a stereotypical script that more outgoing people tend to dye their hair bright (more unnatural) colours because they liked to be noticed whereas more introverted, shy people do not and therefore avoid standing out from a crowd. The significant effect

could therefore be due to participants rating the blonde haired extrovert and brown haired introvert agents more highly on the usability scale because they unconsciously fit their stereotypes.

### 4.5.3 Interview Comments

The exit interview can allow participants to express their views more fully and help explain their preferences. Of those participants who did not like the introverted agent versions comments such as “*presented poorly, eyes all over the place when should be concentrating on me*” “*scary eyes, intimidating*” and “*boring voice, didn't seem interested*” indicate that instead of participants thinking the agent was less confident and therefore making less eye contact and speaking quieter because of their introverted temperament they perceived the behaviour as rudeness. This could of course be down to the personality of those participants, may be being particularly extroverted thus not liking the interaction with the introvert agent (according to the similarity-attraction hypothesis).

The participants who preferred the extroverted agents offered comments such as “*more friendly, more like real person, eyebrows moved more and smiled more*” “*seemed best, most assertive, and trustworthy, seems like he wants to be there*” “*more relaxed and more expressive*”. These would indicate that they perceived the more expressive character correctly and in turn felt they offered a more pleasing and enjoyable service.

Others felt the opposite about the extroverted agents as can be seen through their comments “*the leaning forward could be a bit patronising*” “*too animated, didn't like the eyebrows or the leaning forward*”, “*over-bearing, intimidating*”. These comments



would imply feelings of helplessness and being overwhelmed thus creating a negative impact on the usability and overall efficiency of the service. These participants may not score all that highly on the extroversion dimension and are therefore prefer more introverted personality types (according to the similarity-attraction hypothesis).

One key topic of interest that emerged from participants interview comments were those relating to the motivations behind using certain financial service modalities, such as the branch, ATM, Internet, and Kiosk. Most participants who responded “yes” to the question “do you mainly check your balance using an ATM?” said the reason behind that was “*convenience*” and those who did not checker their balance using an ATM said they used the Internet and again the main reason behind which was “*convenience*”. Another question relating to this area asked “*do you buy financial products (e.g. loans, mortgages etc.) mainly in your branch?*” from those respondents who answered “yes” said the reason behind that was they “*liked to speak to someone*” or “*liked face-to-face contact*”. Those who did not buy financial products in their branch mostly used the Internet. These responses would suggest that the development and employment of ECAs either via the Internet or Kiosk would be welcomed. Firstly, participants like to use financial service modalities that are convenient, which an ECA available via the Internet or in-branch Kiosk would be, but they could also provide the face-to-face contact that they desire. Therefore the introduction of the ECA design highlighted from this research, either via the Internet or an in-branch Kiosk would serve to satisfy some customers’ desires for face-to-face contact and need for convenience.

## 4.6 Discussion and Conclusions

The results show that all four versions (excluding hair colour for the reasons stated below) were rated above neutral indicating a good design in terms of usability. This therefore shows a clear effect of personality on the usability of ECAs within a mortgage application eBanking scenario. The one attribute were all four versions scored negatively was “prefer human”, overall participants would prefer to interact with a human. However, it should be noted that such a system as the one employed in the current research would not be designed to replace humans but instead aim to compliment and support them.

Hair colour was excluded from the further analysis and discussion of results as it was shown to have no constructive effects on usability. The only significant effect observed was the blonde haired extroverts and brown haired introverts were rated as having the highest overall usability score. This result could be explained by stereotypes. For example, the ECAs blonde hair was quite bright and brash and participants often commented on it as being “unnatural” and “fake”. On the other hand the brown haired ECAs were perceived as being the most “natural” in appearance. This choice of colouring used in the experiment may have triggered a representative heuristic in the participants, activating a stereotypical script that more outgoing people tend to dye their hair bright (more unnatural) colours because they liked to be noticed whereas more introverted, shy people do not and therefore avoid standing out from a crowd. The significant effect could therefore be due to participants rating the blonde haired extrovert and brown haired introvert agents more highly on the usability scale because they unconsciously fit their stereotypes. This supports the CASA paradigm (Reeves & Nass, 1996).

The main result from the usability attribute analysis is that overall participants preferred an extrovert agent and in particular a male extrovert agent ( $p < 0.000$ ). This does not support the similarity-attraction hypothesis as even those participants who scored low on the NEO-FFI extroversion scale (introverts) preferred the extrovert agents. The interpretation of this result however is not as simple as accepting the alternative, the complementarity of needs hypothesis. The crosstabulations revealed that the majority of participants who scored moderate to high on the NEO-FFI extroversion scale were also likely to rate an extroverted agent as being the most satisfying. There was however not enough data at the other end of the spectrum to support the similarity-attraction hypothesis, namely there were not many introverted individuals who rated the introverted agents as the most satisfying. Although these results do not support some of the previous research they do allow for an optimal design to be employed in future applications of the ECAs in an eBanking scenario. The male extrovert agent was rated as the most natural, easiest to use, most efficient and so on therefore this design is the best possible overall design. The gender bias observed could be due to the nature of the service being provided i.e. informational rather than emotional thus supporting previous findings that male computers are rated as more efficient and having more reliable information when providing a technical or informational role. This preference would imply the importance and influence of the situation and environment rather than other social rules that govern social interactions. It would seem that in a financial setting, in particular an eBanking mortgage application customers prefer to interact with an ECA that fits the stereotype of a traditional bank advisor. In other words these situational cues activate a representative heuristic causing customers to look for an ECA that for fills this script as close as possible, which in this case would seem to be a male

extrovert ECA. This is rather than follow the usual social rules that would predict liking and satisfaction which are produced through similarity. Once again this result provides support for the CASA paradigm (Reeves & Nass, 1996). There is not only a clear indication that similarity has played a role in the liking of and satisfaction with the ECAs (even though the result is not significant) but the situational factors that also play a major role.

The results of the Pecuniary Questionnaire were less clear cut. Although still in development this experiment has gone some way to aid the direction and refinement of this metric. It was expected that there would be significant inter dimensional correlations for example between the items that were aimed to assess attitudes towards saving and debt, or assess individuals thinking styles. Although there were a number of correlations they did not appear consistent. This would indicate that the questionnaire is in need of some modification. This will be the main aim in a follow-up experiment.

The results for correlations amongst personality traits and financial attitudes were unexpected. From 19 questions analysed only three correlated significantly with participants' NEO-FFI personality traits. Although there has been a relatively substantial body of work to support this link it was not found in the current research. Participants who scored highly on the conscientiousness dimension hold the attitudes that saving is a very sensible thing to do ( $p=0.043$ ) and that it is important for people to be aware of their financial position ( $p=0.021$ ). This result is somewhat expected because of the description and adjectives associated with conscientiousness; efficient, organised, thorough, methodical and so on. The last significant correlation occurred between individuals who feel it is important to think carefully about any financial

advice they receive and who score highly on the openness dimension ( $p=0.021$ ). This correlation may be slightly more surprising as individuals who score highly on this dimension are described as dreamy, idealistic, and spontaneous and so on. It would be interesting to re-test these correlations with the modified pecuniary questionnaire as it may well produce more significant correlations with personality traits once the items have been revised.

The Pecuniary Questionnaire will be developed further to aid the segmentation of customers and the personalisation of ECAs in an eBanking scenario. Once the reliable scale is validated it could become a usefully targeting device by a financial institution. Using this metric a customer would be segmented according to their financial attitudes; a profile developed based their demographic variables and financial status, in turn allowing the bank to target those individuals by tailoring information and products accordingly.

The results can be used by financial institutions as a tool along with the best possible ECA design identified from this research (a male extrovert agent) in eBanking scenarios to modify customers' behaviour by not only making the desired behaviour easier to achieve, for example by targeting their specific attitudes with the tailored information and products, but by also reducing the complex tasks into simple behaviour. Additionally guiding customers through a process, for example a mortgage application, and offering suggestions to the customer at the most appropriate time and so on (Fogg, 2003).

This research provides evidence to support the notion of CASA (Nass & Clifford, 1996). This creates the opportunity for the ECA design highlighted here to influence the attitudes or behaviour of its users by employing the same methods that humans would use to influence each other. For example, using positive feedback to reward individuals, model target behaviour and/or attitude as well as utilise the information that can be inferred from their pecuniary attitudes.

#### **4.7 Summary**

This chapter details the results from an experiment to examine the effects of personality on the usability of ECAs in an eBanking mortgage application scenario. The experiment was designed primarily to test the similarity-attraction hypothesis and complementarity hypothesis when applied to HCI. A second aim was to assess the possible link between NEO-FFI personality traits and individuals pecuniary attitudes. Previous studies have found that people prefer to interact with a computer that displays a similar personality to themselves (Nass et al., 1995), just as they would another human (similarity-attraction hypothesis). An ECA that exhibited extrovert characteristics was preferred and rated highest in terms of usability by both extrovert participants and introvert participants. Therefore these findings do not support the similarity-attraction hypothesis; however this can be explained in terms of environmental constraints where within a financial situation, interactions with an ECA in an eBanking scenario are best suited to the use of an extrovert personality. By that I mean customers need to feel confident that the image in front of them is carrying out the tasks that have been requested and can be trusted to give financial advice / information. The findings also revealed that a male agent was preferred rather than a female agent. Therefore subsequent experiments utilised a male agent (blond hair) who

makes positive, extrovert portrayals; who makes regular eye contact, uses open gestures and confident and relaxed language.

This experiment can go some way to bridge the gap between personality theory, personalisation and ECAs. The possibilities of such an interactive experience within a financial establishment are extensive. For example this technology (personalised, personality specific 3D virtual ECA) could be used in an attempt to modify attitudes and/or behaviour, such as increasing the likelihood of purchase intentions and increase levels of product involvement.

## **Chapter Five**



# **The Effect of Individualised Product Portrayals on the Usability of ECAs in an eBanking Scenario**

## ***5.1 Introduction***

This chapter discusses the results of an empirical evaluation assessing the use of an extrovert 3D embodied conversational agent (ECA) in an eBanking scenario. The aim of the experiment was to assess the impact of ECAs and their role in individualised product portrayals in an eBanking application. As part of the research customers' pecuniary attitudes were assessed.

Due to the increasing levels of switching behaviour exhibited by customers and possible competitors, banks need to strive to provide a modern, flexible and personal service. Segmentation of customers can bridge the gap between money saving standardisation practices and the individual service. By drawing upon demographic information, psychological characteristics and customer information files customers' preferences and needs can be directly accessed. One such metric is designed and investigated here. A pecuniary questionnaire that utilises a multi-dimensional approach had been developed and tested. The resulting data serves as a basis for segmenting customers by a means of preliminary factor analysis.

This chapter accordingly presents and develops a metric and situation within which it might be applied that attempts at classifying and defining certain behaviour in the purchasing of financial products and services.

## **5.2 Revised Pecuniary Questionnaire Design**

The basis of this questionnaire is the creation of a robust and concise pecuniary scale that will enable customer segmentation and subsequently tailoring of products and information to the individuals needs. This research aims to measure correlations between the responses to such a questionnaire and the demographic and economic data a financial institution may possess about its customers. The questionnaire has been divided based on factors that focus on several different aspects of attitudes relating to money and finance. For example, it assesses customers' attitudes towards credit and saving factors as well as towards money itself; customers' economic behaviour, background characteristics, cognitive style and a number of psychological factors. The questionnaire has been amended from the results of the first experiment. The following section details the six key concepts (money attitudes, consumers' thinking styles and cognitions, economic behaviour, background characteristics, psychological traits, credit and saving attitudes) and why they have been included or modified from the first version.

The Pecuniary Questionnaire created for this research consists of a total of forty, 7-point Likert scale statements in which participant's rate to what extent they agree or disagree with each statement. For a summary see Table 5.1. See Appendix 8 for the fully formatted pecuniary questionnaire.

<b>Pecuniary Questionnaire</b>		
<b>Main Concepts</b>	<b>Dimensions</b>	<b>Statements</b>
<b>Money Attitudes</b>	<b>Power</b>	I don't associate being wealthy with success
		I believe you have to spend more to get the very best
		I sometimes buy things I don't need just to impress other people
	<b>Anxiety</b>	I think it is pointless to worry about money
		I often buy things to make myself feel better
		I often worry that I don't have enough money
	<b>Security</b>	I don't always know how much money I have in my bank accounts
		I never pay my bills on time
		I am proud of my ability to save
	<b>Retention</b>	I believe it is important to put money aside for unexpected events
		I think it is important to stick to a budget
		I often buy things just because they are in a sale or reduced in price.
<b>Cognitive Style (Thinking and Information Processing Style)</b>	<b>Cognitive</b>	I think it is important to know what financial terms really mean
		I think it is important to think long and hard before making financial decisions
		I think it is important to look around for the best deals when it comes to financial matters
	<b>Emotive</b>	I think it is important to go with gut feelings when making decisions about financial matters
		I always trust my intuition when dealing with financial matters
<b>Economic Behaviour</b>	<b>Credit</b>	I don't like using credit cards
		I often reach the limit on my credit or store cards
		I often use my overdraft to buy things that are not essential
	<b>Saving</b>	I find it difficult to save on a regular basis
		I save for the long-term
		I save for things I want to do or buy
	<b>Shopping</b>	I like to reward myself with purchases
		I feel a rush of excitement when I purchase things
		I often feel a sense of guilt about things I purchase
<b>Background Characteristics</b>	<b>Parents' Behaviour</b>	When I was a child my parents often argued about money When I was a child my parents discussed family finances with me
<b>Psychological Traits</b>	<b>Risk</b>	I believe the risk of investing in stocks and shares is outweighed by the potential financial rewards
		I don't find gambling exciting
	<b>Extroversion</b>	I usually prefer to do things alone
		I am a social and talkative person
	<b>Conscientiousness</b>	I don't like to plan ahead
		I have a lot of self-discipline
	<b>Openness</b>	I like to try new things and experiences
I am often flexible in my plans		
<b>Credit (and Saving) Attitudes</b>	<b>Credit Attitudes</b>	I think it is unwise to use any credit cards
		I think people who fall into debt are not managing their money properly
	<b>Saving Attitudes</b>	I think it is important to save on a regular basis
		Saving is only important when we get older

**Table 5.1: Pecuniary Questionnaire Summary**

## **5.2.1 Pecuniary Factors Exploited in the Questionnaire**

### **5.2.2 Money Attitude**

The money attitude factors measure an individual's general attitudes held towards money itself. They are a combination of several dimensions from the Money Attitude Scale (MAS) (Yamauchi & Templer, 1982) and the Money Beliefs and Behaviour Scale (MBBS) (Furnham, 1984). There has been support for both of these metrics as well as some criticisms (Furnham, 1996; Hayhoe, Leach, & Turner, 1999; Stone & Maury, 2006); therefore the pecuniary questionnaire uses a modified set of statements which have been derived from both the MAS and MMBS. At the foundation of this factor are four dimensions that have received the most support from previous research; Power, Anxiety, Security and Retention. Consumers who rate highly on the power dimension tend to use money to impress and influence others and see it as a sign of success. The anxiety dimension relates to individuals who view money as a cause of anxiety, as well as a source of protection from anxiety. Individuals who score highly on the security dimension tend to be hesitant and lack confidence with money and are often distrustful of banks and financial institutions. The retention dimension indicates that people feel the need to plan for the future, placing great importance on preparation and accounting for their finances. It was decided to remove the Distrust dimension originally included from the MAS, and replace it with the Security dimension as it was found in both these scales and deemed a more reliable element to include.

### **5.2.3 Cognitive Style**

The cognitive factors measure two different dimensions, Cognitive and Emotive. The first relates to the amount of financial knowledge an individual possesses. The second

relates to a person's thinking and information processing style. Previous research has shown that the amount of financial knowledge a person holds is related to the debt incurred by that individual (Hayhoe et al., 1999; Norvilitis et al., 2006). Therefore it seems reasonable to assess their level of financial knowledge. This factor will also assess individual's thinking and information processing style as it too relates to a person's cognition. It will assess whether they have a cognitive style and thus think carefully about decisions and avoid buying 'on impulse', instead relying on a more emotive style. Although some statements here may overlap with those in other factors they are believed to be important and will therefore be included.

#### **5.2.4 Economic Behaviour**

This factors will measure an individual's actual behaviour in the 'real-world' as there can often be discrepancies between their behaviour and the opinions they report (Hayhoe et al., 1999). It contains three different dimensions; Credit, Saving and Shopping behaviour. An individual who scores high on the credit dimension will have one or more credit cards or store cards, like using credit cards, pay off the balance each month, and prefer to pay for purchases using credit cards rather than cash. Individuals scoring high on the saving dimension will hold several bank accounts, believe it is important to invest; and put money aside on a regular basis for non-specific events. Finally, individuals who score high on the shopping dimension will reward themselves with a purchase when they feel depressed, will enjoy shopping for non-essential items, will often buy things on impulse and will often feel guilt after purchasing an item that has not been budgeted for. This dimension will assess whether or not an individual is a compulsive buyer (Hanley & Wilhelm, 1992).

### **5.2.5 Background Characteristics**

The financial history factor will measure to what extent an individual was exposed to their parents' behaviour towards money and issues relating to money. Several papers have highlighted the importance of the parents' response to money or the lack of it in shaping the attitudes of their offspring towards it (Doyle, 1992; Hanley & Wilhelm, 1992; Hogg & Vaughan, 1998; Livingstone & Lunt, 1992; Stone & Maury, 2006). This follows the social psychology theory of modelling (Hogg & Vaughan, 1998). At one end of the dimension will be individuals who never considered that they had any money problems or hardship whilst growing up; and at the other will be people who felt like they and their parents had to struggle to make ends meet and budget carefully and constantly. These statements therefore assess the individual's experiences with money whilst they were a child.

### **5.2.6 Psychological Traits**

This factor will assess a person's psychological traits that are related strongly to their financial attitudes and behaviour. Traits such as Conscientiousness, Openness, Risk Aversion and Propensity to Plan are included in this factor. Rather than assess an individual's personality via a separate psychological test, such as the NEO-FFI, this factor will assess the personality traits that specifically relate to money and behaviour around money (Nyhus & Webley, 2001). For example self-esteem (Hanley & Wilhelm, 1992; Norvilitis et al., 2006; Stone & Maury, 2006), risk – those who are aroused by financial risk taking (Carducci & Wong, 1998; Furnham, 1996; Zaleskiewicz, 2001), extroversion – affects frivolity with money, conscientiousness – organisation, and openness – flexible planning.

## **5.2.7 Credit (and Saving) Attitudes**

Individual's attitudes towards the general concepts of credit (debt) and saving will be assessed by this factor; assessing whether participants are pro-credit rather than anti-debt and whether they view being in debt as not managing your money properly or if they feel it is just part of today's society to use credit cards. Several of the items are extracted directly from the original pecuniary questionnaire because analysis showed that in the saving - debt dimension most of the items correlated significantly (over 50% of the time) with the other items within the dimension. This indicates that all items are measuring something to do with saving or debt. The first group of statements in the pecuniary questionnaire are designed to assess individuals' attitudes towards the (general) concept of saving and debt. This group of statements should correlate with specific personality traits thereby indicating which types of people possess certain attitudes toward financial matters. This could in turn suggest who will be more (or less) likely to be susceptible to promotion or advertisements of certain financial products (through the use of an ECA). Although there are different forms of saving (Nyhus & Webley, 2001; Wärneryd, 1999), these statements apply to how an individual feels about saving in general because it is hypothesised that through the analysis of other sets of statements, some of these aspects will be addressed. These statements were designed based on previous research findings where, for example, it has been shown that people who held the attitude that being in debt meant that they were not in control of their finances, were less likely to save (Lunt & Livingstone, 1991).

Two of these pecuniary factors (risk aversion and planning propensity) are under investigation here with regards personalised product portrayals. They have been specifically chosen because they have been suggested as strong predictors of attitudes

and behaviour towards money, and because they lend themselves to be utilised in personalised product portrayals. This will in turn assist in the development an ECA that will be personalised and even predict and/or influence customers' behaviour through their interaction.

### ***5.3 Product Uptake Questionnaire Design***

A questionnaire was designed to assess the effects of the product offer on a set of key attributes. It uses a 7-point scale on which participants indicate the extent to which they agree or disagree to statements that relate to each key attribute. These attributes relate to the manner in which the product offer was communicated as well as the likelihood that the participant will take up that product. The questionnaire employed in this experiment consists of 10 statements which will allow an overall measurement of the feeling towards the product presentation and future purchasing behaviour for each of the designs; in turn this measurement will act as a predictor of customer buying behaviour. See Appendix 9 for the fully formatted product uptake questionnaire.

### ***5.4 Experiment Design and Procedure***

The 3D virtual banking ECA was situated within a 3D virtual branch and offered basic transactions (balance enquiry, ordering a new chequebook) as well as information about the four product offers. After each scenario participants were asked to complete a usability questionnaire relating to that scenario; and a questionnaire to assess the impact of the products. The usability questionnaire items were 7-point Likert attitudinal statements presented randomly via a networked laptop (see Appendix 10 for usability questionnaire). The product uptake questionnaire items were also 7-point Likert scale



statements and presented randomly via a laptop (see Appendix 9 for the product uptake questionnaire). In all questionnaires the statements were as balanced as possible regarding polarity (equal number of positively and negatively worded statements). After participants had experienced all four scenarios they were asked open-ended questions, as part of an exit interview, on their opinions regarding the interactions with each of the product portrayals. They were asked to rate which they felt was the most relevant to them and their current financial situation. The ratings were recording via a 30-point scale so that a numerical score could be placed on participants preferences (see Appendix 11 for exit interview). A short demographic questionnaire was administered at the end of the experiment (see Appendix 12).

The demographic questionnaire contained the same questions as from the previous experiment but also included some more in-depth questions regarding participants' economic behaviour, such as amount of debt, number of loans, saving accounts, credit cards and so on. It also assessed how participants felt about money (symbolically), for example it asked about aspects such as respect, freedom, power and so on. All of these are going to be analysed in conjunction with product choice and Pecuniary Questionnaire results. (See Appendix 12 for the fully formatted questionnaire).

The research aimed to test the following hypotheses:

**H<sub>0A</sub>:** There will be no significant difference between the usability of the four different product portrayals.

**H<sub>1A</sub>:** There will be a significant difference between the usability of the four different product portrayals.

---

**H<sub>0B</sub>:** There will be no significant difference observed in the product relevance ratings for the four different product portrayals.

**H<sub>1B</sub>:** There will be a significant difference observed in the product relevance ratings for the four different product portrayals.

---

<b>H<sub>0C</sub>:</b>	<b>There will be no significant correlations observed between participants' Risk Aversion score and their demographic and economic variables.</b>
<b>H<sub>1C</sub>:</b>	<b>Risk Aversion will significantly correlate with participants' demographic and economic variables.</b>
<b>H<sub>0D</sub>:</b>	<b>There will be no significant correlations observed between participants' Planning Propensity score and their demographic and economic variables.</b>
<b>H<sub>1D</sub>:</b>	<b>Planning propensity will significantly correlate with participants' demographic and economic variables.</b>
<b>H<sub>0E</sub>:</b>	<b>There will be no significant difference between the overall product uptake scores for the four different product portrayals.</b>
<b>H<sub>1E</sub>:</b>	<b>There will be a significant difference between the overall product uptake scores for the four different product portrayals.</b>
<b>H<sub>0F</sub>:</b>	<b>There will be no significant difference between customers (pertaining to their financial attitudes as reflected in the pecuniary questionnaire).</b>
<b>H<sub>1F</sub>:</b>	<b>There will be a significant difference between customers (pertaining to their financial attitudes as reflected in the pecuniary questionnaire).</b>

The dependent variables in the experiment were the responses to the individual statements in the usability questionnaire and product uptake questionnaire, the perceived relevance of the products, and participants' financial and economic attitudes as measured by the pecuniary questionnaire. The independent variables were the four different treatments (two products, two different portrayals for each) as well as participant gender and age group. The experiment used a repeated-measures within-subject design and the order of the presentation of the four scenarios was balanced across participants.

The key experiment variables used in the four portrayals were high versus low planning propensity (for a savings product) and high versus low risk aversion (for an investment product). These were presented to participants in 1 of 4 possible sequences, balanced using a Latin Square design with 4 orders (Table 5.12). The agent performed gestures,

exhibited general life signs, and typed into a virtual keyboard for effect; he spoke (pre-recorded audio prompts) and moved in an extroverted manner according to the results of the previous experiment in which this personality performed the best in an eBanking scenario.

<b>Order 1</b>	HPP	LPP	HRA	LRA
<b>Order 2</b>	LPP	LRA	HPP	HRA
<b>Order 3</b>	HRA	HPP	LRA	LPP
<b>Order 4</b>	LRA	HRA	LPP	HPP

**Key:**

<b>HPP</b>	High Planning Propensity	<b>LPP</b>	Low Planning Propensity	<b>HRA</b>	High Risk Averse	<b>LRA</b>	Low Risk Averse
------------	--------------------------	------------	-------------------------	------------	------------------	------------	-----------------

**Table 5.12: Latin Square Design**

A sample of 65 customers of the case bank was recruited for the 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 18-35 and 36 and over, see Table 5.13) to allow gender biases and preferences to be investigated as well as the attitudes and preferences of the different age groups.

<b>Participants</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
<b>Age 18 - 35</b>	15	15	30
<b>Age 36 and over</b>	16	19	35
<b>Total</b>	31	34	65

**Table 5.13: Participants Gender by Age Group Analysis**

Each participant experienced the four scenarios via a large 800x450 plasma screen and sat approximately 2 feet away. The distance from the screen was judged to be the most comfortable and suitable, was kept constant throughout the experiment and tested using five colleagues. Once the first task was completed (a balance enquiry or a chequebook request), the agent asked if there is anything else they could help with and the participant was instructed to continue with their second task. While the agent was

carrying out the second task, they informed the customer that they were looking at the recent transactions on their account and believed that they had a product that would be of benefit to them. It was hypothesised for the experiment that participant categorisations of pecuniary traits in terms of risk aversion and planning propensity would represent strong predictors of attitudes and reactions towards the individualised product portrayals. Therefore two levels of each pecuniary category were explored in the four treatments of the experiment. The agent recommended to the customer one of two product types, in one of two possible ways (a high or low planning propensity portrayal for a savings account, and a high or low risk aversion portrayal for an investment account). Table 5.14 displays the products and the key features of their portrayals. Once the agent has presented the information they asked the participants if they would like to know about this product and the participant would respond with a yes or no (see Appendix 13 for the agent script). This response was recorded and used as one of the measures of the effectiveness of the product portrayal.

<b>Product Offer Portrayals</b>	<b>Product Information Exploited in each Portrayal</b>
<b>High Planning Propensity</b>	<ul style="list-style-type: none"> <li>• Monthly Saver Account</li> <li>• Gross Fixed Interest Rate 8% for 1 Full Year</li> <li>• Will Automatically Convert to a Guaranteed Tracker</li> <li>• Tracks Bank of England Base Rate</li> <li>• Save Regularly Whilst Receiving Best Interest Rate</li> <li>• Pay in up to £500 in the First 7 Days</li> </ul>
<b>Low Planning Propensity</b>	<ul style="list-style-type: none"> <li>• Monthly Saver Account</li> <li>• Gross Fixed Interest Rate 8% for 1 Full Year</li> <li>• Instant Access</li> <li>• Offers Flexibility</li> <li>• You Choose How much You Pay in Each Month</li> <li>• Unrestricted Access for Unexpected Events</li> </ul>
<b>High Risk Aversion</b>	<ul style="list-style-type: none"> <li>• Guaranteed Investment Account</li> <li>• No Risk and Guaranteed 15% Gross Minimum Return</li> <li>• Benefits from 75% of Stock Market Growth</li> <li>• Watch your money grow without the risks associated with stocks and shares</li> </ul>
<b>Low</b>	<ul style="list-style-type: none"> <li>• Guaranteed Investment Account</li> <li>• Guaranteed 15% Gross Minimum Return</li> </ul>

<b>Risk Aversion</b>	<ul style="list-style-type: none"> <li>• Benefit from 75% of Stock Market Growth</li> <li>• Flexibility to Invest More</li> <li>• No Initial or Annual Charges</li> </ul>
----------------------	---

**Table 5.14: The Text Box Information**

The experiment was designed to use an extrovert male agent (that had been tested in a previous experiment) to assess customer attitude to usability and the impact of four different individualised product portrayals in an eBanking scenario. This experiment was also designed to assess the possible correlation between consumers’ financial attitudes and their demographic and economic variables. Although there has been research into this area previously, such links, if established may help to go some way to predicting consumer’s behaviour and even influencing or directing that behaviour through the use of the agent technology.

See Table 5.15 for an experiment summary.

<b>3D Agent: Product Portrayal and Pecuniary Questionnaire Administration. Experiment 2 Design Details</b>	
<b>Experiment purpose:</b>	Experimental exploration of individualised product portrayal by 3D embodied conversational agents within a financial setting and the development administration of the pecuniary questionnaire.
<b>Experiment hypotheses:</b>	<p>H<sub>1A</sub>: There will be a significant difference between the usability of the four different product portrayals.</p> <p>H<sub>1B</sub>: There will be a significant difference observed in the product relevance ratings for the four different product portrayals.</p> <p>H<sub>1C</sub>: There will be a significant difference between the overall product uptake scores for the four different product portrayals.</p> <p>H<sub>1D</sub>: Risk Aversion will significantly correlate with participants' demographic and economic variables.</p> <p>H<sub>1E</sub>: Planning propensity will significantly correlate with participants' demographic and economic variables.</p> <p>H<sub>1F</sub>: There will be a significant difference between customers (pertaining to their financial attitudes).</p>
<b>Experiment design:</b>	Participants experience 4 different product portrays, (2 for planning propensity and 2 for risk aversion), perform 2 tasks, in a 4 cell, repeated measures, within-subjects design, and balanced exposure.
<b>Dependent variables:</b>	<p>Perceived usability and attitude toward agent and product</p> <p>Satisfaction of interaction rating data (30cm sliding scale) and Rank order (preference)</p> <p>Satisfaction with the agent rating data (30cm sliding scale) and Rank order (preference)</p> <p>Likelihood of product purchase ratings (from most to least)</p>
<b>Other data:</b>	Demographic and Economic data. Exit questionnaire data. Pecuniary Questionnaire data.
<b>Independent variables:</b>	<p>Experiment - 4 treatments (Low-level risk product, high-level risk product, short-term planning product and long-term planning product)</p> <p>Participant - Gender (2 genders, balanced), age group (2 groups, balanced)</p>
<b>Confounding variables:</b>	<p>Researcher bias (randomised)</p> <p>Experiment Room (randomised)</p> <p>Tasks (matched task sheets)</p>
<b>Cohort:</b>	<p>N = 64</p> <p>4 orders x 2 genders x 2 age groups = 16 x 4 = 64</p>
<b>Honorarium</b>	Personal cheque for £30
<b>Duration:</b>	60 minutes. Experiment to run over 1 week

**Table 5.15: Experiment Summary**

## 5.5 Results

### 5.5.1 Usability Questionnaire Results

### 5.5.2 Mean Usability Scores

The usability data were analysed by a series of repeated measure ANOVA analyses looking at product, version order, age group and participant gender, whether or not participants attended higher education, and whether or not they have dependants. The Greenhouse-Geiser<sup>12</sup> statistic was extracted to assess significance levels.

Table 5.16 displays the mean usability scores.

Product Portrayal	Mean Usability Score
High Planning Propensity (HPP)	5.30
Low Planning Propensity (LPP)	5.37
High Risk Averse (HRA)	5.23
Low Risk Averse (LRA)	5.27

**Table 5.16: Mean Usability Scores for the Four Different Product Portrayals**

There are no within-subjects effects on the mean usability.

Table 5.17 displays the four significant between subjects effect of version order ( $p=0.013$ ,  $F=4.235$ ), age ( $p=0.041$ ,  $F=4.404$ ), version order\*age ( $p=0.028$ ,  $F=3.486$ ) and version order\*higher education ( $p=0.026$ ,  $F=3.563$ ) on the mean usability score.

---

<sup>12</sup> **Greenhouse-Geiser** is a very conservative statistic used to check for significance (after checking the Mauchley's Test for Sphericity), often used when conducting repeated measure ANOVA's.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4131.356	1	4131.356	3014.991	.000
Version_Order	17.409	3	5.803	4.235	.013
Age	7.234	1	7.234	5.279	.029
Gender	2.743	1	2.743	2.002	.168
Higher_Ed	4.035	1	4.035	2.945	.097
Dependants	4.464	1	4.464	3.258	.081
Version_Order * Age	14.332	3	4.777	3.486	.028
Version_Order * Gender	.233	3	.078	.057	.982
Age * Gender	2.146	1	2.146	1.566	.221
Version_Order * Higher_Ed	14.648	3	4.883	3.563	.026
Age * Higher_Ed	.008	1	.008	.006	.940
Gender * Higher_Ed	.001	1	.001	.000	.985
Version_Order * Dependants	7.602	3	2.534	1.849	.160
Age * Dependants	2.519	1	2.519	1.838	.186
Gender * Dependants	.134	1	.134	.097	.757
Error	39.738	29	1.370		

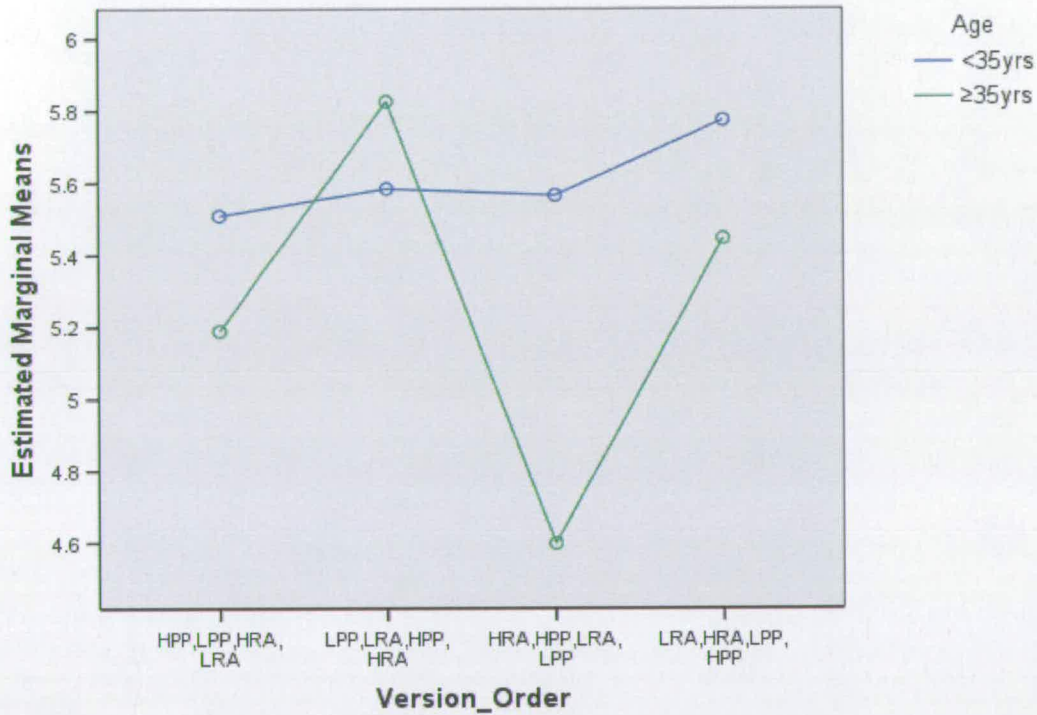
**Table 5.17: Tests of Between-Subjects Effects on the mean Usability Scores**

Participants who experienced version order 2 rated their interactions as significantly higher ( $M=5.75$ ) in terms of usability than those who experienced version order 3 ( $M=4.92$ ). Younger participants also rated their overall experience in terms of usability significantly higher ( $M=5.61$ ) than the older participants ( $M=5.26$ ).

The main result from the interaction effect of version order\*age is that the younger group of participants rated their interactions overall more positively in terms of usability apart from those who experienced version order 2 (see Figure 5.1). During version order 2, the 36's and over rated their interactions higher ( $M=5.83$ ) than the 35's and under ( $M=5.58$ ). The other result to note is that for the 36's and over they rated version order 3 interactions lowest in terms of usability ( $M=4.59$ ).



**Estimated Marginal Means of Version Order Against Age for the Mean Usability Scores**



**Figure 5.1: Estimated Marginal Means of Version Order Against Age for the Mean Usability Scores**

The interaction effect of version order\*higher education can be seen in Figure 5.12 below. In general those with no type of higher education rated their interactions higher (version order 1 M=5.56, 2 M=6.13, 4 M=5.64) in terms of usability compared to those who have some (version order 1 M=5.16, 2 M=5.64, 4 M=5.48), except for those who experienced version order 3 (no higher education M=4.76, higher education M=5.00).

Estimated Marginal Means of Version Order Against Higher Education for the Mean Usability Scores

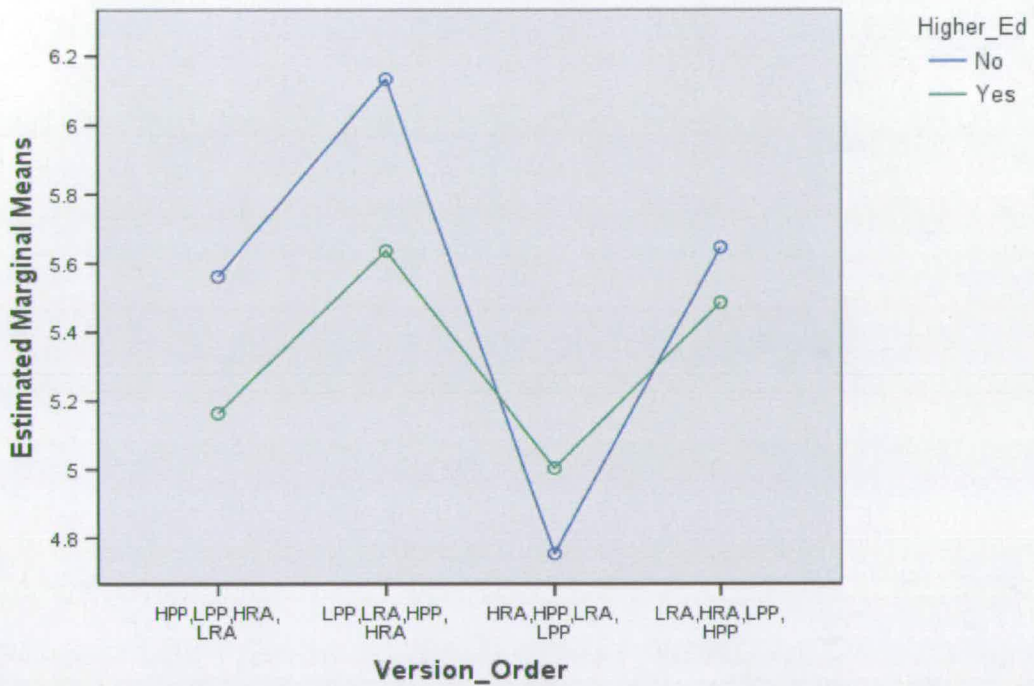


Figure 5.12: Estimated Marginal Means of Version Order Against Higher Education for the Mean Usability Scores

### 5.5.3 Individual Usability Attribute Analysis

#### Usability Attribute – “Interact Again”

There are no significant within subject differences for the usability attribute “interact again”.

There are three between subject differences for the usability attribute “interact again”; age ( $p=0.04$ ,  $F=4.618$ ), version order\*age ( $p=0.002$ ,  $F=6.271$ ) and version order\*dependants ( $p=0.027$ ,  $F=3.515$ ). See Table 5.18 in Appendix 14.

Older participants were slightly less happy to interact with the agent again ( $M=5.17$ ) than the younger group ( $M=5.53$ ). But both age groups were happy to interact with the agent again, indicated by the scores both reaching 5 or above.

Figure 5.13 displays the estimated marginal means for the interaction effect of age\*version order. From this it can be seen that the most noticeable differences occurred for those participants who experienced version orders 2 (LPP, LRA, HPP, HRA) and 3 (LRA, HRA, LPP, HPP). Older participants ( $\geq 36$  yrs) said overall they would be more happy to interact again with the agent ( $M=5.84$ ) compared to the younger group ( $\geq 35$  yrs) ( $M=5.08$ ). For version order 3 it was the 35's and under who responded more positively to this statement ( $M=5.57$ ), whereas the over 36's remained neutral.

Estimated Marginal Means of Age against Version Order for Usability Attribute "Interact Again"

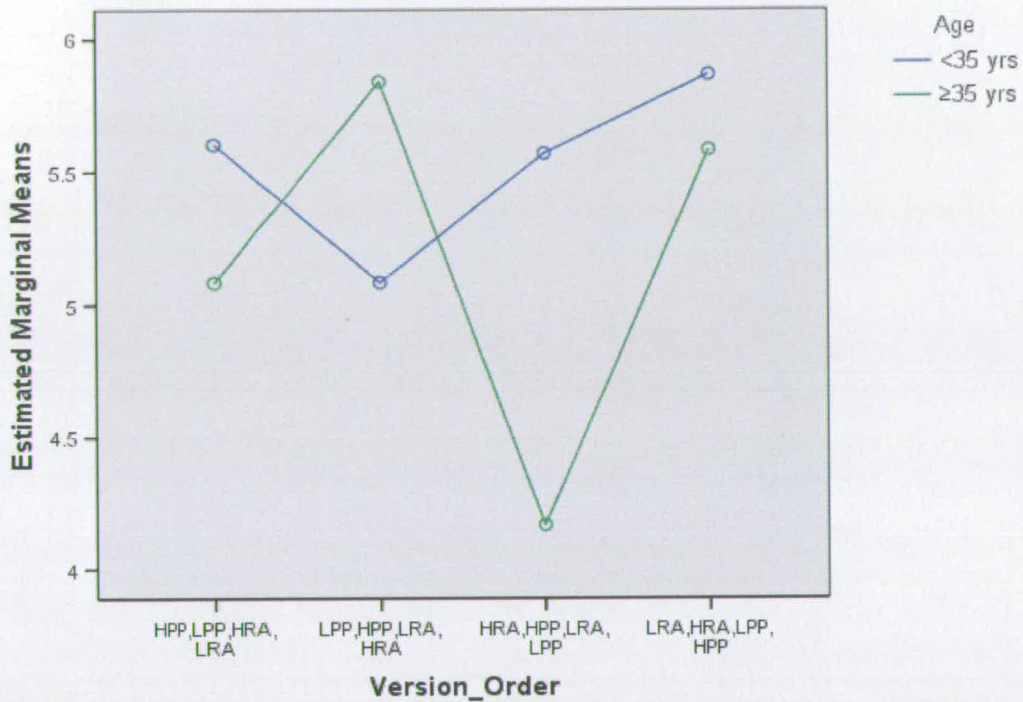
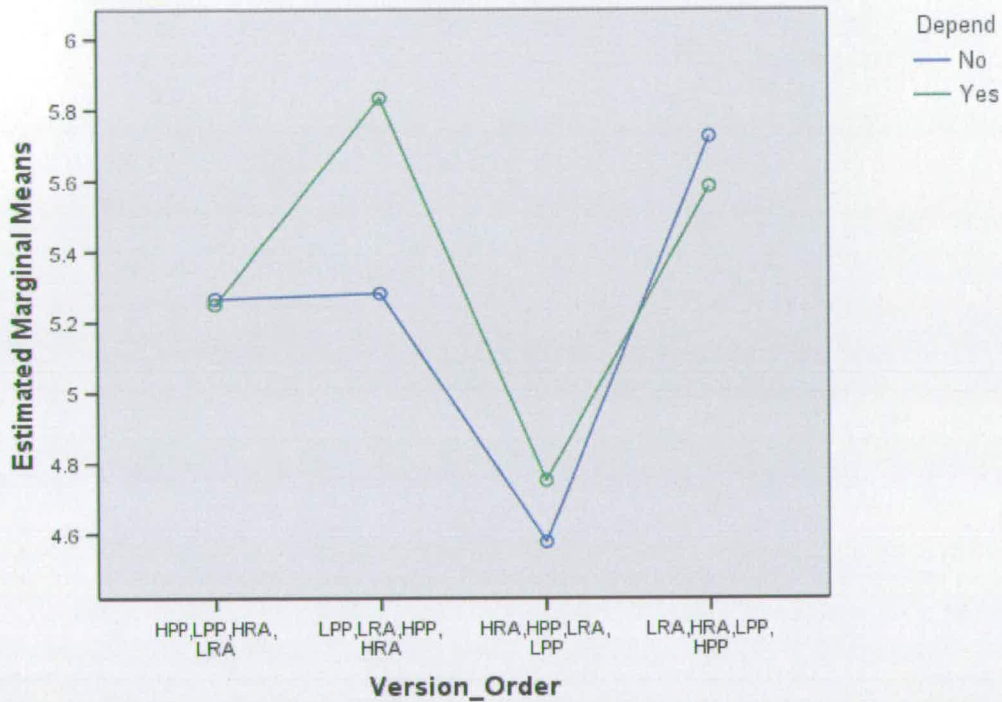


Figure 5.13: Estimated Marginal Means of Version Order Against Age for Attribute "Interact Again"

The interaction effect of version order\*dependants is displayed in Figure 5.14. From this it can be seen that in all version orders whether or not they had dependants did not affect whether or not they would be happy to interact with the agent again. However for the second version order those with no dependants were slightly less happy to interact again with the agent (M=5.28) then those who have dependants (M=5.83). However, in all the cases the scores were above 5 indicating that all groups would be happy to interact with the agent again.

**Estimated Marginal Means of Version Order against Dependants for Usability Attribute "Interact Again"**



**Figure 5.14: Estimated Marginal Means of Version Order Against Dependants for Attribute "Interact Again"**

**Usability Attribute – “Spoke Clearly”**

There no significant effects on the usability attribute “spoke clearly”. The mean scores were all 5 or above indicating that participants felt that the agent spoke clearly.

**Usability Attribute – “Intimidated”**

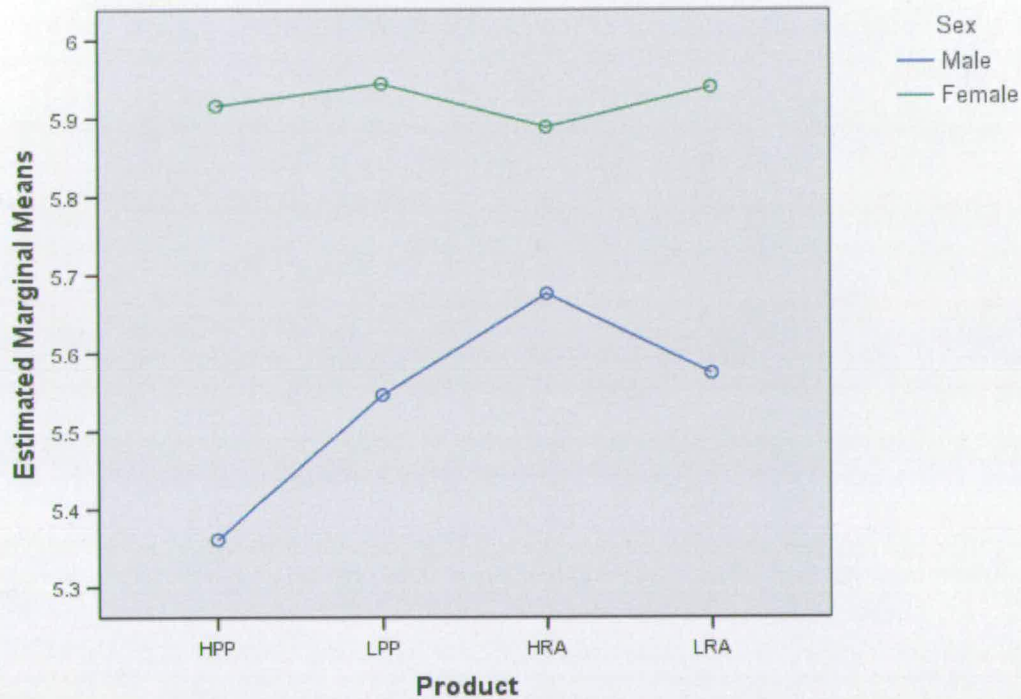
There was one significant between-subjects effect of dependants on the usability attribute “Intimidated” ( $p=0.041$ ,  $F=4.584$ ) (Table 5.19 in Appendix 14). On closer inspection of the pairwise comparisons however reveal that this difference is in fact not significant (Table 5.20 in Appendix 14). Participants who have dependants felt slightly less intimidated ( $M=5.97$ ) than those who have none ( $M=5.76$ ), however both

groups scored quite highly (above 5), indicating that neither really felt intimidated at all.

### **Usability Attribute – “Information Reliable”**

There is one significant within-subject interaction effect of product\*gender ( $p=0.007$ ,  $F=4.841$ ) for the usability attribute “information reliable” (see Table 5.21 in Appendix 14). Overall it can be seen from Figure 5.15 that participants agreed or slightly agreed that the information they received during all the presentations was reliable. This is indicated by the means reaching 5 or above. Overall females consistently rated the information they received about each product as more reliable (HPP  $M=5.92$ , LPP  $M=5.94$ , HRA  $M=5.90$ , LRA  $M=5.94$ ) than the males (HPP  $M=5.36$ , LPP  $M=5.55$ , HRA  $M=5.68$ , LRA  $M=5.57$ ).

**Estimated Marginal Means of Gender Against Product for Usability Attribute "Information Reliable"**



**Figure 5.15: Estimated Marginal Means of Gender Against Product for the Attribute "Information Reliable"**

There are two significant between-subjects effects of version order and gender on the usability attribute "information reliable" (see Table 5.22 in Appendix 14). The only significant differences occurred between the second and third version orders, where participants who experienced the second version felt that the information was slightly more reliable ( $M=6.0$ ) than those who experienced the third version order ( $M=5.47$ ). Females ( $M=5.92$ ) felt that the information they received was slightly more reliable than the males ( $M=5.54$ ) however both groups scored positively for this attribute.

### **Usability Attribute – “Confused”**

There were no significant effects for the usability attribute “confused”. The mean scores were all 5 or above indicating that overall participants did not feel confused during the interactions.

### **Usability Attribute – “Difficult”**

There are two significant between-subject effects of version order ( $p=0.009$ ,  $F=4.596$ ) and an interaction effect of version order\*higher education ( $p=0.02$ ,  $F=3.827$ ) on the usability attribute “difficult”. See Table 5.23 in Appendix 14.

There is a significant difference between participants’ scores who experienced version order 2 and version order 3. Those who experienced LPP, LRA, HPP, HRA products rated the interactions as less difficult ( $M=5.97$ ) than those who experienced HRA, HPP, LRA, LPP ( $M=4.9$ ).

Participants who have not attended any type of higher education establishment and experienced version order 3 gave the lowest scores for this attribution ( $M=4.54$ ), however these results still indicate that no groups of participants’ felt that the interaction was difficult. See Figure 5.16 below.



Estimated Marginal Means of Version Order Against Higher Education for Usability Attribute "Difficult"

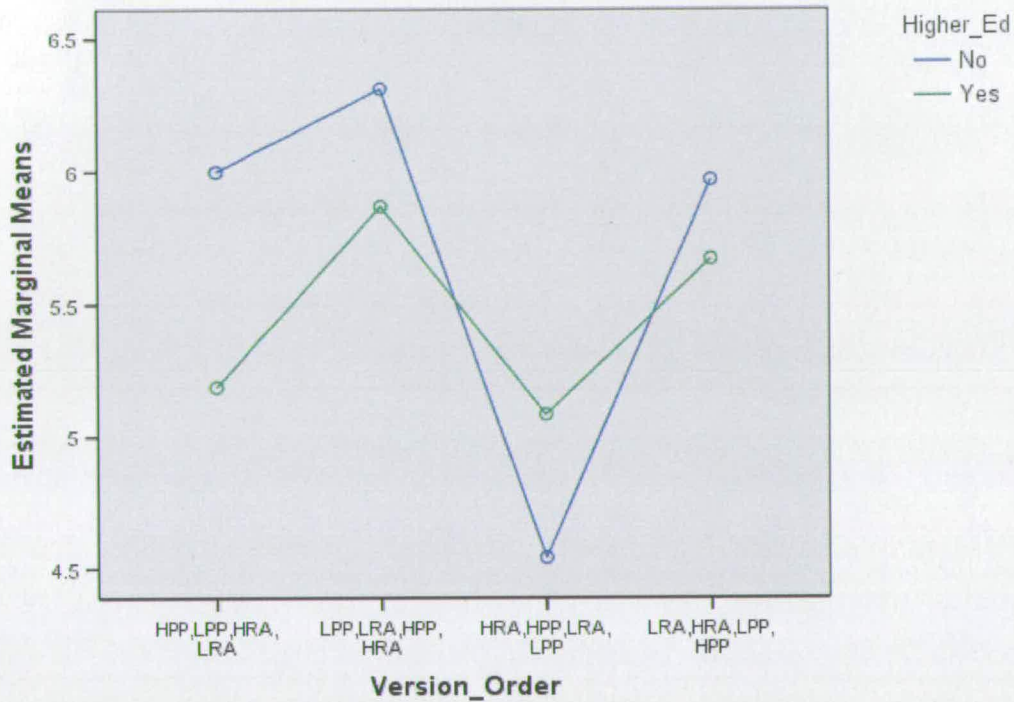


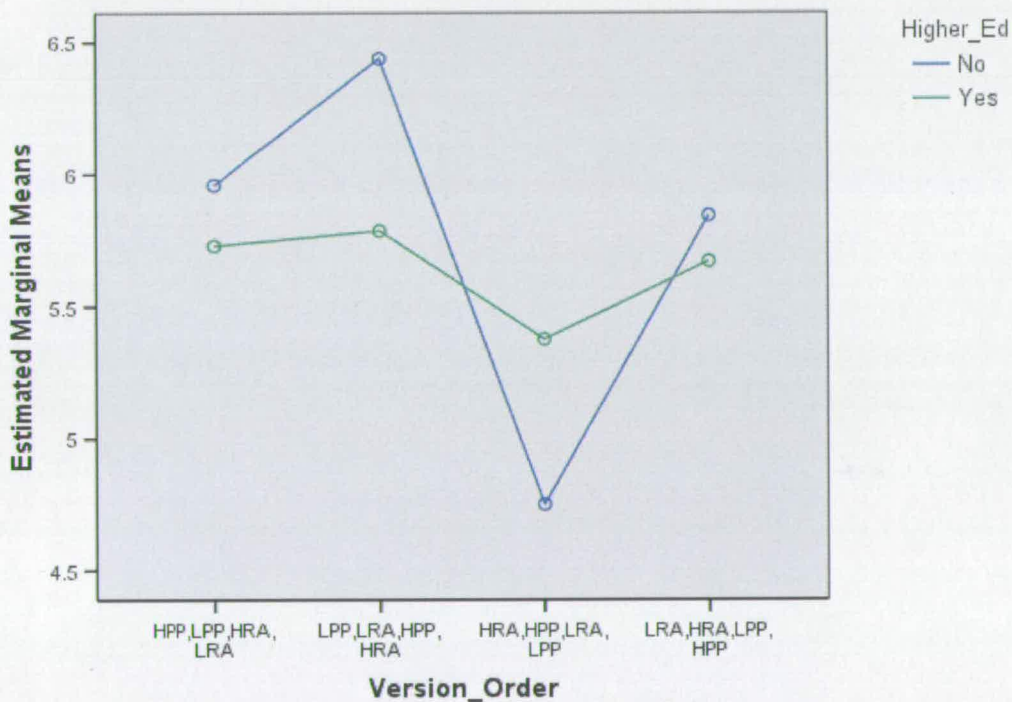
Figure 5.16: Estimated Marginal Means of Version Order Against Higher Education for the Attribute "Difficult"

### Usability Attribute – "Stressed"

There are two significant between-subject effects of dependants ( $p=0.04$ ,  $F=4.636$ ) and version order\*higher education interaction effect ( $p=0.045$ ,  $F=3.044$ ) for the usability attribute "stressed". See Table 5.24 in Appendix 14.

Closer inspection of the pairwise comparisons reveals that there is not a significant difference between participants who have dependants (M=5.73) and those who do not (M=5.61). Again however it should be noted even though there is a significant difference between them they are both above 5, indicating a general positive response.

**Estimated Marginal Means of Version Order Against Higher Education for the Usability Attribute "Stressed"**

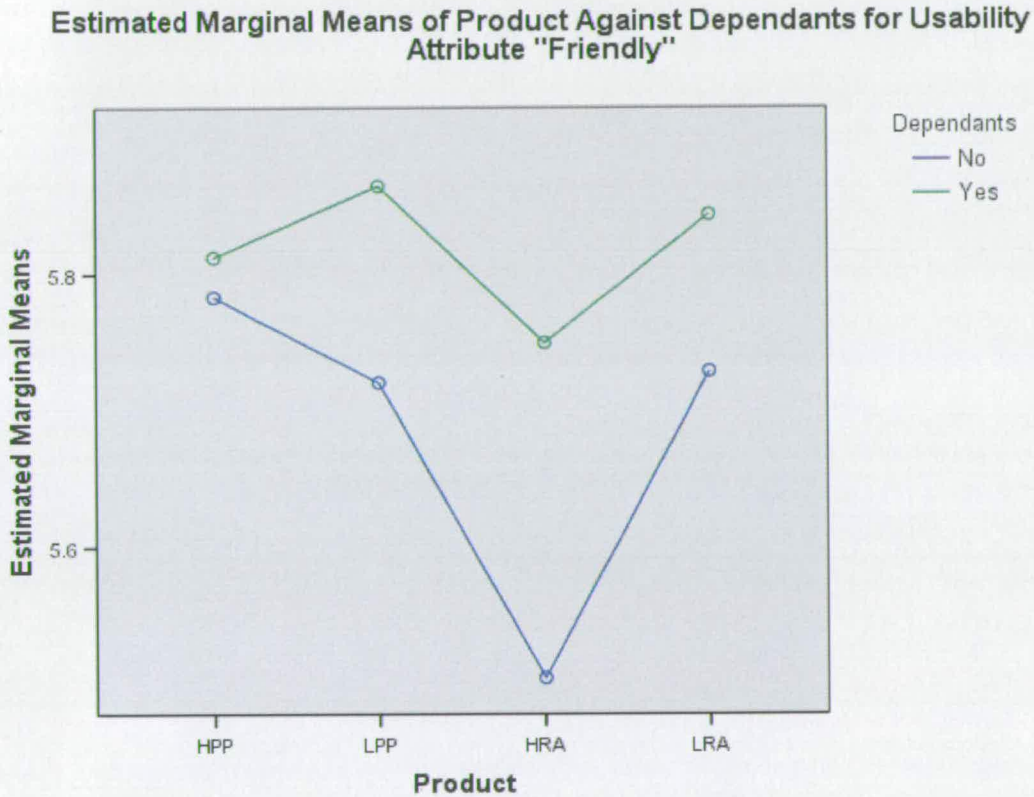


**Figure 5.17: Estimated Marginal Means of Version Order Against Higher Education for the Attribute "Stressed"**

**Usability Attribute – "Friendly"**

There was one significant within-subject interaction effect of Product\*Dependants ( $p=0.04$ ,  $F=3.083$ ) on the usability attribute "friendly" (see Table 5.25 in Appendix 14). Whether or not a participant has dependants or not only seems to make a significant difference when the High Risk Averse product portrayal was experienced. Those with no dependants felt that the agent was less friendly (M=5.50) when they experience the High Risk Averse product, compared to the other product portrayals

(HPP M=5.78, LPP M=5.72, and LRA M=5.73). For a graphical display see Figure 5.18 below.



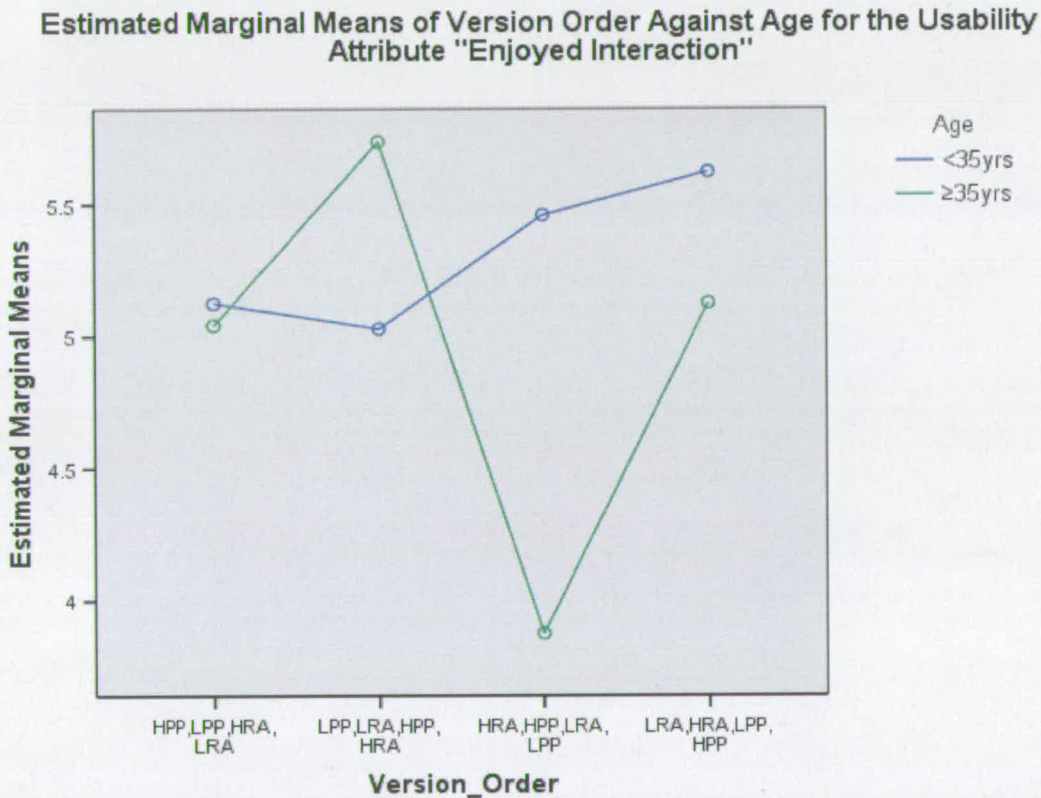
**Figure 5.18: Estimated Marginal Means of Product Against Dependants for the Attribute "Friendly"**

**Usability Attribute – "Enjoyed Interaction"**

There are three significant between subject effects for the usability attribute "enjoyed interaction", Age ( $p=0.003$ ,  $F=10.734$ ), Dependants ( $p=0.017$ ,  $F=6.412$ ) and the interaction effect of Version Order\*Age ( $p=0.006$ ,  $F=5.022$ ). See Table 5.26 in Appendix 14.

The younger age group ( $M=5.31$ ) enjoyed the interactions significantly more than then older group ( $M=4.94$ ). Those with dependants ( $M=5.25$ ) rated the interactions

slightly more enjoyable than those without ( $M=4.92$ ). The interaction effect of version order\*age (see Figure 5.19) shows that the older age group rated the interactions as less enjoyable than the younger group particularly when they experienced version order 3 (HRA, HPP, LRA, LPP) ( $\geq 36$  yrs  $M=3.88$ ,  $\leq 35$  yrs  $M=5.46$ ) but not for version order 2 (LPP, LRA, HPP, HRA) ( $\geq 36$  yrs  $M=5.74$ ,  $\leq 35$  yrs  $M=5.03$ ).



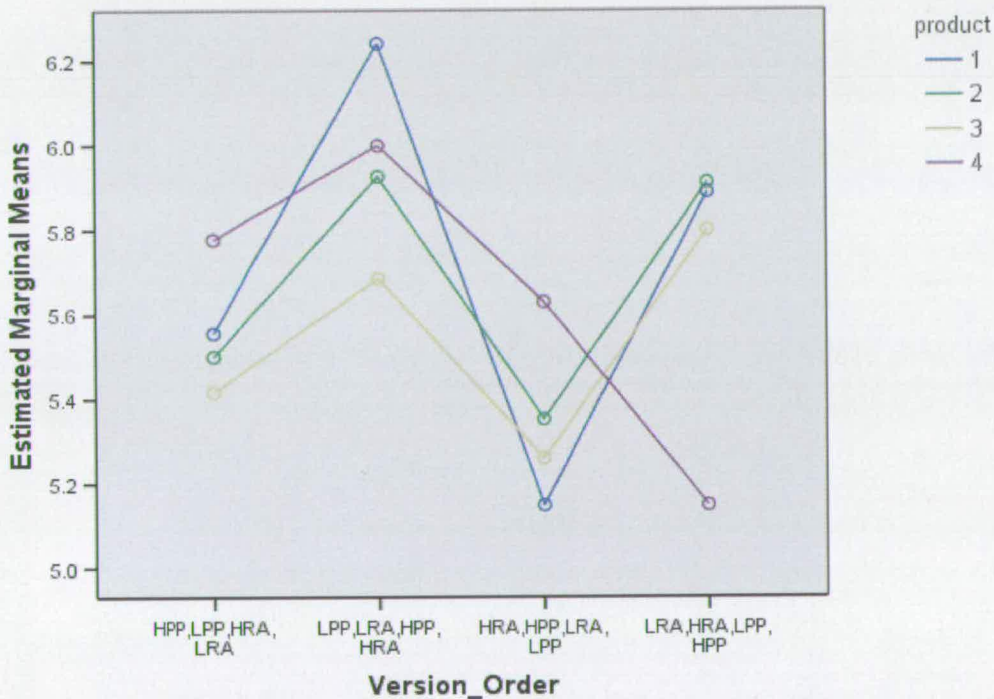
**Figure 5.19: Estimated Marginal Means of Version Order Against Age for the Attribute "Enjoyed Interaction"**

#### Usability Attribute – "Flustered"

There is one significant within-subject interaction effect of product\*version order ( $p=0.011$ ,  $F=2.742$ ) order on the usability attribute "flustered" (see Table 5.27 in Appendix 14). Participants who experienced version order 1 (HPP, LPP, HRA, LRA) and 2 (LPP, LRA, HPP, HRA) felt most flustered during the HRA ( $M=5.45$ ,  $M=5.36$ , respectively) product portrayal. However participants who experienced version order

3 (HRA, HPP, LRA, LPP) felt the most flustered during the scenario where they heard information about the HPP product (M=5.38). Participants who experienced version order 4 (LRA, HRA, LPP, HPP) felt the most flustered during the scenario where they heard the information about the LRA product (M=5.27). See Figure 5.20.

**Estimated Marginal Means of Version Order Against Product for the Usability Attribute "Flustered"**



**Figure 5.20: Estimated Marginal Means of Product Against Version Order for the Attribute "Flustered"**

There are no between-subjects effects for the usability attribute "flustered".

**Usability Attribute – "Engaged with Service"**

There were no significant within-subject effects for the usability attribute "engaged with service". There was one significant between-subjects effect of Version Order ( $p=0.008$ ,  $F=4.805$ ). See Table 5.28 in Appendix 14.

Version orders 2 (LPP,LRA,HPP,HRA) ( $M=5.56$ ) and 3 (HRA,HPP,LRA,LPP) ( $M=4.22$ ) were significantly different from each other as well as 3 and 4 (LRA,HRA,LPP,HPP) ( $M=5.47$ ).

#### **Usability Attribute – “Didn’t like voice”**

There is one significant between subject effect of gender ( $p=0.017$ ,  $F=6.451$ ) on the usability attribute “didn’t like voice” (see Table 5.29 in Appendix 14). The males rated that they like the voice slightly less ( $M=5.46$ ) than the females ( $M=5.78$ ).

#### **Usability Attribute – “Prefer Real”**

There were no significant effects for the usability attribute “prefer real”. Overall participants rated this attribute as either neutral or just below neutral indicating that there is only a slight preference to talk to a real person over the ECA.

#### **Usability Attribute – “Control”**

There were no within-subject effects that reached significance for the usability attribute “control”. Participants rated all scenarios 5 or above indicating that they felt in control during all of them.

There was five significant between-subject effects of version order ( $p=0.005$ ,  $F=5.190$ ), age ( $p=0.007$ ,  $F=8.279$ ), higher education ( $p=0.022$ ,  $F=5.849$ ), version order\*age ( $p=0.031$ ,  $F=3.380$ ) and version order\*higher education ( $p=0.024$ ,  $F=3.640$ ) on the usability attribute “control”. See Table 5.30 in Appendix 14.

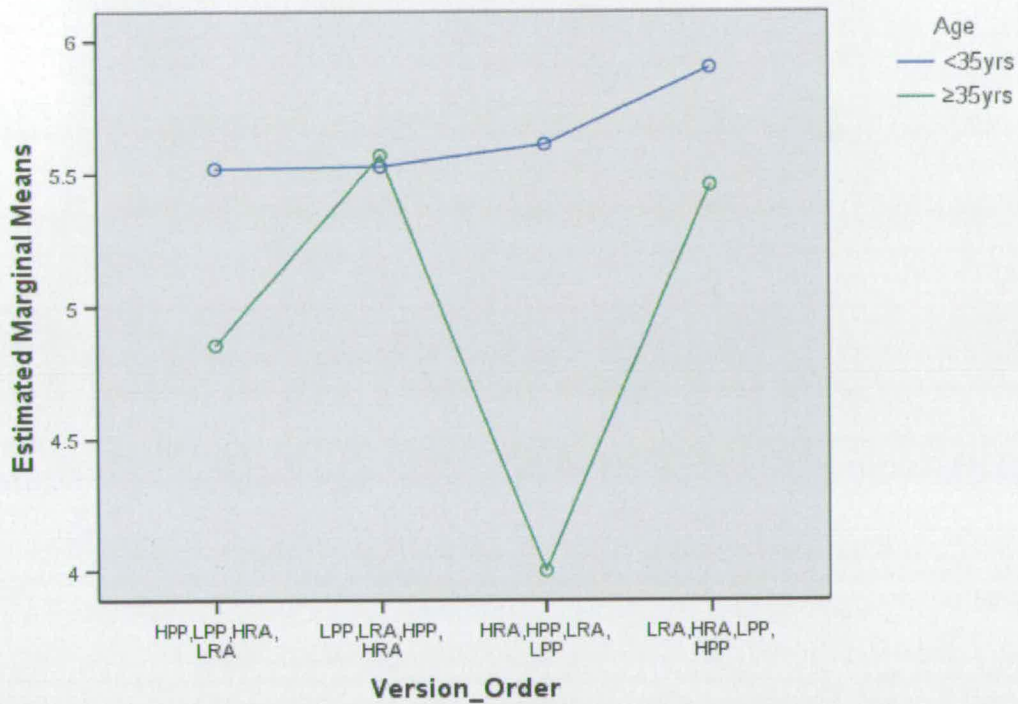
Participants felt significantly more in control when they experienced version order 2 (LPP, LRA, HPP, HRA) ( $M=5.56$ ) and version order 4 (LRA, HRA, LPP, HPP) ( $M=5.61$ ) compared to version order 3 (HRA, HPP, LRA, LPP) ( $M=4.54$ ).

Younger ( $<35$  yrs) participants felt more in control ( $M=5.64$ ) than the older ( $\geq 35$  yrs) participants ( $M=4.97$ ).

Those participants who have not had some kind of higher education felt slightly more in control ( $M=5.5$ ) than those who have ( $M=5.04$ ).

The main difference observed for the version order\*age interaction is that during the third version order (HRA, HPP, LRA, LPP), younger participants felt more in control ( $M=5.61$ ) during these interactions than the older group ( $M=4.0$ ), who felt neutral (see Figure 5.21 below).

**Estimated Marginal Means of Version Order Against Age for the Usability Attribute "Control"**

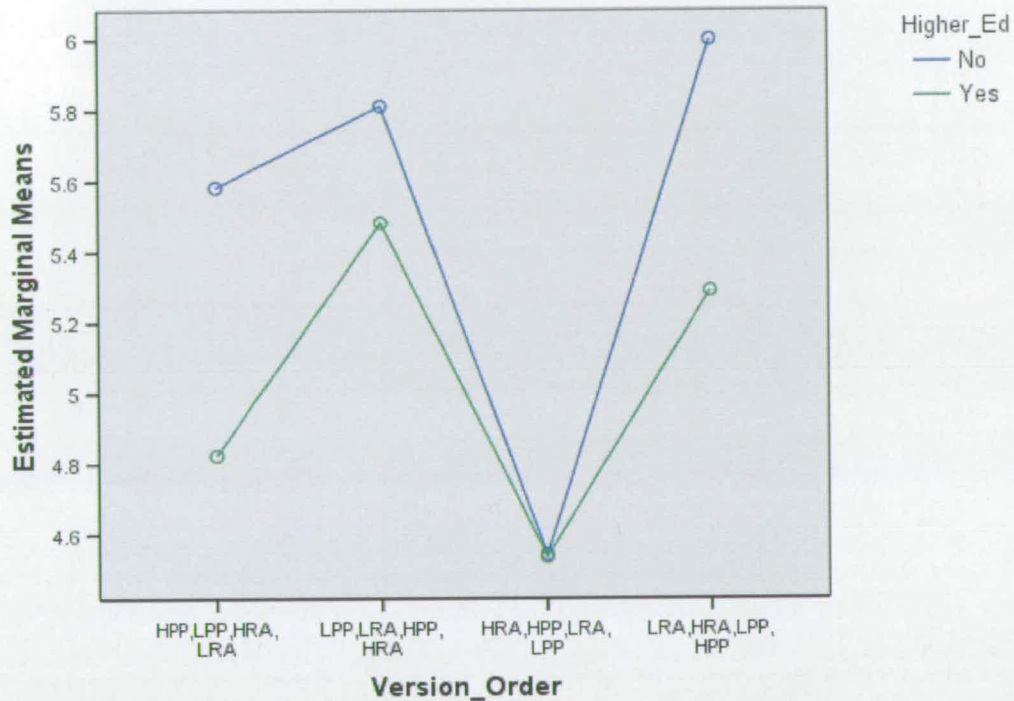


**Figure 5.21: Estimated Marginal Means of Version Order Against Age for the Attribute "Control"**

The main result from the interaction effect of version order\*higher education is both groups felt least in control when experiencing version order three but differed more noticeably on version order 1 and 4. Those participants who have had some type of higher education felt less in control than those who have had none particularly for version orders 1 (M=4.82) and 4 (M=5.29), compared to those with none 1 (M=5.58) and 4 (M=6.0). See Figure 5.22 below.



**Estimated Marginal Means of Version Order Against Higher Education for the Usability Attribute "Control"**



**Figure 5.22: Estimated Marginal Means of Version Order Against Higher Education for the Attribute "Control"**

**Usability Attribute – "Concentration"**

There was six significant between-subject effects of version order ( $p=0.014$ ,  $F=4.204$ ), age ( $p=0.004$ ,  $F=9.695$ ), dependants ( $p=0.042$ ,  $F=4.514$ ), version order\*age ( $p=0.043$ ,  $F=3.083$ ), version order\*dependants ( $p=0.017$ ,  $F=3.992$ ) and age\*dependants ( $p=0.018$ ,  $F=6.303$ ) on the usability attribute "concentration". See Table 5.31 in Appendix 14.

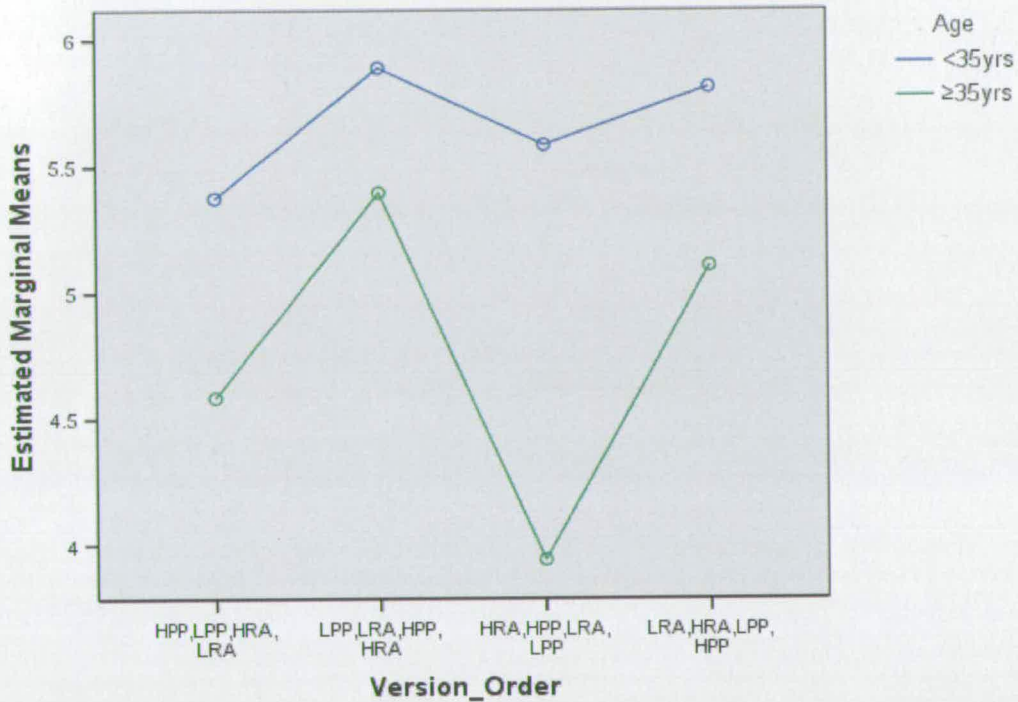
The only significant difference for version order occurred between 2 and 3. Participants felt they had to concentrate more during the interactions of version order 3 (M=4.49) compared to 2 (M=5.56).

Overall older participants felt that they had to concentrate more (M=4.76) than the younger group (M=5.67).

Participants with dependants felt that they had to concentrate slightly more (M=4.99) overall during the interactions compared to those who did not have any. (M=5.11). It should be noted that this result is only just significant ( $p=0.042$ ) and therefore probably due to chance.

Figure 5.23 below shows the interaction effect of version order\*age. The older age group had to concentrate more in all the version orders but particularly for version order 1 (M=4.58) and 3 (M=3.94) compared to the younger group version order 1 (M=5.38) and 3 (M=5.58). This effect is only just significant however ( $p=0.043$ ) and likely to be done to chance.

**Estimated Marginal Means of Version Order Against Age for the Usability Attribute "Concentrate"**



**Figure 5.23: Estimated Marginal Means for Version Order Against Age for the Attribute "Concentrate"**

Figure 5.24 displays the interaction of version order\*dependants. From this it can be seen that those with dependants had to concentrate harder than those without during all the different version orders, apart from version order 3 (M=4.67, M=4.4 respectively)

Estimated Marginal Means of Version Order Against Dependants for the Usability Attribute "Concentrate"

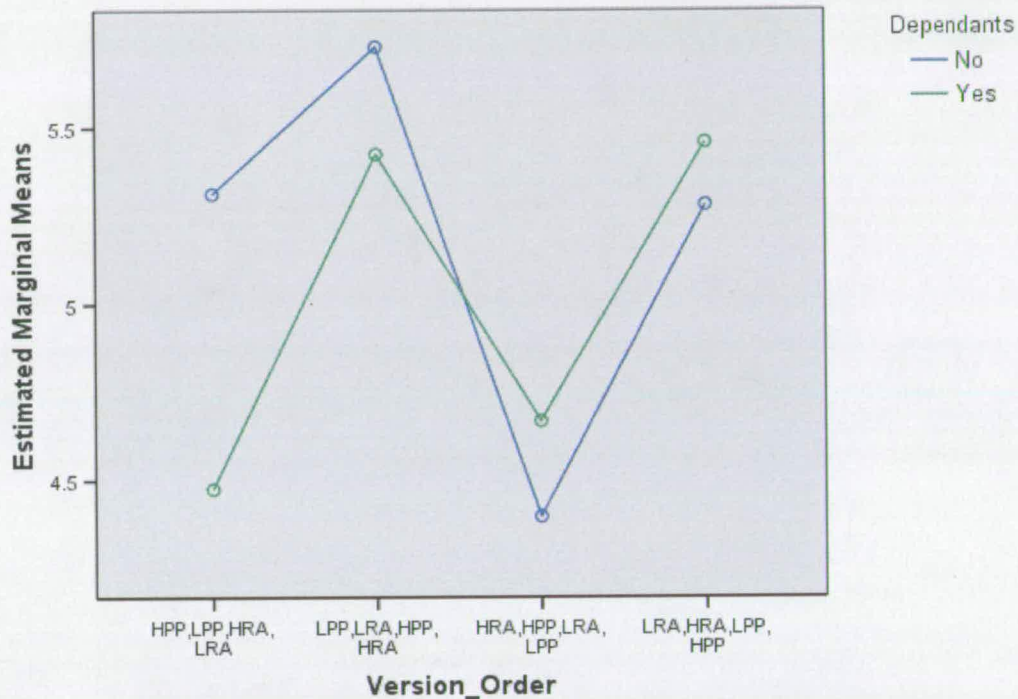


Figure 5.24: Estimated Marginal Means for Version Order Against Dependants for the Attribute "Concentrate"

The last interaction effect of age\*dependants shows that the younger group of participants felt they had to concentrate less (no dependants  $M=5.59$ , dependants  $M=6.06$ ) overall than the older group (no dependants  $M=4.64$ , dependants  $M=4.84$ ), noting that 35's and under who had dependants felt they had to concentrate the least ( $M=6.06$ ). See Figure 5.25.

Estimated Marginal Means of Age Against Dependants for the Usability Attribute "Concentration"

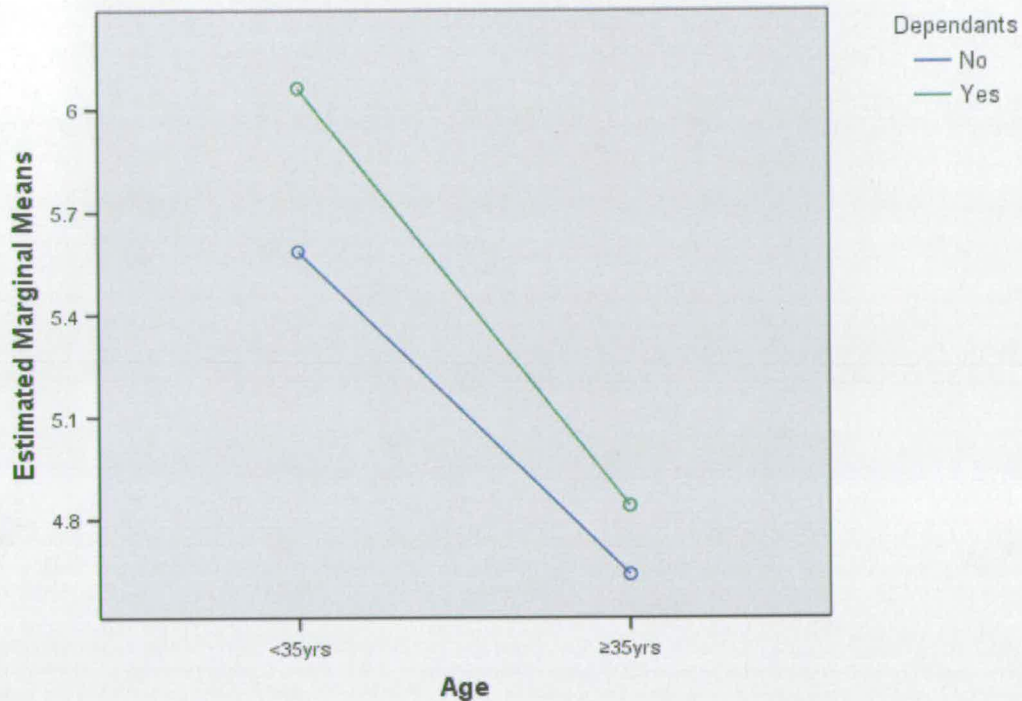


Figure 5.25: Estimated Marginal Means for Age Against Dependants for the Attribute "Concentrate"

#### Usability Attribute – "Understood"

There are three significant between-subject effects of higher education ( $p=0.027$ ,  $F=5.426$ ), age\*gender ( $p=0.002$ ,  $F=11.333$ ) and gender\*dependants ( $p=0.041$ ,  $F=4.557$ ) on the usability attribute "understood information". See Table 5.32 in Appendix 14.

Participants who have attended some kind of higher education establishment understood the information slightly less ( $M=5.61$ ) than those who had not ( $M=5.85$ ). However, on closer inspection of the pairwise comparisons, the difference was not significant.

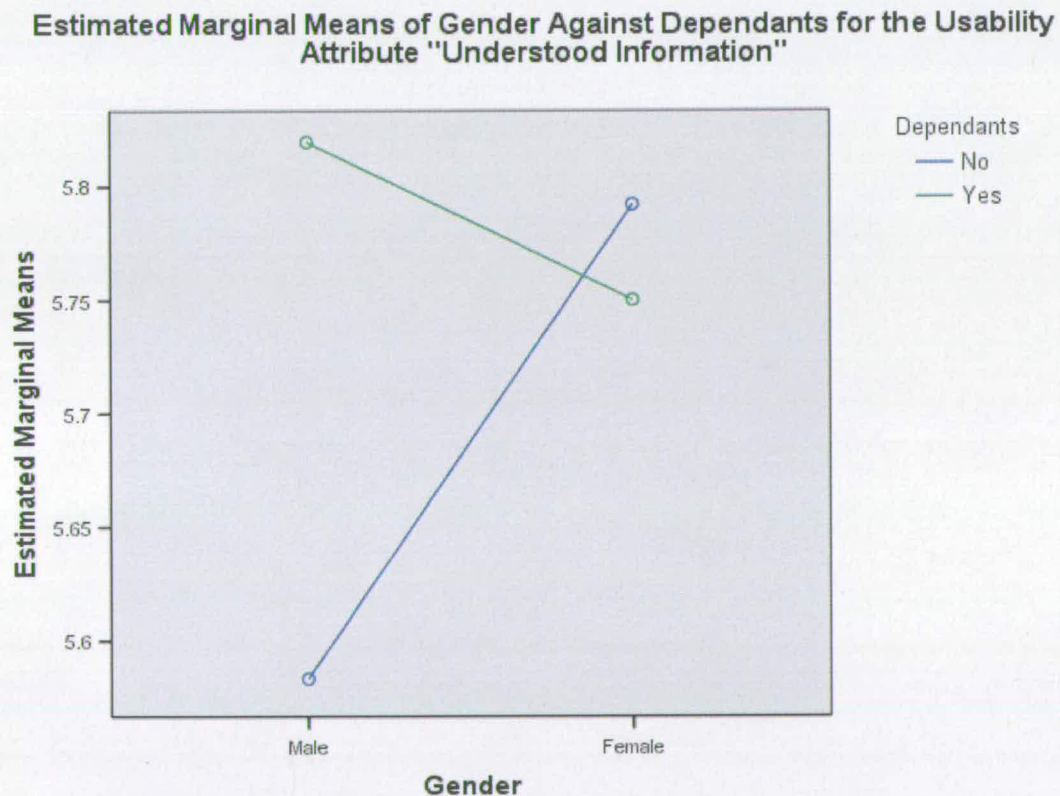
The interaction effect of age\*gender can be seen below (Figure 5.26). Younger males felt that they understood the information better ( $M=6.0$ ) than the younger females ( $M=5.58$ ), however the older females felt that they understood the information more ( $M=5.88$ ) than the older males ( $M=5.5$ ).

**Estimated Marginal Means of Age Against Gender for the Usability Attribute "Understood Information"**



**Figure 5.26: Estimated Marginal Means for Age Against Gender for the Attribute "Understood Information"**

The last interaction effect of age\*dependants on the usability attribute “understood information” can be seen in Figure 5.27. The males with no dependants felt that they understood the information slightly less (M=5.58) than the males with dependants (M=5.82), whereas the females with dependants felt that they understood the information slightly less (M=5.75) than those who had none (M=5.79), although this difference was found not to be significant on closer inspection of the pairwise comparisons.



**Figure 5.27: Estimated Marginal Means for Gender Against Dependants for the Attribute “Understood Information”**

**Usability Attribute – “Competent”**

There are no significant effects for the usability attribute “competent”. Participants rated the agent as competent in all of the scenarios, as indicated by the estimated marginal means reaching 5 or above.

### **Usability Attribute – “Frustrated”**

There is one significant between-subject effect of dependants on the usability attribute “frustrated” ( $p=0.017$ ,  $F=6.475$ ) (see Table 5.33 in Appendix 14). Participants with no dependants felt slightly more ( $M=5.33$ ) frustrated with the service than those with none ( $M=5.61$ ).

### **Usability Attribute – “Polite”**

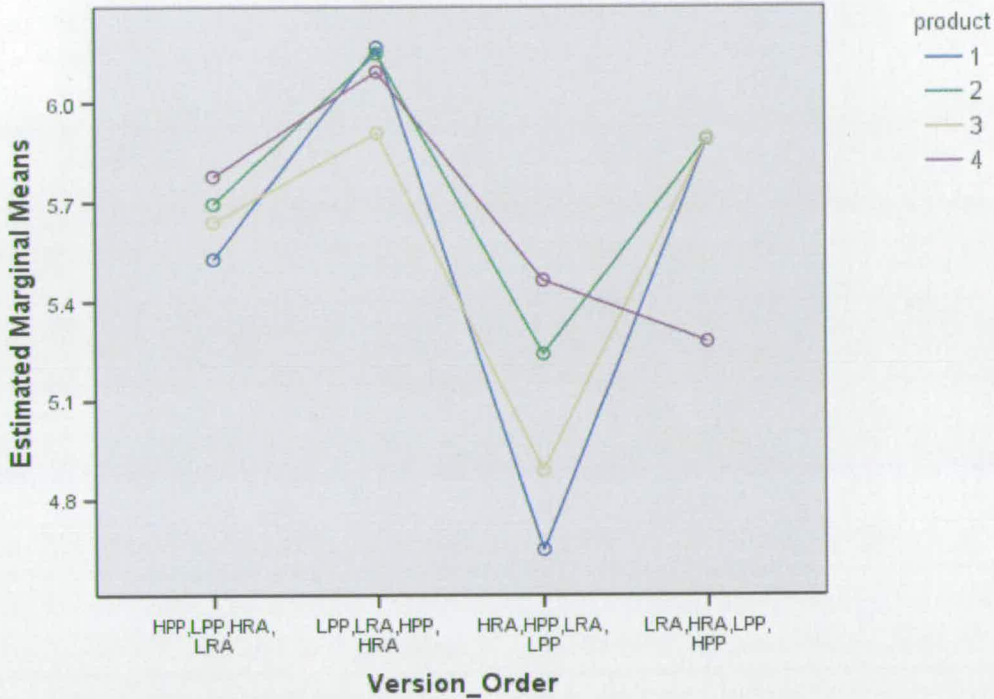
There were no significant effects for the usability attribute “polite”. In general participants found the agent polite, indicated by scores reaching 5 or above.

### **Usability Attribute – “Complicated”**

There is one significant within-subject effect of product\*version order ( $p=0.001$ ,  $F=4.414$ ) for the usability attribute “Complicated” (see Table 5.34 in Appendix 14). Participants scored the products quite similarly in all versions except for the version order 3 where they were scored marginally lower than the rest (HRA  $M=4.65$ , HPP  $M=5.24$ , LRA  $M=4.89$ , LPP  $M=5.46$ ) and the HPP product in version order 4 ( $M=5.27$ ). See Figure 5.26 below.



**Estimated Marginal Means of Version Order Against Product for the Usability Attribute "Complicated"**



**Figure 5.26: Estimated Marginal Means of Product Against Version Order for the Attribute "Complicated"**

There was also two between-subject effects of version order ( $p=0.011$ ,  $F=4.412$ ) and version order\*higher education ( $p=0.022$ ,  $F=3.7949$ ) for the usability attribute "complicated" (see Table 5.35 in Appendix 14). Participants who experienced version order 2 overall rated their interactions as less complicated ( $M=6.08$ ) than those that experienced version order 3 ( $M=5.06$ ).

The interaction between version order and higher education can be seen from the scores given during version order 1 and 3. Participants who attended some kind of higher education establishment and experienced version order 1 felt that the interactions were slightly more complicated ( $M=5.81$ ) than those who had not ( $M=6.08$ ). Participants who had not attended any type of higher education

establishment and experienced version order 3 felt they were slightly more complicated (M=5.67) than those who had (M=6.04).

#### **Usability Attribute – “Needs Improvement”**

There were no significant effects for the usability attribute “needs improvement”. All the means were above neutral indicating that they felt the service they experienced did not need a lot of improvement.

#### **Usability Attribute – “Efficient”**

There is only one between-subject interaction effect of age\*gender ( $p=0.005$ ,  $F=9.307$ ) for the usability attribute “efficient” (see Table 5.36 in Appendix 14). Younger males ( $\leq 35$  years) scored the services as being the most efficient (M=5.94) and the older males ( $\geq 36$  years) scored them as the least efficient (M=5.32). The females in both age groups rated the agents as similarly efficient ( $\leq 35$  yrs M=5.5,  $\geq 36$  yrs M=5.72). Once again however it should be noticed that all groups rated the service as efficient as indicated by all means reaching 5 or above.

#### **Usability Attribute – “Long Process”**

There were no significant effects for the usability attribute “long process”. Overall the mean scores for this attribute reached 5 or above indicating that they did not feel that the process took too long.

#### **Usability Attribute – “Interaction Satisfying”**

There is one significant between subject effect of version order ( $p=0.002$ ,  $F=6.230$ ) for the usability attribute “interaction satisfying” (see Table 5.37 in Appendix 14).

Overall participants rated the interactions during version order 3 as significantly less satisfying ( $M=4.07$ ) than those who experienced version order 2 ( $M=5.24$ ) and 4 ( $M=5.29$ ).

#### **Usability Attribute – “Appearance Distracting”**

There were no significant effects for the usability attribute “appearance distracting”. In general participants did not find the appearance of the agent distracting, indicated by scores reaching 5 or above.

#### **Usability Attribute – “Text Box”**

There is one between-subject effect of higher education ( $p=0.006$ ,  $F=4.614$ ) for the usability attribute “text box” (see Table 5.38 in Appendix 14). Those participants with no type of higher education felt that the text box was more slightly useful ( $M=5.89$ ) than those who have ( $M=5.77$ ).

#### **Mean Usability**

There are no within-subject effects on the mean usability score. There are four between-subjects effects of version order ( $p=0.013$ ,  $F=4.235$ ), age ( $p=0.029$ ,  $F=5.279$ ), version order\*age ( $p=0.028$ ,  $F=3.486$ ) and version order\*higher education ( $p=0.026$ ,  $F=3.563$ ) on the mean usability score. See Table 5.39 in Appendix 14.

Participants who experienced version order 3 rated these interactions as overall less usable ( $M=4.92$ ) than those who experienced version order 2 ( $M=5.76$ ). In general the younger participants rated their experiences more positively ( $M=5.61$ ) in terms of usability than the older participants ( $M=5.26$ ).

The overall usability scores were similar for the different version orders except version order 3 where the 35's and under felt more positively (M=5.57) in terms of usability than the 36's and over (M=4.60).

The lowest score in terms of overall usability were given by those participants who experienced version order 3 who had no type of higher education (M=4.76), and the highest scores were from those who experienced version order 2 and who had no type of higher education (M=6.13).

Recalling hypothesis A relating to the perceived usability of the four different product portrayals:

**H<sub>0A</sub>: There will be no significant difference between the usability of the four different product portrayals.**

**H<sub>1A</sub>: There will be a significant difference between the usability of the four different product portrayals.**

There is sufficient evidence to refute the null hypothesis since significant differences were found between the four different product portrayals on several of the usability attributes, however the majority of these differences did not occur for the product portrayals.

### **Relevance Rating**

The relevance ratings for the four products was rated significantly different from each other ( $p < 0.000$ ,  $F = 21.422$ ). Participants rated on a 30cm ruler the Low Planning

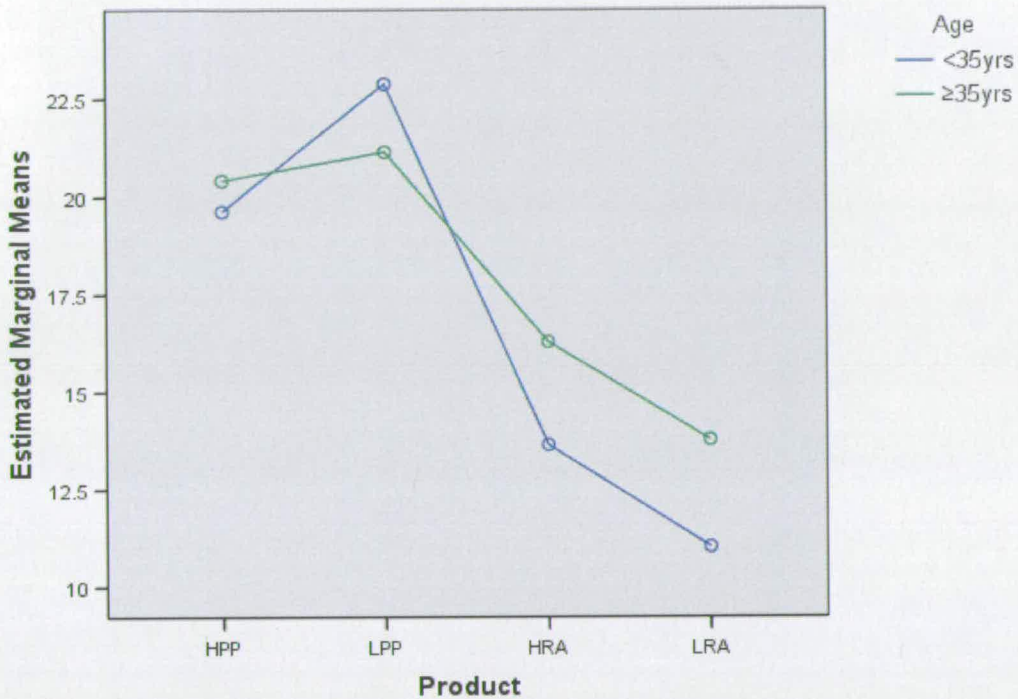
Propensity product as significantly more relevant (M=21.72) than the High Risk Averse product (M=15.04) and the Low Risk Averse Product (M=12.85). The High Planning Propensity product (M= 20.04) was also rated as more relevant than the High Risk Averse product.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Product	2703.401	2.005	1348.180	21.422	.000
Product * Version_Order	686.349	6.016	114.094	1.813	.112
Product * Age	485.541	2.005	242.138	3.847	.027
Product * Gender	70.358	2.005	35.087	.558	.576
Product * Higher_Ed	33.261	2.005	16.587	.264	.770
Product * Dependants	169.335	2.005	84.447	1.342	.269
Error(Product)	3659.704	58.151	62.934		

**Table 5.40: Within-Subject Effects for the Relevance Score**

Figure 5.29 displays the interaction effect of product\*age ( $p=0.027$ ,  $F=3.847$ ) for the relevance score. From this it can be seen that overall the younger age group felt that the products were less relevant (HPP M=19.63, HRA M=13.64, LRA M=11.02) to them than the older group (HPP M=20.42, HRA M=16.28, LRA M=13.77), except for the Low Planning Propensity product (<35yrs M=22.88, ≥35yrs M=21.15).

### Estimated Marginal Means of Product Against Age for the Relevance Score



**Figure 5.29: Estimated Marginal Means for Product Against Age for the Relevance Score**

There are two between subjects effects of version order ( $p=0.49$ ,  $F=2.975$ ) and higher education ( $p=0.011$ ,  $F=7.309$ ) on the relevance score. The version order effect is only just significant so likely to be due to chance and when the pairwise comparisons are investigated there is no significant difference.

Higher education does have a significant effect on the relevance scores for the products, in that those participants with no type of higher education felt overall the products were more relevant to them ( $M=19.48$ ) than those who have ( $M=16.56$ ).

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	43518.854	1	43518.854	770.408	.000
Version_Order	504.094	3	168.031	2.975	.049
Age	.125	1	.125	.002	.963
Gender	41.899	1	41.899	.742	.396
Higher_Ed	412.844	1	412.844	7.309	.011
Dependants	13.188	1	13.188	.233	.633
Version_Order * Age	283.122	3	94.374	1.671	.195
Version_Order * Gender	370.208	3	123.403	2.185	.111
Age * Gender	115.534	1	115.534	2.045	.163
Version_Order * Higher_Ed	276.025	3	92.008	1.629	.204
Age * Higher_Ed	4.876	1	4.876	.086	.771
Gender * Higher_Ed	33.800	1	33.800	.598	.445
Version_Order * Dependants	94.786	3	31.595	.559	.646
Age * Dependants	1.857	1	1.857	.033	.857
Gender * Dependants	.430	1	.430	.008	.931
Error	1638.154	29	56.488		

**Table 5.41: Between-Subjects Effects for the Relevance Score**

Recalling hypothesis B relating to the relevance of the four different product portrayals:

**H<sub>0B</sub>:** There will be no significant difference observed in the product relevance ratings for the four different product portrayals.

**H<sub>1B</sub>:** There will be a significant difference observed in the product relevance ratings for the four different product portrayals.

There is sufficient evidence to refute this null hypothesis since a significant difference was found between the four different product relevance scores. In particular participants rated the LPP product as more relevant than the two Risk Averse products ( $p < 0.000$ ,  $F = 21.422$ ).

## 5.5.4 Product Uptake Questionnaire Results

### 5.5.5 Mean Product Uptake Scores

The product uptake data were analysed by a series of repeated measure ANOVA analyses. Table 5.42 displays the mean product uptake scores.

Product Portrayal	Mean Product Uptake Score
High Planning Propensity (HPP)	4.97
Low Planning Propensity (LPP)	4.99
High Risk Averse (HRA)	4.65
Low Risk Averse (LRA)	4.50

**Table 5.42: Mean Product Uptake Scores for the Four Different Product Portrayals**

Table 5.43 displays the between-subjects effects on the mean product uptake scores. There is one significant between subjects effect of higher education ( $p=0.05$ ,  $F=4.194$ ) on the mean product uptake scores, however it should be noted that this is only just significant. If take as representative then it suggests that those with no type of higher education are significantly more likely to take-up one of the products ( $M=5.09$ ) than those who have ( $M=4.63$ ).



Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3254.202	1	3254.202	2183.795	.000
Version_Order	.927	3	.309	.207	.890
Age	.000	1	.000	.000	.988
Gender	.015	1	.015	.010	.920
Higher_Ed	6.250	1	6.250	4.194	<b>.050</b>
Depend	.328	1	.328	.220	.643
Version_Order * Age	9.480	3	3.160	2.121	.120
Version_Order * Gender	.423	3	.141	.095	.962
Age * Gender	3.933	1	3.933	2.640	.115
Version_Order * Higher_Ed	3.782	3	1.261	.846	.480
Age * Higher_Ed	.265	1	.265	.177	.677
Gender * Higher_Ed	.158	1	.158	.106	.747
Version_Order * Depend	9.589	3	3.196	2.145	.117
Age * Depend	.223	1	.223	.150	.702
Gender * Depend	.154	1	.154	.104	.750
Error	41.724	28	1.490		

**Table 5.43: Tests of Between-Subjects Effects on the Mean Product Uptake Scores**

## 5.5.6 Product Uptake Attribute Analysis

### Product Attribute – “Presentation”

There were two significant between-subjects effect of higher education ( $p=0.007$ ,  $F=8.444$ ) and version order\*age ( $p=0.027$ ,  $F=3.553$ ) on the attribute of “presentation”. See Table 5.44 in Appendix 14.

Participants with no type of higher education liked the presentation of the product ( $M=5.39$ ) more than those who had some ( $M=4.90$ ).

The interaction effect of version order\*age on the presentation attribute can be seen during version order 1 and 3. Participants who experienced version order 1 and are 35yrs and under said that they liked the presentation slightly less ( $M=4.81$ ) than the 36’s and over ( $M=5.04$ ), whereas for those experienced version order 3 it was the 35’s

and under who liked the way the products were presented slightly more ( $M=5.54$ ) than the 36's and over ( $M=4.25$ ).

#### **Product Attribute – “Text Useful”**

There was one significant between-subjects difference of higher education ( $p=0.044$ ,  $F=4.442$ ) for the product uptake attribute “text useful” (see Table 5.45 in Appendix 14). Participants who have some form of higher education felt that the text was slightly less useful ( $M=5.80$ ) than those who have none ( $M=5.57$ ).

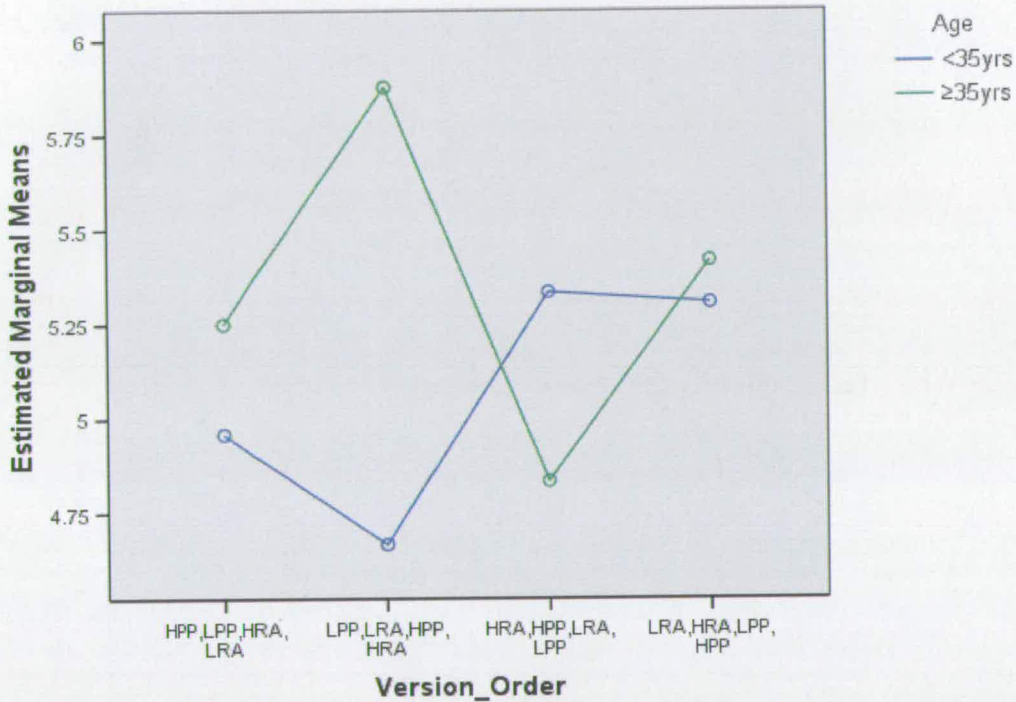
#### **Product Attribute – “Listen”**

There were three significant between-subjects effects of higher education ( $p=0.007$ ,  $F=8.444$ ), version order\*age ( $p=0.027$ ,  $F=3.553$ ) and version order\*gender ( $p=0.028$ ,  $F=3.523$ ) on the attribute “listen”. See Table 5.46 in Appendix 14.

Participants who do not have any type of higher education were slightly more happy ( $M=5.65$ ) to listen to information about the products than those who have ( $M=5.04$ ).

The interaction effect of version order\*age can be from Figure 5.30. Older participants overall were more happy than the younger group to listen to information about the products, however this is not the case from those who experienced version order 3, the younger group were slightly more happy ( $M=5.33$ ) to listen to the information compared to the older group ( $M=4.83$ ).

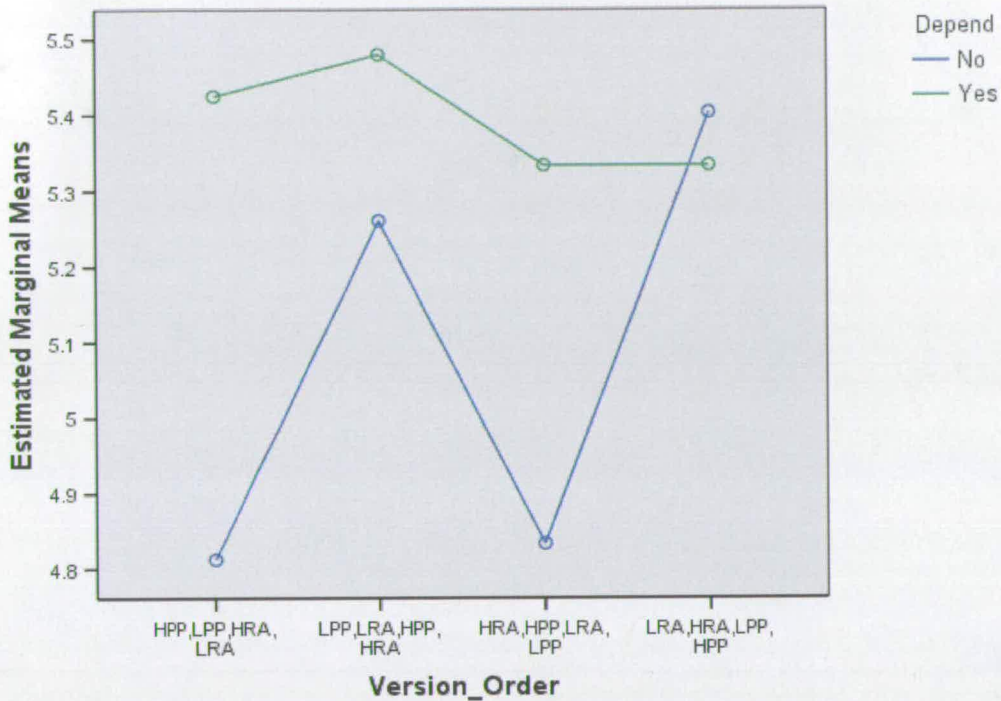
**Estimated Marginal Means of Version Order Against Age for the Attribute "Listen"**



**Figure 5.30: Estimated Marginal Means of Version Order Against Age for Attribute "Listen"**

The interaction effect of version order\*dependants on the attribute "listen" can be seen from Figure 5.31 below. In all version orders participants with dependants were happier to listen to the information about the product than those without, except for version order 4. Those with dependants were slightly less happy to hear the information about the products (M=5.33) than those with none (M=5.40).

**Estimated Marginal Means of Version Order Against Dependants for the Attribute "Listen"**



**Figure 5.31: Estimated Marginal Means Version Order Against Dependants for Attribute "Listen"**

**Product Attribute – “Product Useful”**

There is one significant within-subject effect of product ( $p=0.049$ ,  $F=2.731$ ) for the product uptake attribute “product useful” (see Table 5.47 in Appendix 14). Participants felt that the High Planning Propensity product (HPP) ( $M=5.12$ ) was significantly more useful than the Low Risk Averse product (LRA) ( $M=4.21$ ). It should be noted though that this result is only just significant.

There are no between-subject effects on the product uptake attribute “product useful”.

### **Product Attribute – “Relevant”**

There are no significant effects on the attribute “relevant”, but in general all the scores reached 4 or above indicating that participants either felt neutral about this attribute or that all the products were in some way relevant.

### **Product Attribute – “Beneficial”**

There are no significant effects on the attribute “beneficial”, but in general all the scores reached 5 or above indicating that participants felt that all the products in some way would be beneficial to them.

### **Product Attribute – “More Info”**

There are no significant effects on the attribute “more information”, but in general all the scores reached 4 or above indicating that participants felt neutral about whether or not they would like more information about the products.

### **Product Attribute – “Applying”**

There are no significant effects on the attribute “applying”, but in general all the scores reached 4 or above indicating that participants either felt neutral about applying for the products or that they would consider applying for the products.

### **Product Attribute – “Tailored”**

There is one significant within-subject effect of product ( $p=0.044$ ,  $F=2.817$ ) on the product uptake attribute “tailored” (see Table 5.48 in Appendix 14). Participants felt

that the HPP product was tailored to their needs ( $M=4.95$ ) compared to the LRA product which they felt neutral about ( $M=4.26$ ).

### **Product Attribute – “Chosen”**

There are three significant within-subject effects of product ( $p=0.027$ ,  $F=3.546$ ), product\*version order ( $p=0.046$ ,  $F=2.176$ ) and product\*gender ( $p=0.042$ ,  $F=2.849$ ) on the product attribute “chosen”. See Table 5.49 in Appendix 14.

Participants felt that the LPP product had been especially chosen ( $M=4.99$ ) for them, significantly more than the LRA ( $M=4.17$ ) and HRA ( $M=4.12$ ) products. They also felt that the HPP product had been especially chosen for them ( $M=4.73$ ) significantly more than the LRA ( $M=4.17$ ) product.

The main result from the interaction effect of product\*version order is participants who experienced version order 1 felt that the LRA product had not been especially chosen for them ( $M=3.61$ ), compared to the rest of the products (HPP  $M=4.45$ , LPP  $M=4.50$ , LRA  $M=4.02$ ). In version order 3 it was the HRA product that received the lowest score for this attribute ( $M=3.61$ ), compared to the rest of the products (HPP  $M=4.49$ , LPP  $M=5.09$ , LRA  $M=4.61$ ).

The second interaction effect can be seen in Figure 5.32. In all cases the females felt that the product had been especially chosen for them, significantly more so than the males.

Estimated Marginal Means of Product Against Gender for the Attribute "Chosen"

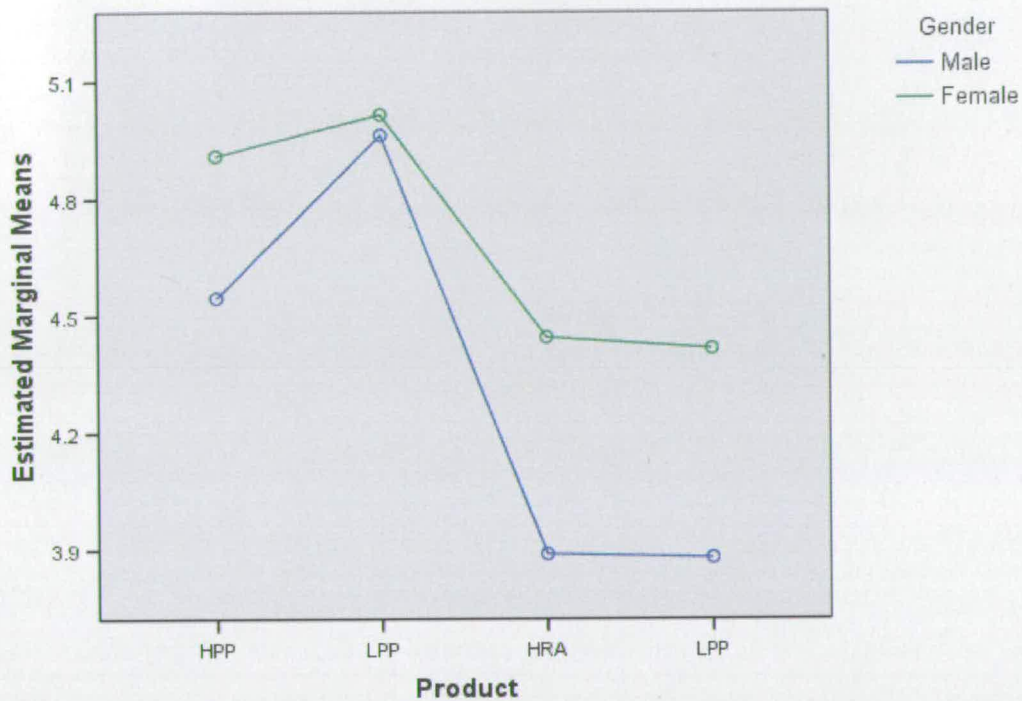


Figure 5.32: Estimated Marginal Means of Product Against Gender for the Attribute "Chosen"

There are no between-subjects effects on the product attribute "chosen".

### Mean Product Uptake Scores

There are no within-subject effects on the mean uptake scores.

There is one significant between-subjects effect of higher education ( $p=0.05$ ,  $F=4.194$ ) on the mean product uptake score. Although only just significant it suggests that participants who have not attended any type of higher education establishment overall rated the products higher ( $M=5.16$ ) compared to those who have ( $M=4.66$ ).

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3254.202	1	3254.202	2183.795	.000
Version_Order	.927	3	.309	.207	.890
Age	.000	1	.000	.000	.988
Gender	.015	1	.015	.010	.920
Higher_Ed	6.250	1	6.250	4.194	<b>.050</b>
Depend	.328	1	.328	.220	.643
Version_Order * Age	9.480	3	3.160	2.121	.120
Version_Order * Gender	.423	3	.141	.095	.962
Age * Gender	3.933	1	3.933	2.640	.115
Version_Order * Higher_Ed	3.782	3	1.261	.846	.480
Age * Higher_Ed	.265	1	.265	.177	.677
Gender * Higher_Ed	.158	1	.158	.106	.747
Version_Order * Depend	9.589	3	3.196	2.145	.117
Age * Depend	.223	1	.223	.150	.702
Gender * Depend	.154	1	.154	.104	.750
Higher_Ed * Depend	.000	0	.	.	.
Error	41.724	28	1.490		

**Table 5.50: Tests of Between-Subjects Effects on the Mean Product Uptake Score**

Recalling hypothesis C relating to the likelihood of product uptake for the four different products:

**H<sub>0C</sub>:** There will be no significant difference between the overall product uptake scores for the four different product portrayals.

**H<sub>1C</sub>:** There will be a significant difference between the overall product uptake scores for the four different product portrayals.

The null hypothesis can be rejected as significant differences were found between the four different product portrayals on several of the product uptake attributes.

### 5.5.7 Demographic Correlations

Participants' demographic and economic variables were investigated in conjunction with their Risk Aversion and Planning Propensity score in order to investigate Hypotheses D and E.



- H<sub>0D</sub>:** There will be no significant correlations observed between participants' Risk Aversion score and their demographic and economic variables.
- H<sub>1D</sub>:** Risk Aversion will significantly correlate with participants' demographic and economic variables.
- H<sub>0E</sub>:** There will be no significant correlations observed between participants' Planning Propensity score and their demographic and economic variables.
- H<sub>1E</sub>:** Planning propensity will significantly correlate with participants' demographic and economic variables.

### **Risk Aversion**

There are several significant correlations between participants' demographic and economic variables and the 2 items from the Pecuniary Questionnaire that were designed to assess an individual's likelihood to be risk averse or not.

Table 5.51 (in Appendix 14) shows significant correlations between age and sex and whether or not the participant finds gambling exciting. Participants in the younger age group ( $\leq 35$  years) said they enjoyed gambling, indicating this group would be willing to take a risk regarding money. The older group ( $\geq 36$  years) however said they did not enjoy gambling and therefore an unwillingness to take risks with their money ( $p=0.001$ ,  $r= -0.405$ ). More females said that they did not enjoy gambling than males ( $p=0.003$ ,  $r= -0.362$ ).

Table 5.52 displays the only other significant correlation between gambling and whether or not a person has or has had a student loan ( $p<0.000$ ,  $r=0.44$ ). In other words people who have or have had a student loan were more likely to say that they enjoyed gambling and thus taking risks with their money. This result is however

linked with the correlation with age, as there are more people below 35 years old that have a student loan.

There were no significant correlations found between any of the following demographic and economic variables and the Risk Aversion items; personal loan, overdraft, use of overdraft, credit cards, use of credit cards, pay off credit cards, number of non-savings accounts, number of savings accounts or income. It must be noted though that the low number of counts within some of these variables will affect the outcome.

The null hypothesis (D) relating to the expected correlations between demographic and economic variables and Risk Aversion items can be rejected as significant correlations were found between the three of the demographic details ( $p \leq 0.01$ ).

### **Planning Propensity**

There are several significant correlations between participants' demographic and economic variables and the 7 items from the Pecuniary Questionnaire that were designed to assess an individual's likelihood to either have a high or a low planning propensity.

Table 5.53 shows that there is one significant correlation between age group and whether or not people save for the long-term ( $p=0.003$ ,  $r=0.367$ ). Participants in the younger age group ( $\leq 35$  years) were more likely to say that they do not save for the long-term compared to the older group ( $\geq 36$  years).

Table 5.54 (in Appendix 14) shows that there are four significant correlations between whether or not participants have a mortgage or not and the planning propensity items. There are more people who don't have a mortgage who are not proud of their ability to save compared to any other group (do have a mortgage and did have a mortgage) ( $p=0.01$ ,  $r=3.19$ ). Those who do have a mortgage or have had a mortgage are very likely to say that they are proud of their ability to save.

Participants who do not have a mortgage are also likely to say that they find it difficult to save on a regular basis, more so than the other two groups ( $p=0.017$ ,  $r=0.295$ ). See table 5.53 in Appendix 14.

Participants who have or have had a mortgage were likely to agree with the statement that they save for the long-term ( $p=0.004$ ,  $r=0.349$ ). Those participants who did not have a mortgage were more likely to disagree with that statement. See table 5.54 in Appendix 14.

A larger number of participants that do not have a mortgage stated that they do not like to plan ahead ( $p=0.013$ ,  $r=0.307$ ) compared to those participants who do have or did have a mortgage. See table 5.54 in Appendix 14.

Two fifths of participants who do not own a car do not like to plan ahead compared to one ninth that do own a car ( $p=0.008$ ,  $r=0.325$ ), indicating that you are more likely to want to plan ahead if you own a car. See table 5.54 in Appendix 14.

A larger number of participants who do not have (or ever had) a student loan like to save for the long-term, than not ( $p=0.002$ ,  $r= -0.374$ ). Those participants who do have or have had a student loan were more evenly spread, but with slightly greater number stating that they do not save for the long term. See table 5.54 in Appendix 14.

There are a larger number of participants who have or have had a student loan that do not like to plan ahead compared to those who have never had one ( $p=0.011$ ,  $r= -0.313$ ). Most participants who have never had a student loan like to plan ahead. See table 5.54 in Appendix 14.

Table 5.55 (in Appendix 14) displays the two significant correlations between the planning propensity items and whether or not they have or have had a personal loan and whether or not if they have an overdraft that they use.

Participants who have or have had a personal loan were more likely than those who have not to say that they do not save for things they want to do or buy ( $p=0.015$ ,  $r= -0.301$ ).

Out of those participants who have an overdraft (50/65), those who use that overdraft were more likely to say that they do not save for the long-term compared to those who don't use it ( $p=0.002$ ,  $r= -0.435$ ). In other words if participants didn't use their overdraft the more likely they are to save for the long-term.

Table 5.56 (in Appendix 14) displays the final eight significant correlations between the planning propensity items and the demographic variables “pay off credit cards”, “non-savings accounts” and “savings accounts”.

Out of the participants who have credit cards (44/65) more participants who paid off the full amount on their credit cards every month were more likely to say that they are also proud of their ability to save ( $p=0.001$ ,  $r= 0.494$ ) (see Table 5.55 in Appendix 14). More people who paid a fixed amount every month to their credit cards (that is neither the full amount nor the minimum) were likely to say that they are not proud of their ability to save.

From the participants who do have credit cards, those who pay the minimum required each month or a fixed amount were more likely to say that they found it difficult to save, compared to those who paid off the full amount ( $p<0.001$ ,  $r=0.527$ ) (see Table 5.56 in Appendix 14).

Participants who pay a fixed amount on their credit cards were more likely to say that they don't save for the long-term compared to those who pay off the full amount each month ( $p=0.006$ ,  $r=0.407$ ) (see Table 5.56 in Appendix 14).

The majority of participants who have a credit card also think it is important to save regularly ( $p=0.045$ ,  $r=0.303$ ) (see Table 5.56 in Appendix 14).

Participants who have 3 or more non-savings accounts were more likely to say that they like to plan ahead than not. Roughly one fifth of those with 1 or 2 non-savings accounts were likely to say that they don't like to plan ahead ( $p=0.012$ ,  $r=0.311$ ) (see Table 5.56 in Appendix 14).

Participants who had no savings accounts were more likely to say that they found it difficult to save on a regular basis compared those who have 3 or 4 savings accounts ( $p=0.037$ ,  $r=0.259$ ) (see Table 5.56 in Appendix 14).

Participants who have two or more savings accounts were more likely to say that that they save for the long-term, compared to those who have one or none ( $p=0.016$ ,  $r=0.299$ ) (see Table 5.56 in Appendix 14).

The last significant correlation indicates that most participants believed it was important to save on a regular basis ( $p=0.031$ ,  $r=0.267$ ) (Table 5.56 in Appendix 14).

The null hypothesis (E) relating to the expected correlations between demographic and economic variables and Planning Propensity items must be rejected as eighteen (nine at the  $p\leq 0.001$  level and nine at the  $p\leq 0.05$  level) significant correlations were found between them and several demographic and economic variables.

### **5.5.8 Pecuniary Questionnaire**

#### **5.5.9 Reliability of Scale**

After running reliability analysis on the full 40 items of the Pecuniary Questionnaire a Cronbach's alpha coefficient of 0.449. From Table 5.57 below it can be seen that there is one item ("Debt managing money") that has a Cronbach's alpha that is higher than the final one obtained, if it is deleted. The background characteristics were also removed due to the increase in the Cronbach's alpha level. The reliability analysis was performed again without the "Debt Managing Money" item and produced a

Cronbach's alpha value of 0.50, which has improved the reliability. As previously stated a Cronbach's alpha value of below 0.7 can also be acceptable due to the diversity of the concepts being measured (Kline, 1999).

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Wealth	165.74	135.071	.102	.446
Spend	165.40	134.181	.140	.439
Impress	166.89	137.629	.080	.448
Worry	164.43	135.280	.168	.437
Feel Better	165.82	136.997	.052	.454
Enough	164.91	145.835	-.174	.484
Know Amount	164.55	138.313	.018	.459
Pay Bills	163.62	129.803	.312	.416
Proud	164.72	127.953	.378	.406
Unexpected	163.60	135.994	.308	.432
Budget	164.14	136.621	.153	.440
Reduced	165.31	141.123	-.051	.469
Financial Terms	164.08	135.728	.192	.436
Best Deals	163.55	138.188	.131	.444
Gut Feelings	164.88	132.766	.201	.431
Intuition	165.75	131.063	.260	.422
Credit Card	165.65	129.201	.206	.426
Limit	167.15	146.976	-.211	.487
Over Draft	166.60	140.838	-.044	.469
Difficult to Save	165.06	130.340	.236	.423
Long-term	164.71	131.960	.207	.429
To Do or Buy	163.86	135.277	.179	.436
Purchases	165.26	132.040	.192	.431
Excitement	165.51	136.816	.062	.452
Guilt	166.03	142.687	-.086	.472
Risk Stocks Shares	165.42	134.872	.135	.440
Gambling	166.15	141.257	-.070	.478
Alone	165.14	145.059	-.151	.484
Social	163.91	141.679	-.042	.462
Plan Ahead	164.35	127.482	.376	.405
Discipline	164.57	134.468	.143	.439
New things	163.88	135.172	.227	.433
Flexible	164.32	141.628	-.038	.460
Unwise	165.23	127.712	.282	.414
Debt Managing Money	<b>165.77</b>	<b>149.305</b>	<b>-.254</b>	<b>.500</b>
Regularly	163.86	135.402	.280	.432
Saving Older	164.29	130.179	.246	.422
Think Hard	163.69	141.435	-.013	.456

**Table 5.57: Pecuniary Questionnaire Item-Total Statistics**

## 5.6.0 Factor Analysis

Factor analysis was conducted even though Cronbach's alpha is 0.5, it was deemed the results would be beneficial enough, but treated with caution. The remaining 37 items of the Pecuniary Questionnaire were subjected to PCA using SPSS. Prior to performing PCA the suitability of data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above. The Kaiser-Meyer-Olkin value was 0.571, which when rounded up reaches the recommended value of 0.6 (H. Kaiser, 1970; H. Kaiser, 1974) and the Bartlett's Test of Sphericity (Bartlett, 1954) reached statistical significance, supporting the factorability of the correlation matrix.

Principal component analysis revealed the presence of twelve components with eigenvalues exceeding 1 (7.479, 2.977, 2.880, 2.339, 2.155, 1.743, 1.461, 1.395, 1.281, 1.239, 1.212, 1.065), explaining 73.58% of the variance. An inspection of the screeplot revealed a break after the seventh component. Using Catell's (Catell, 1966) scree test, it was decided to retain seven of the components for further investigation. To aid in interpretation of these seven components, Varimax rotation was performed. The rotated solution presented in Table 5.58 revealed a number of strong loadings, and most variables mainly loading substantially on only one component. The seven factor solution explained a total of 56.85% of the variance, with Component 1 contributing 10.14%, Component 2 contributing 9.86%, Component 3 contributing 9.74%, Component 4 contributing 8.89%, Component 5 contributing 6.84%, Component 6 contributing 5.83%, and Component 7 contributing 5.55%. From Table 5.54 it can be seen that the factors produced are different from those previously defined. However each item is generally weighted on one main component indicating that



these do in fact assess separate attitudes. For an overview of the seven factors see Diagram 5.1. The factors are made up of related monetary attitudes so the results of the Pecuniary Questionnaire and relationship with the results of the product choice will be analysed further utilising these factors.

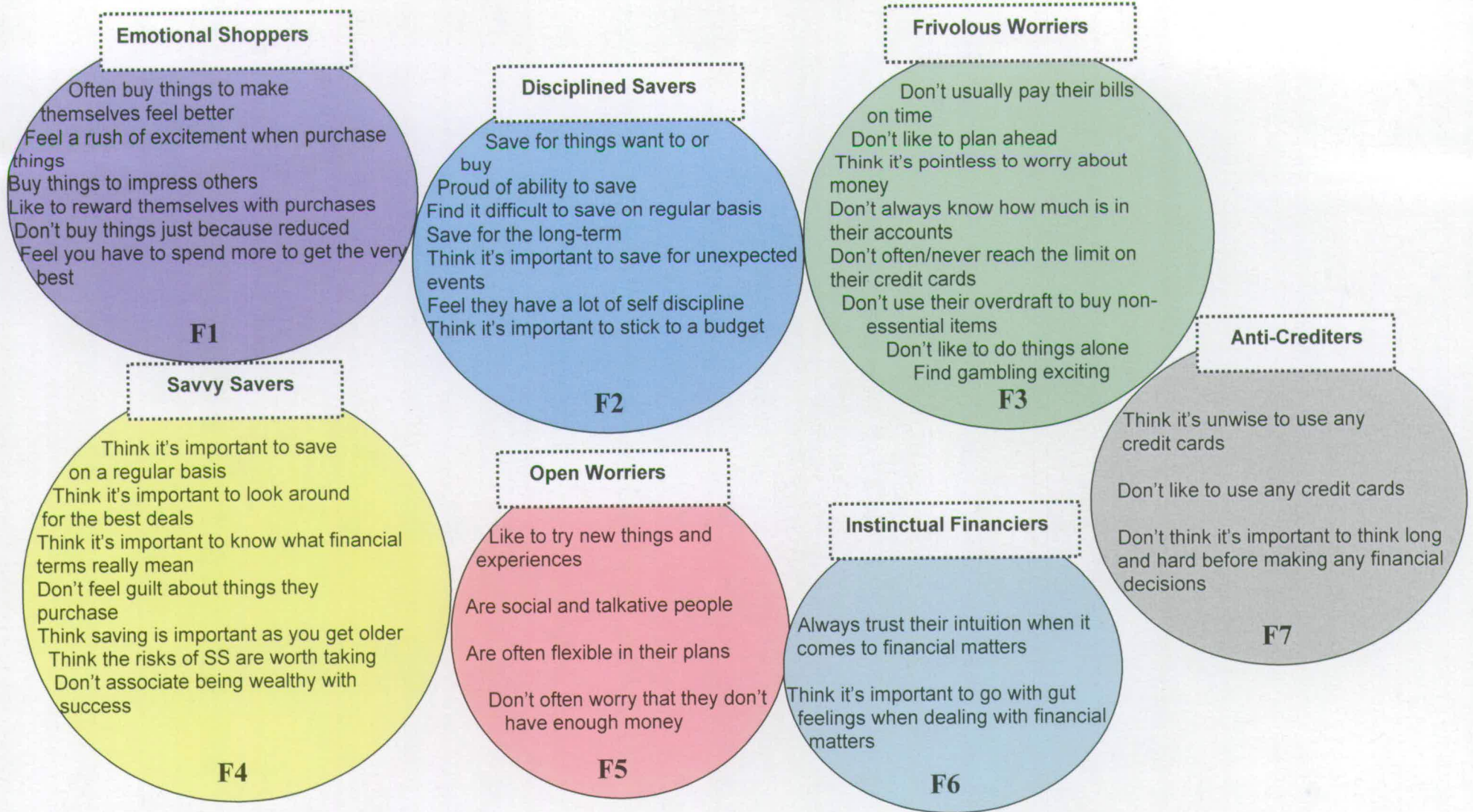
The results of the factor analysis should be taken with caution however as the sample size is only 65 (far lower than recommended for factor analysis), therefore the factors obtained here would not generalise well to the wider population. A further sample of 200 will be assessed to test the reliability and enable the scale to be developed further.

The percentage of variance left unexplained is also fairly high at this point but it is important to remember the complex number of variables that are at work when trying to measure an individual's attitudes towards financial matters. This is one of the reasons why some researches only look at one variable at a time but this then limits the applicability of their metrics in a commercial setting. One that can give a company an overview of these views and be administered within a reasonable time would be more beneficial in a commercial setting.

	Component						
	1	2	3	4	5	6	7
Feel Better	.751				.346		
Excitement	.732						
Impress	.724				-.345		
Purchases	.710						
Reduced	-.636						
Spend	.362						
To Do or Buy		.852					
Proud		.737					
Difficult to Save		.677	.397				
Long-term		.586					
Unexpected		.542		.424			
Discipline	-.373	.513	.356				
Pay Bills			.736				
Plan Ahead			.708				
Worry			.638				
Know Amount			.627				
Limit	.307		-.532				
Over Draft	.309		-.532				
Alone		-.371	-.454				
Gambling			-.315				
Regularly		.394		.730			
Best Deals				.677			
Financial Terms				.661			
Guilt				-.510			
Saving Older				.445			
Risk Stocks Shares	.371			.397			
Wealth				.365	-.323		
New Things					.714		
Flexible					.636		
Social					.632		
Enough				-.459	.480		
Intuition						.799	
Gut Feelings						.721	
Credit Card						.309	.676
Unwise						.424	.663
Think Hard	-.307						-.552
Budget		.329					-.416

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.  
a Rotation converged in 19 iterations.

**Table 5.58: Varimax Rotation of Seven Factor Solution for Pecuniary Items**



**Diagram 5.1: The Seven Pecuniary Factors Produced After Factor Analysis**

### **5.6.1 Correlations**

Correlation matrices were performed for both the original six factors and the new seven factors. Within the original six factors (money attitude scale, cognitive style, credit, saving and shopping behaviour, personality factors, background characteristics and credit and saving attitudes) there were a limited number of correlations within each. However this is mainly due to the fact that within each of these original factors there are quite separate but related dimensions. Therefore although at first glance it may seem as though the items within each of these factors do not relate to one another, in fact it's that they just measure a slightly different dimension.

Correlations within the seven factors that were produced through factor analysis were more consistent. The items that correlate are may be not theoretically linked but superficially and/or behaviourally are. For example Table 5.59 displays the correlations for Factor 1 "Emotional Spenders".

		Feel Better	Excitement	Impress	Purchases	Reduced	Spend
<b>Feel Better</b>	Pearson Correlation	1	.712(**)	.412(**)	.630(**)	-.556(**)	.130
	Sig. (2-tailed)		.000	.001	.000	.000	.300
	N	65	65	65	65	65	65
<b>Excitement</b>	Pearson Correlation	.712(**)	1	.562(**)	.559(**)	-.375(**)	.207
	Sig. (2-tailed)	.000		.000	.000	.002	.098
	N	65	65	65	65	65	65
<b>Impress</b>	Pearson Correlation	.412(**)	.562(**)	1	.415(**)	-.344(**)	.294(*)
	Sig. (2-tailed)	.001	.000		.001	.005	.018
	N	65	65	65	65	65	65
<b>Purchases</b>	Pearson Correlation	.630(**)	.559(**)	.415(**)	1	-.385(**)	.073
	Sig. (2-tailed)	.000	.000	.001		.002	.562
	N	65	65	65	65	65	65
<b>Reduced</b>	Pearson Correlation	-.556(**)	-.375(**)	-.344(**)	-.385(**)	1	-.121
	Sig. (2-tailed)	.000	.002	.005	.002		.335
	N	65	65	65	65	65	65
<b>Spend</b>	Pearson Correlation	.130	.207	.294(*)	.073	-.121	1
	Sig. (2-tailed)	.300	.098	.018	.562	.335	
	N	65	65	65	65	65	65

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

**Table 5.59: Correlations for Factor one: “Emotional Spenders” of the Pecuniary Items**

Individuals who score highly in this factor purchase items because it makes them feel better; they also feel a rush of excitement when they purchase things; sometimes buy things to impress others; like to reward themselves with purchases; feel you have to spend more to get the very best; however do not buy things just because they are reduced in price. Here it is clear that there is an emotional element to these individuals relationship with money and spending. They have attached a high status symbolic meaning with it. During the exit interview participants were asked to rate several symbolic meanings of money. These have been correlated with the factors. The table below (Table 5.60) displays the symbolic meaning of money statements and the “emotional spenders” factor statements.

		Feel Better	Excitement	Impress	Purchases	Reduced	Spend
<b>Spending</b>	Pearson Correlation	<b>.323(**)</b>	<b>.319(**)</b>	<b>.312(*)</b>	<b>.245(*)</b>	<b>-.283(*)</b>	0.235
	Sig. (2-tailed)	<b>0.009</b>	<b>0.01</b>	<b>0.011</b>	<b>0.049</b>	<b>0.022</b>	0.059
	N	65	65	65	65	65	65
<b>Giving</b>	Pearson Correlation	-0.21	-0.226	-0.188	0.002	0.112	0.065
	Sig. (2-tailed)	0.093	0.07	0.133	0.989	0.373	0.607
	N	65	65	65	65	65	65
<b>Saving</b>	Pearson Correlation	-0.218	<b>-.366(**)</b>	<b>-.275(*)</b>	-0.175	0.071	-0.083
	Sig. (2-tailed)	0.082	<b>0.003</b>	<b>0.027</b>	0.163	0.572	0.509
	N	65	65	65	65	65	65
<b>Investing</b>	Pearson Correlation	-0.23	-0.177	-0.01	0.021	0.15	-0.012
	Sig. (2-tailed)	0.066	0.157	0.935	0.865	0.232	0.923
	N	65	65	65	65	65	65
<b>Good</b>	Pearson Correlation	0.012	0.076	-0.151	-0.162	0.163	-0.162
	Sig. (2-tailed)	0.924	0.547	0.23	0.196	0.195	0.197
	N	65	65	65	65	65	65
<b>Evil</b>	Pearson Correlation	-0.038	0.144	0.142	0.033	0.079	-0.03
	Sig. (2-tailed)	0.767	0.254	0.26	0.791	0.533	0.812
	N	65	65	65	65	65	65
<b>Envy</b>	Pearson Correlation	<b>.291(*)</b>	<b>.297(*)</b>	<b>.304(*)</b>	<b>.253(*)</b>	0.01	0.214
	Sig. (2-tailed)	<b>0.019</b>	<b>0.016</b>	<b>0.014</b>	<b>0.042</b>	0.938	0.088
	N	65	65	65	65	65	65
<b>Power</b>	Pearson Correlation	<b>.277(*)</b>	0.15	0.204	0.128	-0.028	0.046
	Sig. (2-tailed)	<b>0.025</b>	0.232	0.104	0.31	0.825	0.716
	N	65	65	65	65	65	65
<b>Achievement</b>	Pearson Correlation	-0.009	-0.087	0.076	-0.102	0.063	-0.058
	Sig. (2-tailed)	0.946	0.49	0.549	0.417	0.62	0.644
	N	65	65	65	65	65	65
<b>Freedom</b>	Pearson Correlation	0.137	0.112	-0.194	-0.002	-0.01	<b>-.263(*)</b>
	Sig. (2-tailed)	0.277	0.375	0.122	0.988	0.938	<b>0.034</b>
	N	65	65	65	65	65	65
<b>Security</b>	Pearson Correlation	-0.142	-0.101	-0.133	-0.192	<b>.267(*)</b>	-0.197
	Sig. (2-tailed)	0.259	0.423	0.292	0.126	<b>0.031</b>	0.116
	N	65	65	65	65	65	65
<b>Respect</b>	Pearson Correlation	-0.163	0.001	0.155	-0.104	0.197	0.092
	Sig. (2-tailed)	0.196	0.994	0.217	0.411	0.116	0.465
	N	65	65	65	65	65	65

\*\*Correlation is significant at the 0.01 level (2-tailed).

\*Correlation is significant at the 0.05 level (2-tailed).

**Table 5.60: Correlations for Factor one: “Emotional Spenders” of the Pecuniary Items**

From this it can be seen that people who spend to make themselves feel better also rate spending as being important to them ( $p=0.009$ ,  $r=0.323$ ) and feel strongly that money can mean envy ( $p=0.019$ ,  $r=0.291$ ) and power ( $p=0.025$ ,  $r=0.277$ ). Another interesting result here is that those who feel that you have to spend more to get the very best do not believe that money can mean freedom ( $p=0.034$ ,  $r= -0.263$ ).

The seven factors were then correlated with the overall product uptake scores. Table 5.61 displays the results.

		Mean HPP	Mean LPP	Mean HRA	Mean LRA
Mean F1	Pearson Correlation	-0.153	0.029	<b>-.323(**)</b>	<b>-.314(*)</b>
	Sig. (2-tailed)	0.224	0.821	<b>0.009</b>	<b>0.011</b>
	N	65	65	65	65
Mean F2	Pearson Correlation	-0.005	-0.173	<b>.269(*)</b>	0.186
	Sig. (2-tailed)	0.971	0.169	<b>0.03</b>	0.137
	N	65	65	65	65
Mean F3	Pearson Correlation	0.166	-0.168	<b>.408(**)</b>	<b>.353(**)</b>
	Sig. (2-tailed)	0.186	0.18	<b>0.001</b>	<b>0.004</b>
	N	65	65	65	65
Mean F4	Pearson Correlation	-0.11	<b>-.270(*)</b>	<b>.385(**)</b>	<b>.245(*)</b>
	Sig. (2-tailed)	0.384	<b>0.03</b>	<b>0.002</b>	<b>0.049</b>
	N	65	65	65	65
Mean F5	Pearson Correlation	0.074	0.177	-0.011	0.14
	Sig. (2-tailed)	0.559	0.158	0.931	0.267
	N	65	65	65	65
Mean F6	Pearson Correlation	-0.076	-0.188	-0.033	-0.069
	Sig. (2-tailed)	0.549	0.133	0.792	0.587
	N	65	65	65	65
Mean F7	Pearson Correlation	0.071	-0.003	0.067	0.121
	Sig. (2-tailed)	0.572	0.982	0.595	0.335
	N	65	65	65	65

\*\*Correlation is significant at the 0.01 level (2-tailed).

\*Correlation is significant at the 0.05 level (2-tailed).

**Table 5.61: Correlations for the seven Pecuniary Factors and the Mean Product Uptake Scores**

It can be seen that for individuals who were likely to take up the Low Planning Propensity (LPP) product would score low on the fourth pecuniary factor “Savvy Savers” (F4) ( $p=0.03$ ,  $r= -0.27$ ). Individuals who were likely to take up the High Risk Averse (HRA) product were likely to score low on the first pecuniary factor “Emotional Shoppers” (F1) ( $p=0.009$ ,  $r= -0.323$ ). The same individuals who were likely to take up the HRA product were likely to score high on the third factor “Frivolous Worriers” ( $p=0.001$ ,  $r=0.408$ ) as well as the fourth factor “Savvy Savers” (F4) ( $p=0.002$ ,  $r=0.385$ ). The strongest correlation that occurred between those

individuals who would take up the Low Risk Averse (LRA) product and the third pecuniary factor “Frivolous Worriers” (F3) ( $p=0.004$ ,  $r=0.353$ ). There were no significant correlations between the mean product uptake score for High Planning Propensity (HPP) and the pecuniary factors.

The relevance ratings for each product were also looked at in conjunction with the pecuniary factors and several appeared. See Table 5.62. Individuals who felt that the HPP product was relevant to them did not score highly on the “Savvy Savers” factor ( $p=0.028$ ,  $r= -0.272$ ). The strongest correlation for those individuals who felt that the LPP product was the most relevant did also not score highly on the “Savvy Savers” factor ( $p=0.007$ ,  $r= -0.329$ ) or the “Frivolous Worriers” factor ( $p=0.01$ ,  $r= -0.317$ ). The individuals who felt that the HRA product was the most relevant to them did score highly on the “Savvy Savers” factor ( $p=0.014$ ,  $r=0.303$ ). Lastly those individuals who felt that the LRA product was the most relevant to their needs scored low on the “Intuition” factor ( $p=0.014$ ,  $r= -0.014$ ) but high on the “Frivolous Worriers” factor ( $p=0.015$ ,  $r=0.3$ ).



		Relevance HPP	Relevance LPP	Relevance HRA	Relevance LRA
<b>Mean F1</b>	Pearson Correlation	-0.107	-0.019	-0.207	-0.134
	Sig. (2-tailed)	0.397	0.878	0.097	0.289
	N	65	65	65	65
<b>Mean F2</b>	Pearson Correlation	-0.075	<b>-.278(*)</b>	0.16	0.109
	Sig. (2-tailed)	0.55	<b>0.025</b>	0.204	0.386
	N	65	65	65	65
<b>Mean F3</b>	Pearson Correlation	-0.057	<b>-.317(*)</b>	0.214	<b>.300(*)</b>
	Sig. (2-tailed)	0.651	<b>0.01</b>	0.087	<b>0.015</b>
	N	65	65	65	65
<b>Mean F4</b>	Pearson Correlation	<b>-.272(*)</b>	<b>-.329(**)</b>	<b>.303(*)</b>	0.229
	Sig. (2-tailed)	<b>0.028</b>	<b>0.007</b>	<b>0.014</b>	0.066
	N	65	65	65	65
<b>Mean F5</b>	Pearson Correlation	-0.037	0.089	-0.138	-0.099
	Sig. (2-tailed)	0.771	0.479	0.274	0.433
	N	65	65	65	65
<b>Mean F6</b>	Pearson Correlation	0.137	-0.164	<b>-.282(*)</b>	<b>-.304(*)</b>
	Sig. (2-tailed)	0.277	0.191	<b>0.023</b>	<b>0.014</b>
	N	65	65	65	65
<b>Mean F7</b>	Pearson Correlation	0.09	-0.069	-0.099	-0.119
	Sig. (2-tailed)	0.478	0.582	0.434	0.344
	N	65	65	65	65

\*\*Correlation is significant at the 0.01 level (2-tailed).

\*Correlation is significant at the 0.05 level (2-tailed).

**Table 5.62: Correlations for the Seven Pecuniary Factors and the Relevance Ratings for all Four Products**

From these results it would seem reasonable to suggest that individuals attitudes towards financial matters (which can be segmented) affects there likelihood to take up different products.

## 5.6.2 Pecuniary Questionnaire Factors and Demographics

There were surprisingly few correlations between participants' demographic and economic variables and their attitudes towards financial matters. Table 5.63 displays the correlations between the seven pecuniary factors and the demographic and economic variables chosen to investigate Hypothesis F.

**H<sub>0F</sub>:**      **There will be no significant difference between customers (pertaining to their financial attitudes).**

**H<sub>1F</sub>:**      **There will be a significant difference between customers (pertaining to their financial attitudes).**

Participants who scored high on Factor 1 are unlikely to have any dependants ( $p=0.001$ ,  $r=-0.41$ ), or a car loan ( $p=0.045$ ,  $r=-0.288$ ), or a personal loan ( $p=0.01$ ,  $r=-0.319$ ) but are likely to have a student loan ( $p=0.001$ ,  $r=.4$ ).

Participants who scored high on Factor 2 are likely to have a mortgage ( $p=0.009$ ,  $r=0.321$ ) as well as more than one savings account ( $p=0.037$ ,  $r=0.259$ ).

Participants who scored high on Factor 3 are likely to have a mortgage ( $p=0.001$ ,  $r=0.387$ ), own a car ( $p=0.003$ ,  $r=0.359$ ), more than one savings account ( $p=0.016$ ,  $r=0.297$ ), but are unlikely to have a student loan.

Participants who scored high on Factor 4 are likely to have more than one savings account ( $p=0.002$ ,  $r=0.373$ ).

Participants who scored high on Factor 5 are not very likely to have a mortgage ( $p=0.025$ ,  $r=-0.277$ ).

Factor 6 does not have any significant correlations with the demographic and economic data gathered from this experiment however may if other data was gathered. Also it should be noted that this is the smallest factor, containing only two items, making it less likely to have significant correlation considering the small sample size.

Participants who scored high on Factor 7 are likely to have at least one credit card ( $p=0.002$ ,  $r=0.380$ ). This result is somewhat surprising as this factor “Anti-creditors” consists of individuals who said that they think it’s unwise to use any credit cards and don’t like to use any credit cards. This result could be due to the small sample size and factor analysis results needing adjusting again due to the sample size.

There is sufficient evidence to suggest that the null hypothesis (F) relating to the expected differences between customers (relating to their financial attitudes) can be rejected as factor analysis produced seven groups for which thirteen significant correlations were found between the six of and demographic details (nine at the  $p\leq 0.01$  level and four at the  $p<0.05$  level).

		University	Dependants	Mortgage	Car	Car Loan	Student Loan	Personal Loan	Overdraft	Credit cards	Non Savings A/C	Savings A/C	Incom
MeanF1	Pearson Correlation	0.226	<b>-.410(**)</b>	-0.172	-0.14	<b>-.288(*)</b>	<b>-.400(**)</b>	<b>-.319(**)</b>	0.145	-0.032	-0.189	-0.125	-0.07
	Sig. (2-tailed)	0.07	<b>0.001</b>	0.172	0.265	<b>0.045</b>	<b>0.001</b>	<b>0.01</b>	0.251	0.801	0.132	0.321	0.55
	N	65	65	65	65	49	65	65	65	65	65	65	65
MeanF2	Pearson Correlation	-0.061	0.003	<b>.321(**)</b>	0.047	-0.089	-0.227	-0.213	-0.158	-0.045	0.117	<b>.259(*)</b>	-0.05
	Sig. (2-tailed)	0.627	0.981	<b>0.009</b>	0.708	0.543	0.069	0.089	0.207	0.722	0.353	<b>0.037</b>	0.63
	N	65	65	65	65	49	65	65	65	65	65	65	65
MeanF3	Pearson Correlation	-0.153	0.202	<b>.387(**)</b>	<b>.359(**)</b>	-0.068	<b>-.440(**)</b>	0.044	-0.029	0.235	<b>.297(*)</b>	0.2	0.18
	Sig. (2-tailed)	0.223	0.107	<b>0.001</b>	<b>0.003</b>	0.644	<b>0</b>	0.728	0.821	0.059	<b>0.016</b>	0.11	0.14
	N	65	65	65	65	49	65	65	65	65	65	65	65
MeanF4	Pearson Correlation	0.12	0.154	0.085	0.223	-0.078	-0.085	-0.127	-0.051	<b>.293(*)</b>	<b>.373(**)</b>	0.204	0.18
	Sig. (2-tailed)	0.34	0.22	0.499	0.074	0.595	0.5	0.313	0.685	<b>0.018</b>	<b>0.002</b>	0.102	0.3
	N	65	65	65	65	49	65	65	65	65	65	65	65
MeanF5	Pearson Correlation	-0.031	-0.104	<b>-.277(*)</b>	-0.105	-0.143	0.106	0.065	0.171	-0.145	0.08	-0.065	-0.18
	Sig. (2-tailed)	0.806	0.408	<b>0.025</b>	0.406	0.327	0.403	0.606	0.173	0.249	0.527	0.608	0.3
	N	65	65	65	65	49	65	65	65	65	65	65	65
MeanF6	Pearson Correlation	-0.027	0.036	0.04	-0.019	0.064	-0.034	-0.066	0.065	0.054	-0.111	0.219	0.3
	Sig. (2-tailed)	0.833	0.776	0.752	0.88	0.663	0.791	0.599	0.605	0.67	0.377	0.08	0.3
	N	65	65	65	65	49	65	65	65	65	65	65	65
MeanF7	Pearson Correlation	0.099	-0.139	0.053	0.12	0.081	-0.03	0.178	-0.075	<b>.380(**)</b>	0.029	-0.083	0.0
	Sig. (2-tailed)	0.434	0.27	0.674	0.34	0.58	0.81	0.155	0.552	<b>0.002</b>	0.818	0.512	0.5
	N	65	65	65	65	49	65	65	65	65	65	65	65

\*\*Correlation is significant at the 0.01 level (2-tailed).

\*Correlation is significant at the 0.05 level (2-tailed).

**Table 5.63: Correlations for the Seven Pecuniary Factors and Demographic Variables**

### 5.6.3 Further Analysis

One-way ANOVAs were conducted on the seven pecuniary factors against the demographic variables to see what differences, if any there were between the groups.

There are 10 significant results.

Demographic Variable	Pecuniary Factor	Sum of Squares	F Statistic	Sig.
Income	Factor 3	2.862	2.798	0.034
Mortgage	Factor 2	2.005	3.613	0.033
	Factor 3	2.811	5.660	0.006
Own a Car	Factor 3	2.342	9.301	0.003
Car Loan	Factor 1	2.081	4.249	0.045
Student Loan	Factor 1	5.754	12.030	0.001
	Factor 3	3.517	15.087	0.000
Personal Loan	Factor 1	3.655	7.144	0.010
Number of Credit Cards	Factor 7	6.789	3.170	0.020
Number of Savings A/C	Factor 4	1.159	2.877	0.030

**Table 5.64: ANOVA results for the Pecuniary Factors and Demographic Variables**

From Table 5.64 it can be seen that on the demographic variable Income there is one significant between-subject effect for Factor 3 ( $p=0.034$ ,  $F=2.798$ ). This indicates that individuals with different income levels are scoring differently on the pecuniary Factor 3. Those individuals who have a mortgage, did have a mortgage or do not have a mortgage also all score differently on Factor 2 ( $p=0.033$ ,  $F=3.613$ ) and Factor 3 ( $p=0.006$ ,  $F=5.66$ ). For those who own a car, they score significantly different on Factor 3 of the Pecuniary questionnaire than those who do not ( $p=0.003$ ,  $F=9.301$ ). Participants who used a car loan to purchase they're car scored significantly different on pecuniary Factor 1 ( $p=0.045$ ,  $F=4.249$ ) from those who did not use a car loan. Those individuals who have or have had a student loan scored significantly different from those who have not had one Factor 1 ( $p=0.001$ ,  $F=12.03$ ) and Factor 3 ( $p=0.000$ ,  $F=15.087$ ). Participants who have never taken out a personal loan scored significantly different from those who have on the pecuniary Factor 1 ( $p=0.01$ ,  $F=7.144$ ).

Participants also differed significantly from each other on Factor 7 depending on the number of credit cards they have ( $p=0.02$ ,  $F=3.17$ ). The last significant between-subject effect occurs in Factor 4 for the differing number of savings accounts participants have ( $p=0.03$ ,  $F=2.877$ ).

## **5.7 Interview Comments**

The exit interview can allow participants to express their views more fully and help explain their preferences. The information regarding the personalisation issue of products and information was of most interest and is documented below. When asked about what they thought of the information they were given during each scenario and how they were presented. There was a general consensus that the information given about the products is a good idea, however there should be an option to opt out:

*“Yeah think it's useful as you're not always aware of what to ask for”*

*“Good idea but should have the option to opt out”*

*“Good as long as the product is relevant and depends on how much time you have”*

Another interesting point picked up on by the participants is the ‘personalisation’ element to the product:

*“I don't mind, seemed as if it was a bit more personal than usual”*

*“It's very good especially if they've looked at my accounts etc.”*

*“If they have looked at my background then it makes me feel valued as a customer”*

*“If it was a human it'd be put out but because it's a virtual agent its as if the bank are actually looking at your personal financial situation to see what's best for you”*

*“With the agent I could have said no, but because he had looked at my background I wanted to listen.”*

The few negative comments regarding the information and its presentation were similar; in particular they would prefer the information through the post:

*“I'm not fond of it, should just send the information in the post”*

*“Yes it's ok but I think I might prefer some information in the post”*

It should be noted that the reasons given for why they rated the certain products as the most relevance to themselves were in terms of how the product offered something specific to them and their current financial situation. For example those many of those who chose the High Planning Propensity product stated:

*“Because it was a savings account, and said had looked at my current account”*

*“Savers accounts are more beneficial to me right now”*

*“I can take out my money whenever I want”*

*“Good offer, good rate”*

Those who chose the Low Planning Propensity Product as the most relevant:

*“Flexible”*

*“Flexible and high interest rate”*

*“Flexible and save at same time”*

*“Could get access to your money”*

High Risk Averse:

*“Unrestricted access to my assets, flexible as my financial situation changes all the time”*

*“Guaranteed 75% growth and NO RISK”*

*“Could listen to the info and it said there was NO RISK”*

*“Guaranteed return”*

Low Risk Averse:

*“Investment is something I'm interested in”*

*“Get to invest and don't have to keep putting money in”*

*“The product suits my needs now”*

*“I like to put my money in several places so stocks and shares appeal to me”*

## **5.8 Discussion and Conclusions**

The results show that all four versions were rated above neutral indicating a good design in terms of usability. There was no main effect of product type on the mean usability scores indicating that the differing product portrayals did not have an effect on the usability of the ECA in an eBanking scenario. To an extent this result was expected as it would not be desirable for a change in the product on offer to affect the overall usability of the service. When there was an effect or interaction effect relating to the product it was for such attributes associated with fluency or cognition, for example getting flustered or the interaction being complicated. This seems logical as the risk product offers scored lowest and the majority of people said they were not interested in such products and therefore would have less exposure to the type of



information within each offer causing slightly more frustration or appearing more complicated.

On many of the usability attributes there was an effect of version order. It appears that in particular version order 3 in which participants experienced the High Risk Averse product, High Planning Propensity, the Low Risk Averse Product, and ending with the Low Planning Propensity offer had an impact on the usability of the service. This version order often produced more negative results than the other version orders. One possibility is that this version order started with a risk related product which participants may have been more uncomfortable listening to but this pattern was not observed for the fourth version order (in which a risk product was also offered first) so there is not enough data to support such a conjecture.

There are effects and interaction effects of age, gender, dependants and higher education. There were mixed results regarding age. For the cognitive and fluency usability attributes the younger age group scored higher and for others such as quality and engagement the older age group scored higher. This result again seems logical as older participants tend to be “kinder” in their remarks regarding enjoyment and efficiency and younger participants are more likely to have to concentrate less and feel more in control when using such a service due to their exposure to such technology.

Regarding gender, there were not many significant results, nonetheless in general females seemed to be more accepting and in general give higher ratings.

The effects observed relating to whether or not participants have dependants are slightly less clear. In most cases those with dependants scored higher, for example felt less stressed, less flustered and enjoyed the interactions more; however they also had to concentrate more.

For the independent variable higher education, generally those who have not attended any they scored higher than those who have attended some type of higher education establishment, except in interaction effects with version order. Participants who have attended some type of higher education rated higher after experiencing version order 3, for example on attributes such as “difficult”, “stress”. This result might indicate something within this version order that might rely on a greater understanding of the way in which the information was presented and which those who have attended some form of higher education have been previous exposed to. Again though there is not enough evidence to support such speculation.

The one attribute where all four versions scored negatively was “prefer human”, overall participants would prefer to interact with a human. These scores were only just below the neutral mark, all between three and four, indicating only a slight preference. However, it should be noted that such a system as the one employed in the current research would not be designed to replace humans but instead aim to compliment and support them. The younger group of participants (<35 years) scored each interaction overall higher than the older group ( $\geq 35$  years).

In relation to the type of product offered there were also significant differences observed. It would appear that the best types of products to offer via an ECA that will

appeal to the majority of customers are savings accounts. Both the high and low planning propensity product portrayals were rated higher in terms of likelihood of product uptake/future purchase compared to the risk aversion product portrayals. In other words it seems that products that relate to individuals planning propensity are more likely to be taken as being more useful, tailored to their needs and especially chosen for them. All products reached an overall score of five or above indicating positive reactions in terms of both product presentation and possible future purchasing behaviour. Several of the between-subject results encourage the use of targeting specific demographics and segments of customers to ensure the best response in turn compounding the bank-customer relationship.

The results of the Pecuniary Questionnaire are limited but promising. Although the factor analysis can only be taken as preliminary findings and will need far larger sample numbers to make statistically viable they do show a possible underlying seven factor structure. This structure can in turn be utilized by banks to segment its customers, thus allowing for a more personal and individualised level of service and will consequently strengthen the bank-customer relationship. The aim of this metric is so that banks can use it as a tool to draw upon demographic, economic, psychological characteristics and customer files to target customers' needs through individualised product portrayals.

Several of the correlations between the seven factors and the relevance ratings suggest that certain financial attitudes can affect whether or not a customer feels a product is relevant to them. Due to these correlations and those between several of the factors and the demographic and economic variables it seems reasonable to suggest that the

pecuniary questionnaire be developed further to help assist in the segmentation of a banks customers and in turn predict purchasing behaviour. For example participants who scored high on the “Emotional Shoppers” factor are unlikely to have any dependants, own a car, or have a personal loan but are likely to have or have had a student loan. It could be implied from this, that these individuals who often purchase items to make themselves feel better, feel a rush of excitement when they do purchase items and buy things to impress others, could benefit from either a personal loan (however this raises moral and ethical issues), or even a flexible saving account. This would allow them to gain access to their money when needed, [which may be frequently] but enable them to save at the same time. Even though there were no significant correlations between the flexible portrayal of the savings account (LPP) and this factor, it does not rule out such correlations in the future with a larger sample size or slightly modified product.

In relation to the type of product offered, significant differences were observed which suggest that the best types of products to offer via an ECA that will appeal to the majority of customers are savings accounts. Both the high and low Planning Propensity product portrayals were rated higher in terms of likelihood of product uptake / future purchase behaviour compared to the Risk Aversion product portrayals. It seems that products that relate to an individual's planning propensity are more likely to be taken as being tailored to their needs and especially chosen for them. All products achieved positive reactions in terms of both product presentation and possible future purchasing behaviour. Several of the between-participants results encourage the use of targeting specific demographics and segments of customers to ensure the best response in turn compounding the bank-customer relationship.

Financial institutions can use these results as a tool along with the male extrovert ECA design identified from the previous experiment (detailed in Chapter 4) in eBanking scenarios to modify customers' behaviour by targeting their specific attitudes with the tailored information and products, as well as simplifying complex tasks into simple sets of behaviours and guiding customers through the process (be that a loan application for example) (Fogg, 2003). This research also provides further evidence to support the notion of CASA paradigm (Nass & Clifford, 1996). This work also goes some way to show that using an ECA in more of a sales capacity can lead to greater satisfaction with the retailer, a more positive attitude toward the product, and a greater purchase intention, therefore with the potential to become a more effective sales agent that can lead to high levels of product involvement.

## **5.9 Summary**

This chapter details the results from an experiment to examine the effects of individualised product portrayals on the usability of ECAs in an eBanking scenario. A secondary aim was to assess the possible link between demographic, economic and psychological characteristics and individuals pecuniary attitudes. This experiment can go some way to bridge the gap between psychological theories, personalisation and ECAs. The possibilities of such an interactive experience within a financial establishment are extensive. For example this technology (personalised, personality specific 3D virtual ECA) could be used to modify attitudes and/or purchasing behaviour.

## **Chapter Six**

# **Empirical Evaluation of the Pecuniary Questionnaire**

## **6.1 Introduction**

This chapter discusses the results of an empirical evaluation assessing the Pecuniary Questionnaire. The aim of the Pecuniary Questionnaire is to provide a reliable psychographic metric for financial institutions to utilise as a means of further assessing the attitudes of its customers. It will enable banks to create segments pertaining to a variety of financial attitudes and economic behaviour. In turn, this should allow the bank to tailor its product offers to the individual and increase the likelihood of product uptake.

The results of the second experiment were encouraging in terms of separate and definable factors from the Pecuniary Questionnaire. Factor analysis was carried out even though the sample size was too small to be statistically viable. It did produce seven distinct and logical factors. It was decided on these results that a larger sample was needed in order to reject or support these initial findings. The Pecuniary questionnaire was sent to 278 Royal Bank of Scotland customers, 221 were returned. Participants' age range was 18-84, with 97 males and 124 females.

## **6.2 Reliability of Scale**

To support the use of factor analysis the reliability of the scale was measured by assessing the Cronbach's alpha. For these set of data the Cronbach's alpha reached 0.585. If no items were removed then this scale has a Cronbach alpha coefficient that is too low to ensure reliability. However from Table 6.1 it can be seen that there are

four items (“Wealth”, “Proud”, “Plan ahead” and “Self discipline”) that have a Cronbach’s alpha that are 0.015 points higher than the final one obtained (if they are deleted) but not improve the overall score. Once again it was deemed acceptable due to the diversity of the concepts being measured (Kline, 1999). The questionnaire under investigation here comprises of several fairly distinct factors that when looked at as whole will be able to help in categorising customers into segments according to there financial attitudes and economic behaviour.



	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
<b>Wealth</b>	158.08	220.83	-0.02	<b>0.60</b>
<b>Spend</b>	157.60	216.66	0.09	0.58
<b>Impress</b>	160.39	210.50	0.26	0.57
<b>Worry</b>	159.48	222.45	-0.04	0.59
<b>Feel Better</b>	158.60	198.17	0.41	0.55
<b>Enough</b>	157.95	204.39	0.31	0.56
<b>Know Amount</b>	159.07	216.48	0.03	0.59
<b>Pay Bills</b>	160.61	217.78	0.10	0.58
<b>Proud</b>	158.06	221.60	-0.03	<b>0.60</b>
<b>Unexpected</b>	156.59	220.03	0.06	0.58
<b>Budget</b>	156.93	219.19	0.08	0.58
<b>Reduced</b>	158.24	203.77	0.31	0.56
<b>Financial Terms</b>	156.40	219.29	0.10	0.58
<b>Think Hard</b>	156.36	218.56	0.15	0.58
<b>Best Deals</b>	156.08	220.59	0.10	0.58
<b>Gut Feel</b>	159.28	208.02	0.26	0.57
<b>Intuition</b>	158.77	205.54	0.30	0.56
<b>Credit Card</b>	158.86	207.39	0.21	0.57
<b>Limit</b>	160.51	210.66	0.23	0.57
<b>Over Draft</b>	160.45	212.18	0.18	0.57
<b>Diff Save</b>	158.50	217.51	0.03	0.59
<b>Long Term</b>	157.66	222.45	-0.04	<b>0.60</b>
<b>To Do Buy</b>	157.53	214.45	0.14	0.58
<b>Purchases</b>	158.98	200.06	0.43	0.55
<b>Excitement</b>	158.91	200.63	0.40	0.55
<b>Guilt</b>	159.19	204.55	0.34	0.56
<b>Argue</b>	159.52	207.83	0.23	0.57
<b>Discussed</b>	160.14	215.90	0.11	0.58
<b>Risk SS</b>	158.41	217.92	0.05	0.59
<b>Gambling</b>	157.18	219.47	0.00	0.59
<b>Alone</b>	158.62	220.86	-0.02	0.59
<b>Social</b>	157.22	211.12	0.24	0.57
<b>Plan Ahead</b>	159.84	224.62	-0.09	<b>0.60</b>
<b>Discipline</b>	157.54	223.98	-0.07	<b>0.60</b>
<b>New Things</b>	157.04	216.59	0.14	0.58
<b>Flexible</b>	157.07	217.91	0.13	0.58
<b>Unwise</b>	159.45	204.84	0.28	0.56
<b>Debt MM</b>	157.77	215.14	0.09	0.58
<b>Regularly</b>	156.84	218.06	0.12	0.58
<b>Saving Older</b>	160.29	219.28	0.06	0.58

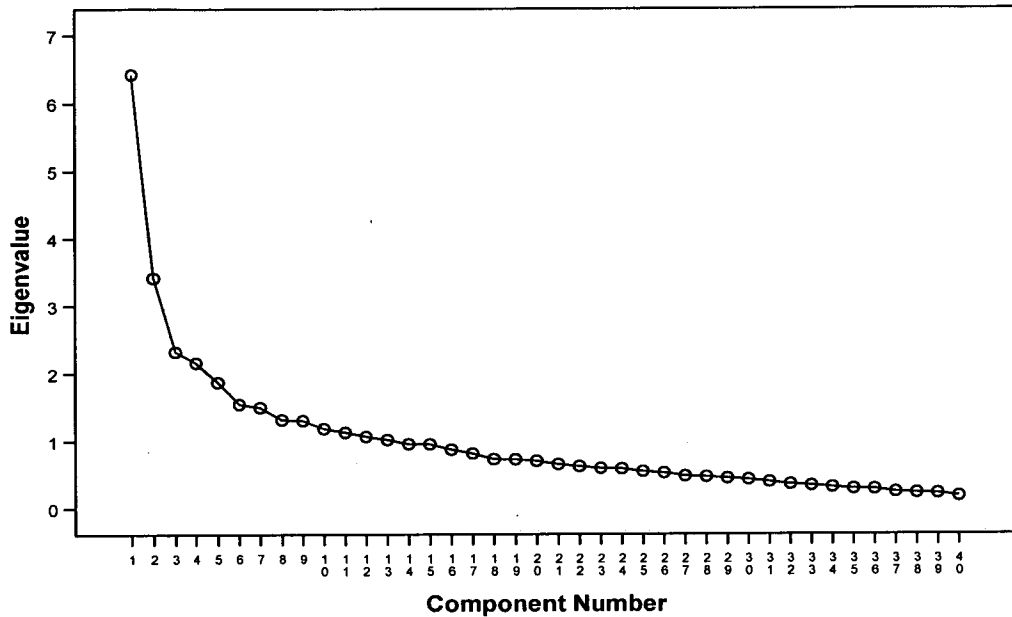
**Table 6.1: Pecuniary Questionnaire Item-Total Statistics**

### **6.3 Factor Analysis**

The 40 items of the Pecuniary Questionnaire were subjected to PCA using SPSS. Prior to performing PCA the suitability of data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above. The Kaiser-Meyer-Okin value was 0.762, which is comfortably higher than the recommended value of 0.6 (H. Kaiser, 1970; H. Kaiser, 1974) and the Bartlett's Test of Sphericity (Bartlett, 1954) reached statistical significance, supporting the factorability of the correlation matrix.

Principal component analysis revealed the presence of thirteen components with eigenvalues exceeding 1 (6.43, 3.41, 2.32, 2.15, 1.87, 1.54, 1.49, 1.31, 1.30, 1.18, 1.12, 1.06, 1.01), explaining 65.49% of the variance. An inspection of the screeplot revealed a break after the seventh component. Using Catell's (Catell, 1966) scree test, it was decided to retain seven of the components for further investigation (see Figure 6.1).

### Scree Plot



**Figure 6.1: Scree Plot for Pecuniary Questionnaire**

To aid in interpretation of these seven components, Varimax rotation was performed. The rotated solution presented in Table 6.12 revealed a number of strong loadings, and most variables mainly loading substantially on three of the components. The seven factor solution explained a total of 48.02% of the variance, with Component 1 contributing 10.80%, Component 2 contributing 8.94%, Component 3 contributing 8.71%, Component 4 contributing 5.26%, Component 5 contributing 5.22%, Component 6 contributing 4.80%, and Component 7 contributing 4.29%. Table 2 displays the factors that the factor analysis produced these are different from those previously defined. However each item is generally weighted on one main component indicating that these do in fact assess separate attitudes. For an overview of the seven factors see Diagram 6.1.

Component	1	2	3	4	5	6	7
Proud	0.754242	0.305274					
Long Term	0.739772						
Diff Save	-0.72283						
Over Draft	-0.65667		0.317591				
To Do Buy	0.604937						
Limit	-0.53051						
Discipline	0.485434						
Enough	-0.47016		0.460161				
Debt M M	0.455451						
Discussed	0.32803						
Regularly		0.68344					
Think Hard		0.672672					
Best Deals		0.655261					
Unexpected	0.347182	0.652783					
Financial Terms		0.542369					
Budget		0.523253					
Saving Older		-0.5215					
Worry		-0.47557					
Plan Ahead	-0.31132	-0.39432					0.313327
Excitement			0.779702				
Purchases			0.750541				
Feel Better			0.74467				
Guilt			0.576024				
Impress			0.47488			0.349253	
Argue			0.415651				
New Things				0.793851			
Flexible				0.678652			
Social				0.673841			
Unwise					0.842064		
Credit Card					0.797321		
Pay Bills		-0.30864			0.468669		
Risk SS						0.494694	
Know Amount		-0.31026			0.349272	0.467359	
Wealth						-0.43176	
Reduced			0.400503			0.424426	
Spend						0.379876	
Gambling						-0.37803	
Gut Feelings							0.777443
Intuition							0.715535
Alone				-0.33337			-0.36881

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a                      Rotation converged in 7 iterations.

**Table 6.12 Rotated Factor Solution**

### Disciplined Savers

Proud of their ability to save  
Save for the long-term  
Don't find it difficult to save on a regular basis  
Don't use their overdraft for to buy non-essential items  
Save for things they want to do or buy  
Don't often reach the limit on their credit cards  
Feel they have a lot of self-discipline  
Don't often worry that they don't enough money  
Do think that people who are in debt are not managing their money properly  
Whilst a child their parents did discuss family finances with them

F1

### Emotional Shoppers

Feel a rush of excitement when they purchase things  
Like to reward themselves with purchases  
Often buy things to make themselves feel better  
Often feel a sense of guilt when they purchase things  
Sometimes buy things they don't need just to impress other people  
Often buy things just because they are reduced in price  
Whilst a child their parents often argued money

F2

### Savvy Savers

Think it is important to save on a regular basis  
Think it's important to think long and hard before making financial decisions  
Think it's important to look around for the best deals  
Think it's important to put money aside for unexpected events  
Think it's important to know what financial terms really mean  
Think saving isn't only important as we get older  
Think it's important to stick to a budget  
Don't think it's pointless to worry about money  
Like to plan ahead.

F3

### Power Driven Risk Takers

Don't always know how much money is in there bank accounts  
Believe the risks involved with stocks and shares are outweighed by the potential financial rewards  
Associate being wealthy with success  
Believe you have to spend more to get the very best  
Find gambling exciting

F4

### Anti-Creditors

Think it is unwise to use any credit cards  
Don't like using credit cards  
Don't always pay their bills on time

F5

### Instinctual Financiers

Think it is important to go with your gut feelings when making financial decisions  
Always trust their intuition when dealing with financial matters  
Don't usually prefer to do things alone

F6

### Open Extroverts

Like to try new things and experiences  
Are often flexible in their plans  
Are social and talkative people

F7

Diagram 6.1: The Seven Pecuniary Factors Produced After Factor Analysis

From the above diagram it can be seen that two of the seven factors produced contain more 'stand-alone' personality factors rather than a combination of attitudes, behaviour and personality factors. These are 'Open Extroverts' and 'Instinctual Financiers'. This limits the use of these two factors in future segmentation.

#### **6.4 Discussion and Conclusions**

These results provide evidence to support the future use of this metric in that customers' attitudes can be categorised into seven factors and these factors in turn can be utilised to help target its customers more effectively. This results are also provide support for the previous findings in Chapter 5, compounding it's effectiveness.

The seven factors produced vary in the extent to which they would assist in product tailoring individually. For example the factor 'Open Extroverts' alone would be difficult to marry with one particular product, however when looked in conjunction with a rating on another factor it becomes more valuable. In other words just knowing whether a person is open to new experiences and/or is a social and talkative person suggests that those who rate highly on it would be more open and receptive to information about a new product. However when they are looked at along with the other factors a wider more comprehensive picture emerges, thus allowing the financial institution to develop a customer profile.

An example of such a profile can be seen in Table 6.13:

	<b>Pecuniary Factor</b>	<b>Score</b>	<b>Profile Suggestions</b>
Customer ID 178	Disciplined saver	<b>5.70</b>	High on this factor suggesting would not be keen on products relating to overdrafts or credit cards but would be interested in both long-term savings and instant access accounts.
	Savvy Saver	<b>6.00</b>	High on this factor indicates that needs good detail about product offers, keen on savings and likes to plan so possibly a financial advisor service.
	Emotional Shopper	<b>1.17</b>	Very Low on this factor indicating not keen on impulse purchases and doesn't have the emotional attachment to spending, therefore wouldn't be interested in products tailoring to or highlighting these needs.
	Instinctual Financier	<b>3.50</b>	Fairly Low on this factor shows that they do not follow gut feelings or instinct when it comes to financial matters, so product offers need to appeal to their cognitive style of thinking.
	Anti-Crediter	<b>2.00</b>	Low on this factor means they are not anti-credit cards, loans but due to their high score on other factors it would probably be best not offering credit cards if they already had them.
	Open Extroverts	<b>6.00</b>	High on this factor means can offer products through new forms of technology as are open to new experiences.
	Power Driven Risk Taker	<b>3.00</b>	Fairly Low on this factor so wouldn't be particularly interested in products containing risk e.g. stocks and shares.

**Table 6.13: Customer Profile**

Further analysis aimed to test the reliability of the factors produced. The same method was employed as the initial reliability testing (Cronbach's alpha). The results are very promising. For three of the main factors (Disciplined Savers, Savvy Savers and Emotional Shoppers) the Cronbach's alpha exceeded the minimum value of 0.7. After any negative loadings were normalised the Disciplined Savers factor reached 0.818, the Savvy savers reached 0.742 and the Emotional Shoppers reached 0.77. These results indicated good reliability of scale, therefore indicating that this metric could be used as a reliable categorisation tool by financial institutions. The two smallest factors

Instinctual Financiers and Anti-Crediters were below the recommended value however if an item is removed from each then the Cronbach's alpha exceeds the 0.7 value. Before any deletions the Anti-Crediters factor only reached 0.655, but if the item "pay bills" is removed the Cronbach's alpha would become 0.85. The Instinctual Financiers alpha value would increase from 0.452 to 0.712.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Unwise	5.45	5.967	.678	.219
CreditCd	4.86	5.763	.639	.282
PayBills	6.62	12.447	.167	.850

**Table 6.14: Item-total Statistics for Anti-Crediters**

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
GutFeel	7.86	5.843	.440	.044
Intuition	7.34	6.054	.386	.146
RvsdAlone	6.87	8.611	.057	.712

**Table 6.15: Item-total Statistics for Instinctual Financiers**

Due to the increased reliability of these two items are deleted, it was decided that they should be removed from the questionnaire. Further testing would confirm this however due to resource constraints this cannot be completed at this point.

The Cronbach's alpha for the last two factors failed to reach the recommended value. Open Extroverts only just failed to reach it at 0.638 and the Power Driven Risk Takers failed by some way at 0.417.

It should be noted that this analysis would ideally be carried out on a different sample to the one employed for this second reliability analysis so to avoid optimistic bias.



This could be caused by the post-hoc nature of the testing i.e. the reliability analysis of the seven factors being reliant on the results of the factor analysis.

The Pecuniary results are positive and are strong enough to stand up against previous findings such as those produced from Lunt & Livingston (1991), Yamauchi & Templer (1982) and Zaleskiewicz (2001) in so much that an individual's economic attitudes and behaviour can be successfully categorised. In other words the driving forces behind such behaviour and attitudes can be measured and segmented increasing commercial ability to predict future behaviour. The current research and development of the Pecuniary Questionnaire has highlighted the complex nature of the behaviour and attitudes under investigation, however that it still can be achieved and be beneficial in a commercial environment. Several examples of this potential can be seen from the distinct factors presented, with over 65% of the variance explained by the model and the number of interesting and exciting correlations between the Pecuniary factors, demographics and dependant measures (from Chapter 4 and 4).

## ***6.5 Future Applications***

Using this metric will allow banks to measure customers' attitudes towards a wide variety of pecuniary matters in turn enabling them to place the individual on a scale for each factor. From these data a customer profile can be produced detailing customers locations within these factors. This will allow the institution to tailor the products it offers, and possibly more importantly the manner in which that product is presented, in turn hopefully increasing the likelihood of product uptake.

The results are promising but further analysis is being conducted into possible cluster analysis to further strengthen the evidence of the seven segments and test the discriminatory power of the variables explained here. This further analysis could lead to a multi-dimensional financial services customer map. As it stands the segments produced here could prove to be valuable bases in segmenting customers for personal financial services.

## **Chapter Seven**

## Conclusions and Suggestions for Future Work

The research presented here has examined a new user interface and applications through which a bank can provide a new and innovative service, as well as develop a metric by which the bank can segment its customers to provide a more personalised service. The contribution to knowledge extends from the research in personality assignment to ECAs and the evidence provided specifically within a financial context, to the development of the Pecuniary Questionnaire, a practical metric by which the bank can create customer profiles. The research has attended to the two key aspects crucial in a customer's choice of financial institution, ease of doing business (usability) and the quality of the personal service, to produce a body of work that increases the knowledge of virtual agent technology within the financial sector and measure customer attitudes.

Many theories from psychology and other disciplines are actively applied to HCI research, with contradicting results. In an attempt to test the personality similarity and complementarity paradigms within a financial setting, the first experiment uncovered possible contextual constraints regarding the application of virtual agents within such framework. A questionnaire was also developed to assess customer's attitudes to a variety of financial matters in order to help create a more personalised service. From the results of this experiment an agent design was produced that scored relatively highly in terms of its usability design and satisfaction ratings. From this basis the types of application and effectiveness of the product presentation were investigated in the second experiment. It utilised the agent design from the first experiment and

developed methods by which the Case Bank can increase the level of personalisation it offers its customers. The two products were chosen because they were thought to be particularly important in customers' lives and could both be assessed in conjunction with the pecuniary questionnaire. The effectiveness of these portrayals via the ECA was assessed. Combining the technology with a personal service was the aim of this second experiment. The pecuniary questionnaire was expanded and factor analysed with interesting results. The third experiment tested the results from the second with regards the pecuniary questionnaire. A larger sample size was employed through mailing paper versions of the questionnaire and subsequently more valid statistical analysis was performed. The results provide the bank with the seven factor structure by which customer profiles can be produced increasing the level of personalisation it offers.

The first empirical investigation examined the personality similarity and complementarity paradigms in relation to HCI, virtual agents and within a financial setting. There have been previous efforts producing contradictory results indicating that this field is still in need of further research. This investigation embarked on two important avenues of research. Firstly the development of an optimal ECA design relating specifically to the needs of the financial world, and secondly a metric by which the bank can segment its customers by in turn allowing them to offer a more personalised service. Methods which are becoming more and more important in the current climate with the level of competition increasing as well as the amount of switching behaviour displayed by customers. With the use of more automated and at base level impersonal services, research into creating positive user-computer relationships is essential. This investigation also took into the account usability which

is an important aspect of HCI, and is somewhat overlooked by other researchers attempting practical applications for virtual agents.

The experimental results did not support either paradigm of similarity or complementarity of needs, postulating in turn that participants would in fact prefer to interact with an ECA that reflects their own personality, or that they prefer the opposite to their own, respectively. The results found that there was in fact one preferred and recognisable ECA personality, extroversion. The result could be due to an uneven spread in the personalities of the participants, i.e. there were more extroverts than introverts. However when the results were stripped back the raw data analysed, there were still not enough introverted participants rating the introverted agent as the best (both in terms of usability and overall satisfaction). Due to the numbers of extroverts scoring the extrovert agent the highest the similarity hypothesis cannot be dismissed as a factor in the attraction to the extrovert ECA but it would seem that other factors are also at play. There was also a gender bias that emerged. Previous studies have found female virtual agents and the most liked and most satisfying to interact with, however the results from this investigation found that in fact the male ECA performed better in terms of usability, satisfaction and outright preferred agent. Looking at the context of the investigation, bank customers carrying out banking tasks within an eBanking scenario it would seem ignorant to assume that this had played no role. These factors would in fact activate certain cognitions within participants and therefore the normal social cues and rules that govern interaction may not be as strongly applied. This work has highlighted the importance of including the situational context when investigating ECAs. If the bank were to employ such technology then it is suggested that this design be employed so that the interaction be

as easy and efficient as possible. This would allow the banks customers to use a time saving device (i.e. via a kiosk in a Branch or via the Internet) yet still receive a friendly personable service.

Much of the research into virtual agents is more on a theoretical and architectural level but here a practical application have been applied to the technology and the usability and personality affects have also been investigated. Such aspects as gaze behaviour, gesturing and turn taking were all included to design a realistic, believable agent. These areas are still relatively sparse in terms of volume of research and although not the main focus of design it is important to note that these aspects were included and applied. The methodology for gathering the movement for the ECA was also a relatively novel one. Motion capture of actors' natural movement then categorisation of these gestures is still not common place. Future work in the field of ECAs in the financial world would ideally look at improving the technology and increasing its responsiveness level. For example not only would the personal service be accomplished by the products it would offer and the manner in which it did so but respond to customers' actions or needs in real-time.

In the second part of the investigation a practical metric was developed from several pervious scales and studies so that customers' profiles are created. The initial proposal which was that customers attitudes could be inferred from their demographics and information the bank held, did not come to fruition as there were surprisingly few stable correlations between demographics and customers economic behaviour and their attitudes (measured by the pecuniary scale). It was expected that participants personality scores would correlate with many of the factors being measured in the

pecuniary questionnaire however the results produced relatively few. From the first empirical investigation most of the correlations seemed logical in terms of traits and behaviour links but ideally these correlations would be tested on a larger sample with the finalised pecuniary factors (from the last section of the thesis). The first investigation of the pecuniary questionnaire produced interesting results although a little mixed, however it was felt that any tool that could help a company target its customers better would be worth examining further.

The second empirical investigation utilised the design that emerged from the previous experiment to test how the ECA could offer a more personalised service through product offers. This was linked to the pecuniary questionnaire as the products were chosen so that could be analysed in conjunction with several of the items. They were also chosen due to their wide appeal and the real need for UK residents to save and invest more. The two products (a saving account and an investment account) were offered in two different ways, intended to appeal to different segments of customers.

The results were good overall in terms of usability as the product portrayal had minimal affect on this aspect of the ECA and its service. The product offer that highlighted the flexible nature of the savings account (LPP) was rated as more relevant than the other version of that offer and the other product (investment account) overall. This is not surprising considering most people like to keep their options open to enable them to cope with unexpected events. The little or no effect of product offer on usability is a positive one. In terms of design it points to the fact that the overall design is a fairly good one and this fact does not change even if a product is offered that the customer does not want, thus supporting the ECA design from the first



empirical investigation. Similar results were produced from the product uptake scores. Most participants said they were more likely to take up the LPP product rather than the HRA product. Correlations were conducted with the factors from the factor analysis and several significant results were found. Several of these correlations suggest that certain financial attitudes can affect whether or not a customer feels a product is relevant to them. Due to these correlations and those between several of the factors and the demographic and economic variables it seems reasonable to suggest that the pecuniary questionnaire be developed further to help assist in the segmentation of a banks customers and in turn predict purchasing behaviour. For example scoring high on the “Emotional Shoppers” factor meant that participants were unlikely to have any dependants, own a car, or have a personal loan but are likely to have or have had a student loan. These demographics in turn correlate with the statements indicating their behaviour such as often purchasing items to make themselves feel better, feeling a rush of excitement when they do purchase items and buying things to impress others. It would seem reasonable to then suggest that these individuals may want either a personal loan (however this raises moral and ethical issues), or a flexible saving account. The flexible saving account allowing them to gain access to their money when needed, which is likely to be on a regular basis but enable them to save at the same time. Even though there were no significant correlations between the flexible portrayal of the savings account (LPP) and this factor, it does not rule out such correlations in the future with a different sample, larger in size along side different products.

The third and final exploration of the pecuniary questionnaire was to test and attempt to confirm the findings from the previous investigation. A larger sample were

recruited (221 participants) to increase the statistical validity. Once again the measure of reliability fell short, however many psychologists point out that for this particular statistical test to apply to such a metric (measuring a variety of attitudes) it is not as important to reach the recommended level. Due to the complex nature of economic behaviour and the factors that affect it, some of which are trying to be measured here it is justified that the same caution be taken with the Cronbach's alpha levels reported in this research. Seven factors were produced (similar to those from the second empirical investigation) from factor analysis. Further analysis on these factors produced three useful and robust factors, Disciplined Savers, Savvy Savers and Emotional Shoppers. These three factors are all distinguishable by the different attitudes and behaviours encompassed within them. Ideally further analysis using the items contained within these three factors would be conducted to test their robustness as well as validity and produce a new pecuniary questionnaire. The data from the third investigation of the pecuniary questionnaire ideally should be tested again on a different sample and if the same factors were produced, create customer profiles and test these against product offers to see whether there are significant correlations between pecuniary profile scores and likelihood of product uptake.

There are successes and failures regarding the pecuniary questionnaire but the emergence of at least three distinct, coherent and pertinent factors suggests that future work could lead to some interesting results regarding the segmentation and targeting of the banks customers.

Creating an ECA that can offer products in a way that appeals to customers by noting their personal circumstance, patterns in behaviour (and even administering a short

pecuniary questionnaire to gather attitudes) will increase the likelihood of customers' willingness to listen to information about different products but also the likelihood of them adopting those products. It would be interesting to test customers behaviour towards an ECA that can adapt its behaviour in real-time to a given situation. For example if a customer displays unsure behaviour towards the technology, which could be picked up on by the hesitations marked by the "um's" and "er's" within the speech or shuffling from side to side, an adaptable ECA could offer reassurance or a step by step guide through whichever banking task is being carried out. Personalised, adaptable virtual agents are the next step, and for financial institutions wanting to reduce waiting times within branches or offer an alternative medium for transactions further research into this exciting area would be beneficial.

In summary the research reported provides evidence for the thesis that Embodied Conversational Agents (ECAs) represent a highly effective tool for human-computer interactions in future financial services applications, particularly when their product portrayals match the pecuniary traits of the customer. ECAs can provide a personal and effective platform for everyday banking enquiries whilst utilising and realising an effective customer targeting tool.

The work presented throughout this book has contributed to the knowledge of virtual agents and has attempted a practical metric by which a bank could effectively target its customers. One conclusion that can be drawn is that this area is extremely complex, with many facets and dimensions weaving the web, and that more than one instrument may be required for targeting customers. Some results were more positive than others, yet even the pecuniary questionnaire has assisted to some degree in filling

the gap in predicting individual's economic behaviour from their attitudes by a reliable and valid instrument. Financial institutions can use these results and turn them into practical tools by which to modify customers' behaviour by targeting their specific attitudes with tailored information and products, through ECA technology and the Pecuniary metric. These as a result have the potential to lead to greater satisfaction with the financial institution, create more positive attitudes toward products, and increase purchase intentions.

## Bibliography

- Albrecht, I., Haber, J., & Seidel, H.-P. (2002). *Automatic Generation of Non-Verbal Facial Expressions from Speech*. Retrieved 16/05, 2007, from [www.mpi-inf.mpg.de/resources/FAM/publ/cgi2002.pdf](http://www.mpi-inf.mpg.de/resources/FAM/publ/cgi2002.pdf)
- Allport, G. W. (1935). Attitudes. In C. M. Murchison (Ed.), *Handbook of Social Psychology* (pp. 789-844). Worcester, MA: Clark University Press.
- André, E., Klesen, M., Gebhard, P., Allen, S., & Rist, T. (1999). *Integrating Models of Personality and Emotions into Lifelike Characters*. Paper presented at the International Workshop on Affect in Interactions. Towards a New Generation of Interfaces, Siena, Italy.
- Argamon, S., Dhawle, S., Koppel, M., & Pennebaker, J. W. (2005). *Lexical predictors of personality type*. Paper presented at the the Joint Annual Meeting of the Interface and the Classification Society of North America.
- Bartlett, M. S. (1954). A note on the multiplying factors for various chi square approximations. *Journal of the Royal Statistical Society*, 16(Series B), 296-298.
- Baylor, A. L., & Kim, S. (2008). *The Effects of Agent Nonverbal Communication on Procedural and Attitudinal Learning Outcomes*. Paper presented at the IVA 2008, Tokyo, Japan.
- Berry, D. C., Butler, L., & De Rosis, F. (2005). Evaluating a Realistic Agent in an Advice-Giving Task. *International journal of Human-Computer Studies*, 63(3), 304-327.
- Bickmore, T., & Picard, R. W. (2005). Establishing and Maintaining Long-Term Human-Computer Relationships. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 12(2), 293-327.
- Brandstätter, H., & Königstein, M. (2001). Personality Influences on Ultimatum Bargaining Decisions. *European Journal of Personality*, 15(S1), S53-S70.
- Carducci, B. J., & Wong, A. S. (1998). Type A and Risk Taking In Everyday Money Matters. *Journal of Business and Psychology*, 12(3), 355-359.
- Cassell, J. (2000). Embodied Conversational Interface Agents. *Communications of the ACM*, 43(4), 70-78.
- Cassell, J., Sullivan, J., Prevost, S., & Churchill, E. (Eds.). (2000). *Embodied Conversational Agents*. London: The MIT Press.
- Catell, R. B. (1966). The scree test for number of factors. *Multivariate Behavioral Research*, 1, 245-276.
- Cattell, R. B. (1947). The Description of Personality: Basic traits resolved into clusters. *Journal of Abnormal and Social Psychology*, 38, 476-506.
- Costa, P. T., Jr., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PIR and NEO Five-Factor Inventory (NEO-FFI) Professional Manual*. Odessa, FL: Psychological Assessment Resources, Inc.
- Costanzo, L. A., & Ashton, J. K. (2006). Product innovation and consumer choice in the UK financial services industry. *Journal of Financial Regulation and Compliance*, 14(3), 285-303.
- Dewaele, J.-M., & Furnham, A. (2000). Personality and Speech Production: A pilot study of second language learners. *Personality and Individual Differences*, 28, 355-365.

- Doyle, K. O. (1992). Toward a Psychology of Money. *American Behavioral Scientist*, 35(6), 708-724.
- Dryer, C. D. (1999). Getting Personal with Computers: How to design personalities for agents. *Applied Artificial Intelligence*, 13, 273-295.
- Dryer, C. D., & Horowitz, L. M. (1997). When Do Opposites Attract? Interpersonal complementarity versus similarity. *Journal of Personality and Social Psychology*, 72(3), 592-603.
- Edwards, A. L. (1957). *Techniques of Attitude Scale Construction*. New York: Appleton-Century-Crofts.
- Endler, N. S., & Rosenstein, A. J. (1997). Evolution of the Personality Construct in Marketing and its Applicability to Contemporary Personality Research. *Journal of Consumer Psychology*, 6(1), 55-66.
- Epstein, S. (1998). Cognitive-experiential self theory. In D. F. Barone, M. Hersen & V. B. Van Hasselt (Eds.), *Advanced Personality* (pp. 211-238). New York: Plenum.
- Epstein, S., Pacini, R., Denes-Raj, V., & Heier, H. (1996). Individual Differences in Intuitive-Experiential and Analytical-Rational Thinking Styles. *Journal of Personality and Social Psychology*, 71(2), 390-405.
- Eysenck, H. J. (1970). *The Structure of Human Personality* (3rd ed.). London: Methuen.
- Faulkner, X. (2000). *Usability Engineering*. London: Macmillan Press Ltd.
- Fishbein, M. (1967). *Readings in Attitude Theory and Measurement*. New York: John Wiley.
- Fogg, B. J. (2003). *Persuasive Technology: Using Computers to Change What We Think and Do*. London: Morgan Kaufmann Publishers.
- Furnham, A. (1984). Many Sides of the Coin: The Psychology of Money Usage. *Journal of Personality and Individual Differences*, 5(5), 501-509.
- Furnham, A. (1990). Language and Personality. In H. Giles & W. Robinson (Eds.), *Handbook of Language and Social Psychology* (pp. 73-95). Chichester: Wiley.
- Furnham, A. (1996). Attitudinal Correlates and Demographic Predictors of Monetary Beliefs and Behaviours. *Journal of Organizational Behavior*, 17(4), 375-388.
- Furnham, A., & Heaven, P. (1999). *Personality and Social Psychology*. London: Arnold.
- Garau, M., Slater, M., Bee, S., & Sasse, A. M. (2001). The impact of eye gaze on communication using humanoid avatars, *Proceedings of the SIGCHI conference on Human factors in computing systems*. Seattle, Washington, United States: ACM.
- Garau, M., Slater, M., Vinayagamoorthy, V., Brogni, B., Steed, A., & Sasse, A. M. (2003). The impact of avatar realism and eye gaze control on perceived quality of communication in a shared immersive virtual environment, *Proceedings of the SIGCHI conference on Human factors in computing systems*. Ft. Lauderdale, Florida, USA: ACM.
- Gill, A. J., & Oberlander, J. (2002). *Taking Care of the Linguistic Features of Extroversion*. Paper presented at the The 24th Annual Conference of the Cognitive Science Society, Fairfax, VA.
- Goldberg, L. R. (1992). The Development of Markers of the Big-Five Factor Structure. *Psychological Assessment*, 4, 26-42.
- Gong, L., & Nass, C. I. (2000). *Does Adding a Synthetic Face Always Enhance Speech Interfaces?* Retrieved 20th August, 2006, from <http://www.stanford.edu/~nass/comm369/pdf/SyntheticFaceandTypeOfVoice.pdf>

- Grayson, D., & Coventry, L. (1998). The Effects of Visual Proxemic Information in Video Mediated Communication. *SIGCHI Bulletin*, 30(3), 30-39.
- Hanley, A., & Wilhelm, M. S. (1992). Compulsive buying: An exploration into self-esteem and money attitudes. *Journal of Economic Psychology*, 13(1), 5-18.
- Harrison, T. S. (1994). Mapping Customer Segments for Personal Financial Services. *International Journal of Bank Marketing*, 12(8), 17-25.
- Hayhoe, C. R., Leach, L., & Turner, P. R. (1999). Discriminating the number of credit cards held by college students using credit and money attitudes. *Journal of Economic Psychology*, 20, 643-656.
- Hogg, M. A., & Vaughan, G. M. (1998). *Social Psychology* (Second ed.). Glasgow: Prentice Hall.
- Isbister, K., & Nass, C. (2000). Consistency of Personality in Interactive Characters: Verbal Cues, Non-Verbal Cues, and User Characteristics. *International Journal of Human-Computer Interaction*, 53, 251-267.
- Ishii, R., & Nakano, Y. I. (2008). *Estimating User's Conversational Engagement Based on Gaze Behaviors*. Paper presented at the IVA 2008, Tokyo, Japan.
- ISO. (1998). Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) Part II: Guidance on Usability. *International Organization for Standardization*, ISO 9241-9211.
- Kaiser, H. (1970). A Second Generation Little Jiffy. *Psychometrika*, 35, 401-415.
- Kaiser, H. (1974). An Index of Factorial Simplicity. *Psychometrika*, 39, 31-36.
- Katz, D. (1960). The functional approach to the study of attitudes. *Public Opinion Quarterly*, 24, 163-204.
- Kline, P. (1999). *The handbook of psychological testing* (2nd edition ed.). London: Routledge.
- Krueger, J., & Rothbart, M. (1988). Use of Categorical and Individuating Information in Making Inferences About Personality. *Journal of Personality and Social Psychology*, 55(2), 187-195.
- Kshirsagar, S., & Magnenat-Thalman, N. (2002). A Multilayer Personality Model, *Symposium on Smart Graphics*. Hawthorne, NY, USA: ACM.
- Kurzban, R., & Houser, D. (2001). Individual Differences in Cooperation in a Circular Public Goods Game. *European Journal of Personality*, 15(S1), S37-S52.
- Lance, B., & Marsella, S. C. (2008). *The Relation between Gaze Behavior and the Attribution of Emotion: An Empirical Study*. Paper presented at the IVA 2008, Tokyo, Japan.
- Livingstone, S. M., & Lunt, P. K. (1992). Predicting personal debt and debt repayment: Psychological, social and economic determinants. *Journal of Economic Psychology*, 13, 111-134.
- Love, S., Dutton, R. T., Foster, J. C., Jack, M. A., & Stentiford, F. W. M. (1994). *Identifying Salient Usability Attributes for Automated Telephone Services*. Paper presented at the International Conference on Spoken Language Processing.
- Lunt, P. K., & Livingstone, S. M. (1991). Psychological, Social and Economic Determinants of Saving: Comparing recurrent and total savings. *Journal of Economic Psychology*, 12, 621-641.
- Mehrabian, A. (2007). *Nonverbal Communications*. London: Transaction Publishers.
- Mignault, A., & Chaudhuri, A. (2003). The many faces of a neutral face: head tilt and perception of dominance and emotion. *Journal of Nonverbal Behavior*, 27(2), 111-132.

- Moon, Y., & Nass, C. I. (1996). Adaptive Agents and Personality Change: Completeness versus similarity as forms of adaptation., *In Proceedings of CHI Conference 1996*. Vancouver, BC Canada.
- Nakanishi, H., Nakazawa, S., Ishida, T., Takanashi, K., & Isbister, K. (2003). Can software agents influence human relations? Balance theory in agent-mediated communities, *International Conference on Autonomous Agents Proceedings of the second international joint conference on Autonomous agents and multiagent systems*. Melbourne, Australia: ACM Press.
- Nass, C., & Lee, K. M. (2001). Does Computer-Synthesized Speech manifest Personality? Experimental Tests of Recognition, Similarity-Attraction, and Consistency-Attraction. *Journal of Experimental Psychology: Applied*, 7(3), 171-181.
- Nass, C., Moon, Y., Fogg, B. J., Reeves, B., & Dryer, D. C. (1995). Can Computer Personalities be Human Personalities? *International Journal of Human-Computer Studies*, 43, 223-239.
- Norvilitis, J. M., Merwin, M. M., Osberg, T. M., Roehling, P. V., Young, P., & Kamas, M. M. (2006). Personality Factors, Money Attitudes, Financial Knowledge, and Credit-Card Debt in College Students. *Journal of Applied Social Psychology*, 36(6), 1395-1413.
- Nyhus, E. K., & Webley, P. (2001). The Role of Personality in Household Saving and Borrowing Behaviour. *European Journal of Personality*, 15(S1), S85-S103.
- Pennebaker, J. W., & King, L. A. (1999). Linguistic Styles: Language Use as an Individual Difference. *Journal of Personality and Social Psychology*, 77(6), 1296-1312.
- Perugini, M., & De Raad, B. (2001). Editorial: Personality and Economic Behaviour. *European Journal of Personality*, 15, S1-S4.
- Preece, J., Rogers, Y., & Sharp, H. (2002). *Interaction Design: Beyond Human-Computer Interaction*. New York: John Wiley & Sons Inc.
- Prendinger, H., Ma, C., & Yingzi, J. (2005). Understanding the Effects of Life-Like Interface Agents Through Users' Eye Movements, *ICMI'05*. Trento, Italy.
- Reeves, B., & Nass, C. (1996). *The Media Equation: How people treat computers, television, and new media like real people and places*. Cambridge: Cambridge Press.
- Robles, E., Bienstock, H., Treinen, M., Heenan, C., & Nass, C. (2000). *Using Design to Increase Disclosure: A Study of the Effects of Modality and Gender of Prompt on Willingness to Disclose*. Retrieved 2nd May, 2007, from [www.stanford.edu/~nass/comm369/pdf/Disclosure.pdf](http://www.stanford.edu/~nass/comm369/pdf/Disclosure.pdf)
- Rosenburg, M. J., & Hovland, C. I. (1960). Cognitive affective and behavioral components of attitude. In M. J. Rosenburg, C. I. Hovland, W. J. McGuire, R. P. Abelson & J. W. Brehm (Eds.), *Attitude Organization and Change: An Analysis of Consistency Among Attitude Components*. New Haven, CT: Yale University Press.
- Scherer, K. R. (1978). Personality Inference from Voice Quality: The loud voice of extroversion. *The European Journal of Social Psychology*, 8(4), 467-487.
- Scherer, K. R. (1979). Personality Markers in Speech. In K. Scherer & H. Giles (Eds.), *Social Markers in Speech* (pp. 147-209). Cambridge: Cambridge University Press.
- Stone, B., & Maury, V. R. (2006). Indicators of personal financial debt using a multi-disciplinary behavioral model. *Journal of Economic Psychology*, 27, 543-556.
- Tan, D. S., Gergle, D., Scupelli, P. G., & Pausch, R. (2003). With Similar Visual Angles, Larger Displays Improve Spatial Performance, *CHI*. Ft. Lauderdale, Florida, USA.



- Thurstone, L. L. (1947). *Multiple Factor Analysis*. Chicago: University of Chicago Press.
- Trapnell, P. D., & Wiggins, J. S. (1990). Extension of the Interpersonal Adjective Scales to Include the Big Five Dimensions of Personality. *Journal of Personality and Social Psychology*, 59, 781-790.
- Verplanken, B., & Herabadi, A. (2001). Individual Differences in Impulse Buying Tendency: Feeling and no Thinking. *European Journal of Personality*, 15(S1), S71-S83.
- Wärneryd, K. E. (1999). *The Psychology of Saving. A Study on Economic Psychology*. Cheltenham: Edward Elgar.
- Yamauchi, K. T., & Templer, D. I. (1982). The development of a Money Attitude Scale. *Journal of Personality Assessment*, 46(5), 522-528.
- Zaleskiewicz, T. (2001). Beyond Risk Seeking and Risk Aversion: Personality and the Dual Nature of Economic Risk Taking. *European Journal of Personality*, 15(S1), S105-S122.

# Appendix 1

## Scripts

Code	Extrovert Prompt
1e	Hi how can I help you?
5e	Certainly, can I have the 1st digit from your pin number please
6e	and the 3rd digit please
13e	I'm sorry I didn't catch that can you repeat it?
14e	I'm sorry I didn't catch that.
15e	Certainly, your balance is £675.40 in credit
16e	Certainly, your balance is £785.00 in credit
17e	Certainly, your balance is £850.20 in credit
18e	Certainly, your balance is £720.60 in credit
19e	Anything else I can help you with?
20e	Ok, I have requested that for you and it will be sent out to you in the next few days
22e	Yes certainly, our mortgages are in partnership with Cheltenham & Gloucester, which is part of the Lloyds TSB group.
23e	Would you like me to run through what mortgages are available?
24e	You can choose from Fixed Rate mortgages, where you can fix your mortgage rate so that your payments stay the same over a specified period, no matter what happens to interest rates.
25e	Or there's the Tracker Mortgage where your rate is linked to the Bank of England base rate.
26e	And there's the Standard Variable Mortgage rate that gives you even more flexibility, as you can repay your mortgage at any point at no charge and you are guaranteed a rate no more than 2% above the Bank of England base rate
27e	There's also the Lloyds TSB Offset option where you pay less interest on your mortgage, because you run your current and savings accounts along side your mortgage.
28e	Or if you're a first time buyer then we offer a First Time Buyer Mortgage where you can benefit from lower monthly payments for the first year as well as a fixed rate for the first year.
29e	There's also a range of mortgages for buy-to-let purposes
30e	So would you like to proceed with the basic application process?
31e	Would you like to proceed with the basic application process?
32e	This is not an agreement and does not obligate you to take this mortgage; it is just to let you know the potential amount of money you can borrow.
33e	How much would you like to borrow?
34e	Thanks, and over how many years?
35e	Over how many years would you like to borrow the money?
36e	What type of property would you like to purchase?
37e	Would you like to re-mortgage or are you a first time buyer?
38e	What is your occupation?
39e	What is your basic annual salary before tax?
40e	And finally, have you ever been declared bankrupt?
41e	Have you ever been declared bankrupt?
42e	Thanks,
43e	I am pleased to say that we can offer you a mortgage for £100,000; I'll arrange for the relevant information to be sent to you by post along with an application form.
44e	I am pleased to say that we can offer you a mortgage for £120,000; I'll arrange for the relevant information to be sent to you by post along with an application form.
45e	I am pleased to say that we can offer you a mortgage for £110,000; I'll arrange for the relevant information to be sent to you by post along with an application form.
46e	I am pleased to say that we can offer you a mortgage for £140,000; I'll arrange for the relevant

	information to be sent to you by post along with an application form.
47e	Is there anything else I can help you with today?
48e	Thanks, goodbye.
<b>Code</b>	<b>Introvert Prompt</b>
1i	Hello how can I help you?
5i	Can I have the 1st digit from your pin number please
6i	and the 3rd digit please
11i	I'm sorry I didn't catch that can you repeat it?
12i	I'm sorry, I didn't catch that.
13i	Your balance is £850.20 in credit
14i	Your balance is £720.60 in credit
15i	Your balance is £675.40 in credit
16i	Your balance is £785.00 in credit
17i	Is there anything else I can help you with?
18i	Yes of course that has been requested and your chequebook will be posted in the next few days
20i	We offer mortgages in partnership with Cheltenham & Gloucester, which is part of the Lloyds TSB group.
21i	Would you like me to tell you about what type mortgages we offer?
22i	You can choose from Fixed Rate mortgages, where you can fix your mortgage rate so that your payments stay the same over a specified period, no matter what happens to interest rates.
23i	There is the Tracker Mortgage where your rate is linked to the Bank of England base rate.
24i	There is also the Standard Variable Mortgage rate that gives you even more flexibility, as you can repay your mortgage at any point at no charge and you are guaranteed a rate no more than 2% above the Bank of England base rate.
25i	The Lloyds TSB Offset where you pay less interest on your mortgage, as you run your current and savings accounts along side your mortgage.
26i	Or if you are a first time buyer then we offer a First Time Buyer Mortgage where you can benefit from lower monthly payments for the first year as well as a fixed rate for the first year.
27i	There is also a range of mortgages for buy-to-let purposes.
28i	Would you like to proceed with the basic mortgage application process?
29i	You should know that this not an agreement and does not obligate you to take this mortgage; it is just to let you know the potential amount of money you can borrow.
30i	How much would you like to borrow?
31i	Thank you, and over how many years?
32i	Over how many years would you like to borrow the money?
33i	What type of property would you like to purchase?
34i	Would you like to re-mortgage or are you a first time buyer?
35i	What is your occupation?
36i	What is your basic annual salary before tax?
37i	Have you ever been declared bankrupt?
38i	Thank you
39i	I am pleased to say that we can offer you a mortgage for £120,000; the bank will send you the relevant information by post along with an application form.
40i	I am pleased to say that we can offer you a mortgage for £100,000; the bank will send you the relevant information by post along with an application form.
41i	I am pleased to say that we can offer you a mortgage for £140,000; the bank will send you the relevant information by post along with an application form.
42i	I am pleased to say that we can offer you a mortgage for £110,000; the bank will send you the relevant information by post along with an application form.
43i	Is there anything else I can help you with today?
44i	Thank you, goodbye.

# Appendix 2

## Usability Questionnaire

Participant ID: Date:
--------------------------

*This questionnaire relates to the virtual person 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 would be happy to interact with this person again.

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

2. I thought this person spoke clearly.

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

3. I felt intimidated by this person.

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

4. I think the information supplied by this person is reliable.

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

5. I found interacting with this person 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"/>

6. I found it difficult to interact with this 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"/>

7. I felt under stress while interacting with this 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"/>

8. I found this person 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"/>

9. I enjoyed interacting with this 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"/>

10. I got flustered when interacting with this 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"/>

11. This person helped me feel engaged with the service.

<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 didn't like the voice of this 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"/>

13. 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"/>

14. I felt in control when interacting with this 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"/>

15. I had to concentrate hard when interacting with this 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"/>

16. I understood the information I was given by this person.

**Strongly Agree**   **Agree**   **Slightly Agree**   **Neutral**   **Slightly Disagree**   **Disagree**   **Strongly Disagree**  
                 

17. **I thought this person was competent.**

**Strongly Agree**   **Agree**   **Slightly Agree**   **Neutral**   **Slightly Disagree**   **Disagree**   **Strongly Disagree**  
                 

18. **I found it very frustrating interacting with this person.**

**Strongly Agree**   **Agree**   **Slightly Agree**   **Neutral**   **Slightly Disagree**   **Disagree**   **Strongly Disagree**  
                 

19. **I thought this person was polite.**

**Strongly Agree**   **Agree**   **Slightly Agree**   **Neutral**   **Slightly Disagree**   **Disagree**   **Strongly Disagree**  
                 

20. **I thought interacting with this person was complicated.**

**Strongly Agree**   **Agree**   **Slightly Agree**   **Neutral**   **Slightly Disagree**   **Disagree**   **Strongly Disagree**  
                 

21. **I felt this service needs a lot of improvement.**

**Strongly Agree**   **Agree**   **Slightly Agree**   **Neutral**   **Slightly Disagree**   **Disagree**   **Strongly Disagree**

22. I thought this service 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"/>

23. I felt that the process 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"/>

24. I found the appearance of this person distracting.

<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

### Avatar Personality

*Please tick the box that reflects how much you agree with the statement, in relation to the agent you have just interacted with.*

**1. I think this person is sociable.**

<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 think this person often takes things seriously.**

<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 believe this person enjoys talking to 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"/>

**4. I believe this person enjoys interacting with 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"/>

**5. I think this person does not laugh readily.**

<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 think this person is often energetic.**

<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 think this person is cheerful and full of 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"/>

**8. I think this person is a pessimist.**

<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 think this person expresses themselves through their hands and facial expressions.**

<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 think this person can be described as being cautious, thoughtful, contained and independent.**

<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 think this person can be described as being lively, enthusiastic, expressive, energetic and 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"/>
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

**12. I think this person likes to be the centre of attention.**

<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 think this person prefers to do things alone.**

<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 think this person leads an exciting and busy 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"/>
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

**15. I think this is not a very active 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"/>
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

**16. I think this person would not like the role of a leader.**

<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: 101</b> <b>Order: EFRa EMRb IFBc IMBd</b> <b>Date:</b>
---

**1. Was there anything in particular that you liked about the first version of the service that you used today?**

.....  
.....  
.....  
.....

**2. Was there anything about that version that you disliked, or thought could be improved?**

.....  
.....  
.....  
.....

**3. Was there anything in particular that you liked about the second version of the service that you used today?**

.....  
.....  
.....  
.....

**4. Was there anything about that version that you disliked, or thought could be improved?**

.....  
.....  
.....  
.....

**5. Was there anything in particular that you liked about the third version of the service that you used today?**

.....  
.....  
.....  
.....

**6. Was there anything about that version that you disliked, or thought could be improved?**

.....  
.....

.....  
.....

**7. Was there anything in particular that you liked about the forth version of the service that you used today?**

.....  
.....  
.....  
.....

**8. Was there anything about that version that you disliked, or thought could be improved?**

.....  
.....  
.....  
.....

**9. Did you feel that any one of the four versions provided a better service than the others, (in terms of speed of use, ease of use, or enjoyment of the service) if so why?**

.....  
.....  
.....

**10. What differences did you notice between the four versions you used today?**

.....  
.....  
.....

**11. Thinking about the appearance of the agents you interacted with today, which did you prefer? (Show screen shots in order)**

1<sup>st</sup>     2<sup>nd</sup>     3<sup>rd</sup>     4<sup>th</sup>     None

**Why**.....  
.....

**12. Overall, can you rate (your preference for) the four agents 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**

Version	Measurement (cm)	Order
1		
2		
3		
4		

**13. Overall, can you rate how satisfied you are with the four interactions you experienced today?**

**Place the magnets along the ruler scale between ‘Very Poor’ and ‘Excellent’.**

**Record the order and positions to the nearest 0.5cm**

Version	Measurement (cm)	Order
1		
2		
3		
4		

**14. 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**

.....

.....  
(Only ask Q.16 if said they would use such a service in Q.15)

**15. Where would you be most likely to use such a service/technology (such as the one you used today)?**

**Train Station**  **Local Branch**

**Any branch belonging to your bank**  **On the street**

**At home (e.g. Internet)**  **Other**

.....

**16. For what purpose would you be most likely to use such a service (like the one you experienced today)?**

**Checking Balance**  **Requesting Information**   
(e.g. for mortgages, loans, different accounts)

**Ordering Chequebooks**  **Transferring money**

**Making Payments**  **Set-up, Change or Cancel Standing Orders Or Direct Debits**

Other.....   
.....

**17. How would you feel about completing a personality questionnaire for Lloyds TSB in order that they can personalise such a service?**

.....  
.....  
.....  
.....

**18. Finally, do you have any other comments you would like to add?**

.....  
.....  
.....  
.....

# Appendix 5

## Demographic Questionnaire

*(to be completed by the researcher)*

**Participant ID: 101**  
**Date:**

1. Age: .....

2. Gender:       Female     Male

3. Occupation: .....  
*(if retired or unemployed give previous occupation)*

4. How long have you banked with Lloyds TSB? .....

5. Did you go to or are you at University, college, or any other higher education establishment? .....

*And now just a few questions about your behaviour when it comes to money.*

6. Do you normally/mainly check your balance using an ATM.

Yes     No        Why.....

7. Do you withdraw money from your savings account on a regular basis.

Yes     No        Why.....

8. Do you put money into your savings account regularly.

Yes     No        Why.....

9. Do you buy financial products (e.g. loans, mortgages etc.) mainly in your branch.

Yes     No        Why.....

*Using the ruler could you rate which of the following you consider most important (give priority to).*

10.    Record the order and positions to the nearest 0.5cm

	Measurement (cm)	Order
<b>Spending</b>		
<b>Saving</b>		
<b>Investing</b>		
<b>Giving</b>		

E-mail address (only if you want the results of personality questionnaire)



# Appendix 6

## Pecuniary Questionnaire

Participant ID: Date:
--------------------------

*This questionnaire relates to your financial and economic behaviour and attitudes.*

Please tick the box that most closely represents how you feel about each of the statements.

1. I think saving is a very sensible thing to do.

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

2. I think people who can afford to save and choose not to are irresponsible.

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

3. I think people who fall into debt are not managing their money properly.

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

4. I think people should not buy on impulse.

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

5. I think it is important for people to be aware of their financial position.

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

6. I believe it is important to think long and hard when making financial decisions.

Strongly Agree    Agree    Slightly Agree    Neutral    Slightly Disagree    Disagree    Strongly Disagree

7. I think it is important to go with gut feelings when making decisions about financial matters.

Strongly Agree    Agree    Slightly Agree    Neutral    Slightly Disagree    Disagree    Strongly Disagree

8. I think it is important to look around for the best deals when it comes to making financial decisions.

Strongly Agree    Agree    Slightly Agree    Neutral    Slightly Disagree    Disagree    Strongly Disagree

9. I believe people should think very carefully about any financial advice they receive.

Strongly Agree    Agree    Slightly Agree    Neutral    Slightly Disagree    Disagree    Strongly Disagree

10. I believe the risk of investing in stocks and shares is outweighed by the potential financial rewards.

Strongly Agree    Agree    Slightly Agree    Neutral    Slightly Disagree    Disagree    Strongly Disagree

11. I think being wealthy is a sign of success.

Strongly Agree    Agree    Slightly Agree    Neutral    Slightly Disagree    Disagree    Strongly Disagree

Agree		Agree		Disagree		Disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. I think it is important to save on a regular basis.

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

13. I think it is important for people to stick to a budget.

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

14. I think it is important to put money aside for unexpected events.

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

15. I believe most banks take advantage of their customers.

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

16. I think people should trust their bank to look after their interests.

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

17. I believe you have to spend more to get the very best.

Strongly Agree	Agree	Slightly Agree	Neutral	Slightly Disagree	Disagree	Strongly Disagree
----------------	-------	----------------	---------	-------------------	----------	-------------------

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

18. **I think people should not spend money just to make themselves feel better.**

<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 think it is pointless to worry about money.**

<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 think it is acceptable for people to be in debt these days.**

<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 7

### Results from Chapter 4, ANOVA Tables

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	14.769	1.000	14.769	13.282	.001
Personality * Gender	.014	1.000	.014	.013	.910
Personality * Age Group	1.002	1.000	1.002	.901	.350
Personality * Vord_cb	1.665	3.000	.555	.499	.685
Personality * Hair Colour	.641	1.000	.641	.576	.453
Error (Personality)	35.583	32.000	1.112		
Agent Gender	.014	1.000	.014	.024	.879
Agent Gender * Gender	2.564	1.000	2.564	4.190	.049
Agent Gender * Age Group	.519	1.000	.519	.848	.364
Agent Gender * Vord_cb	.964	3.000	.321	.525	.668
Agent Gender * Hair Colour	.579	1.000	.579	.945	.338
Error (Agent Gender)	19.583	32.000	.612		
Personality * Agent Gender	1.853	1.000	1.853	1.792	.190
Error (Personality * Agent Gender)	33.083	32.000	1.034		

**Table 4.20: Within-Subjects Effects ANOVA for Usability Attribute "Confusion"**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	18.177	1.000	18.177	11.901	.002
Personality * Gender	.811	1.000	.811	.531	.471
Personality * Age Group	3.770	1.000	3.770	2.468	.126
Personality * Vorder_cb	2.692	3.000	.897	.588	.628
Personality * Hair Colour	.385	1.000	.385	.252	.619
Error (Personality)	48.875	32.000	1.527		
Agent Gender	.337	1.000	.337	.241	.627
Agent Gender * Gender	2.254	1.000	2.254	1.613	.213
Agent Gender * Age Group	.250	1.000	.250	.179	.675
Agent Gender * Vord_cb	3.679	3.000	1.226	.878	.463
Agent Gender * Hair Colour	.010	1.000	.010	.007	.933
Error (Agent Gender)	44.708	32.000	1.397		
Personality * Agent Gender	1.302	1.000	1.302	.461	.502
Error (Personality * Agent Gender)	90.375	32.000	2.824		

**Table 4.21: Within-Subjects Effects ANOVA for Usability Attribute "Concentration"**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	11.173	1.000	11.173	6.730	.014
Personality * Gender	1.212	1.000	1.212	.730	.399
Personality * Age Group	.609	1.000	.609	.367	.549
Personality * Vord_cb	2.813	3.000	.938	.565	.642
Personality * Hair Colour	.962	1.000	.962	.579	.452
Error (Personality)	53.125	32.000	1.660		
Agent Gender	.385	1.000	.385	.402	.530
Agent Gender * Gender	.885	1.000	.885	.925	.343
Agent Gender * Age Group	1.125	1.000	1.125	1.176	.286
Agent Gender * Vord_cb	4.868	3.000	1.623	1.695	.188
Agent Gender * Hair Colour	.741	1.000	.741	.774	.386
Error (Agent Gender)	30.625	32.000	.957		
Personality * Agent Gender	1.125	1.000	1.125	1.216	.278
Error (Personality*Agent Gender)	29.625	32.000	.926		

**Table 4.22: Within-Subjects Effects ANOVA for Usability Attribute “Flustered”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	12.130	1.000	12.130	14.115	.001
Personality * Gender	.002	1.000	.002	.002	.966
Personality * Age Group	.707	1.000	.707	.822	.371
Personality * Vord_cb	1.487	3.000	.496	.577	.634
Personality * Hair Colour	2.694	1.000	2.694	3.135	.086
Error (Personality)	27.500	32.000	.859		
Agent Gender	.579	1.000	.579	.788	.381
Agent Gender * Gender	.014	1.000	.014	.020	.889
Agent Gender * Age Group	.079	1.000	.079	.107	.746
Agent Gender * Vord_cb	.487	3.000	.162	.221	.881
Agent Gender * Hair Colour	.194	1.000	.194	.264	.611
Error (Agent Gender)	23.500	32.000	.734		
Personality * Agent Gender	3.540	1.000	3.540	4.095	.051
Error (Personality*Agent Gender)	27.667	32.000	.865		

**Table 4.23: Within-Subjects Effects ANOVA for Usability Attribute “Stress”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	36.540	1.000	36.540	17.049	<b>.000</b>
Personality * Gender	3.245	1.000	3.245	1.514	.227
Personality * Age Group	28.776	1.000	28.776	13.426	<b>.001</b>
Personality * Vord_cb	7.961	3.000	2.654	1.238	.312
Personality * Hair Colour	.361	1.000	.361	.168	.684
Error (Personality)	68.583	32.000	2.143		
Agent Gender	1.348	1.000	1.348	.762	.389
Agent Gender * Gender	.707	1.000	.707	.400	.532
Agent Gender * Age Group	1.256	1.000	1.256	.711	.406
Agent Gender * Vord_cb	2.566	3.000	.855	.484	.696
Agent Gender * Hair Colour	.014	1.000	.014	.008	.929
Error (Agent Gender)	56.583	32.000	1.768		
Personality * Agent Gender	9.256	1.000	9.256	5.780	<b>.022</b>
Error (Personality*Agent Gender)	51.250	32.000	1.602		

**Table 4.24: Within-Subjects Effects ANOVA for Usability Attribute "Frustration"**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	5472.923	1	5472.923	2182.349	.000
Gender	.103	1	.103	.041	.841
Age Group	17.002	1	17.002	6.779	<b>.014</b>
Vord_cb	4.096	3	1.365	.544	.655
Hair Colour	16.673	1	16.673	6.648	<b>.015</b>
Gender * Age Group	3.540	1	3.540	1.412	.244
Gender * Vord_cb	19.087	3	6.362	2.537	.074
Age Group * Vord_cb	3.611	3	1.204	.480	.698
Gender * Hair Colour	.006	1	.006	.003	.960
Age Group * Hair Colour	.194	1	.194	.077	.783
Vord_cb * Hair Colour	12.398	3	4.133	1.648	.198
Error	80.250	32	2.508		

**Table 4.25: Between-Subjects Effects ANOVA for Usability Attribute "Frustration"**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	10.256	1.000	10.256	10.850	.002
Personality * Gender	.314	1.000	.314	.332	.568
Personality * Age Group	2.077	1.000	2.077	2.197	.148
Personality * Vord_cb	1.099	3.000	.366	.388	.763
Personality * Hair Colour	1.641	1.000	1.641	1.736	.197
Error (Personality)	30.250	32.000	.945		
Agent Gender	.271	1.000	.271	.343	.562
Agent Gender * Gender	.079	1.000	.079	.100	.754
Agent Gender * Age Group	.040	1.000	.040	.051	.823
Agent Gender * Vord_cb	1.066	3.000	.355	.450	.719
Agent Gender * Hair Colour	.040	1.000	.040	.051	.823
Error (Agent Gender)	25.250	32.000	.789		
Personality * Agent Gender	3.391	1.000	3.391	4.031	.053
Error (Personality*Agent Gender)	26.917	32.000	.841		

**Table 4.26: Within-Subjects Effects ANOVA for Usability Attribute “Complication”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	5.769	1.000	5.769	5.313	.028
Personality * Gender	.707	1.000	.707	.651	.426
Personality * Age Group	.923	1.000	.923	.850	.363
Personality * Vord_cb	1.705	3.000	.568	.524	.669
Personality * Hair Colour	.923	1.000	.923	.850	.363
Error (Personality)	34.750	32.000	1.086		
Agent Gender	.776	1.000	.776	.746	.394
Agent Gender * Gender	.463	1.000	.463	.446	.509
Agent Gender * Age Group	.641	1.000	.641	.617	.438
Agent Gender * Vord_cb	2.073	3.000	.691	.665	.580
Agent Gender * Hair Colour	.923	1.000	.923	.888	.353
Error (Agent Gender)	33.250	32.000	1.039		
Personality * Agent Gender	.848	1.000	.848	.972	.332
Error (Personality*Agent Gender)	27.917	32.000	.872		

**Table 4.27: Within-Subjects Effects ANOVA for Usability Attribute “In Control”**



Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	10.256	1.000	10.256	6.642	<b>.015</b>
Personality * Gender	.463	1.000	.463	.300	.588
Personality * Age Group	.579	1.000	.579	.375	.545
Personality * Vord_cb	7.362	3.000	2.454	1.589	.211
Personality * Hair Colour	.079	1.000	.079	.051	.823
Error(Personality)	49.417	32.000	1.544		
Agent Gender	.026	1.000	.026	.030	.863
Agent Gender * Gender	.579	1.000	.579	.684	.414
Agent Gender * Age Group	1.168	1.000	1.168	1.380	.249
Agent Gender * Vord_cb	5.790	3.000	1.930	2.280	.098
Agent Gender * Hair Colour	.079	1.000	.079	.093	.763
Error (Agent Gender)	27.083	32.000	.846		
Personality * Agent Gender	4.848	1.000	4.848	6.532	<b>.016</b>
Error (Personality* Agent Gender)	23.750	32.000	.742		

**Table 4.28: Within-Subjects Effects ANOVA for Usability Attribute “Competency”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	13.712	1.000	13.712	10.735	<b>.003</b>
Personality * Gender	.292	1.000	.292	.229	.636
Personality * Age Group	2.375	1.000	2.375	1.860	.182
Personality * Vord_cb	5.296	3.000	1.765	1.382	.266
Personality * Hair Colour	.491	1.000	.491	.384	.540
Error (Personality)	40.875	32.000	1.277		
Agent Gender	2.760	1.000	2.760	2.188	.149
Agent Gender * Gender	.292	1.000	.292	.231	.634
Agent Gender * Age Group	4.587	1.000	4.587	3.635	.066
Agent Gender * Vord_cb	1.783	3.000	.594	.471	.705
Agent Gender * Hair Colour	.145	1.000	.145	.115	.737
Error (Agent Gender)	40.375	32.000	1.262		
Personality * Agent Gender	.212	1.000	.212	.276	.603
Error (Personality*Agent Gender)	24.542	32.000	.767		

**Table 4.29: Within-Subjects Effects ANOVA for Usability Attribute “Speed”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	6096.875	1	6096.875	1496.453	.000
Gender	14.616	1	14.616	3.587	.067
Age Group	27.712	1	27.712	6.802	.014
Vord_cb	6.457	3	2.152	.528	.666
Hair Colour	18.866	1	18.866	4.631	.039
Gender * Age Group	1.042	1	1.042	.256	.617
Gender * Vord_cb	6.905	3	2.302	.565	.642
Age Group * Vord_cb	14.566	3	4.855	1.192	.328
Gender * Hair Colour	8.423	1	8.423	2.068	.160
Age Group * Hair Colour	2.760	1	2.760	.677	.417
Vord_cb * Hair Colour	10.991	3	3.664	.899	.452
Error	130.375	32	4.074		

**Table 4.30: Between-Subject Effects ANOVA for Usability Attribute “Speed”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	54.552	1.000	54.552	24.259	.000
Personality * Gender	3.927	1.000	3.927	1.746	.196
Personality * Age Group	7.520	1.000	7.520	3.344	.077
Personality * Vord_cb	14.403	3.000	4.801	2.135	.115
Personality * Hair Colour	3.318	1.000	3.318	1.475	.233
Error (Personality)	71.958	32.000	2.249		
Agent Gender	.177	1.000	.177	.094	.762
Agent Gender * Gender	.004	1.000	.004	.002	.965
Agent Gender * Age Group	1.125	1.000	1.125	.596	.446
Agent Gender * Vord_cb	1.620	3.000	.540	.286	.835
Agent Gender * Hair Colour	.010	1.000	.010	.005	.942
Error (Agent Gender)	60.458	32.000	1.889		
Personality * Agent Gender	3.927	1.000	3.927	2.541	.121
Error (Personality*Agent Gender)	49.458	32.000	1.546		

**Table 4.31: Within-Subjects Effects ANOVA for Usability Attribute “Ease of Use”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	15.548	1.000	15.548	16.247	.000
Personality * Gender	.385	1.000	.385	.402	.530
Personality * Age Group	2.375	1.000	2.375	2.482	.125
Personality * Vord_cb	2.868	3.000	.956	.999	.406
Personality * Hair Colour	1.302	1.000	1.302	1.360	.252
Error (Personality)	30.625	32.000	.957		
Agent Gender	1.798	1.000	1.798	2.321	.137
Agent Gender * Gender	.385	1.000	.385	.497	.486
Agent Gender * Age Group	.212	1.000	.212	.274	.605
Agent Gender * Vord_cb	14.155	3.000	4.718	6.090	.002
Agent Gender * Hair Colour	.212	1.000	.212	.274	.605
Error (Agent Gender)	24.792	32.000	.775		
Personality * Agent Gender	1.212	1.000	1.212	2.846	.101
Error (Personality*Agent Gender)	13.625	32.000	.426		

**Table 4.32: Within-Subjects Effects ANOVA for Usability Attribute “Voice Clarity”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	51.923	1.000	51.923	28.003	.000
Personality * Gender	2.077	1.000	2.077	1.120	.298
Personality * Age Group	11.579	1.000	11.579	6.245	.018
Personality * Vord_cb	32.070	3.000	10.690	5.765	.003
Personality * Hair Colour	5.207	1.000	5.207	2.808	.104
Error(Personality)	59.333	32.000	1.854		
Agent Gender	1.348	1.000	1.348	.784	.382
Agent Gender * Gender	1.348	1.000	1.348	.784	.382
Agent Gender * Age Group	2.827	1.000	2.827	1.645	.209
Agent Gender * Vord_cb	7.534	3.000	2.511	1.461	.244
Agent Gender * Hair Colour	3.103	1.000	3.103	1.805	.189
Error (Agent Gender)	55.000	32.000	1.719		
Personality * Agent Gender	1.963	1.000	1.963	1.472	.234
Error (Personality*Agent Gender)	42.667	32.000	1.333		

**Table 4.33: Within-Subjects Effects ANOVA for Usability Attribute “Use Again”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	5100.410	1	5100.410	1407.010	.000
Gender	7.853	1	7.853	2.166	.151
Age Group	21.194	1	21.194	5.847	<b>.021</b>
Vord_cb	6.435	3	2.145	.592	.625
Hair Colour	11.579	1	11.579	3.194	.083
Gender * Age Group	3.848	1	3.848	1.061	.311
Gender * Vord_cb	5.150	3	1.717	.474	.703
Age Group * Vord_cb	7.155	3	2.385	.658	.584
Gender * Hair Colour	.848	1	.848	.234	.632
Age Group * Hair Colour	.231	1	.231	.064	.802
Vord_cb * Hair Colour	10.518	3	3.506	.967	.420
Error	116.000	32	3.625		

**Table 4.34: Between-Subject Effects ANOVA for Usability Attribute “Use Again”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	3.245	1.000	3.245	5.962	<b>.020</b>
Personality * Gender	.006	1.000	.006	.012	.914
Personality * Age Group	.848	1.000	.848	1.558	.221
Personality * Vord_cb	4.148	3.000	1.383	2.541	.074
Personality * Hair Colour	1.002	1.000	1.002	1.840	.184
Error(Personality)	17.417	32.000	.544		
Agent Gender	.079	1.000	.079	.277	.603
Agent Gender * Gender	.026	1.000	.026	.090	.766
Agent Gender * Age Group	.014	1.000	.014	.051	.823
Agent Gender * Vord_cb	1.138	3.000	.379	1.336	.280
Agent Gender * Hair Colour	1.002	1.000	1.002	3.529	.069
Error (Agent Gender)	9.083	32.000	.284		
Personality * Agent Gender	2.963	1.000	2.963	10.251	<b>.003</b>
Error (Personality*Agent Gender)	9.250	32.000	.289		

**Table 4.35: Within-Subjects Effects ANOVA for Usability Attribute “Reliability”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	33.694	1.000	33.694	14.804	.001
Personality * Gender	.361	1.000	.361	.158	.693
Personality * Age Group	17.333	1.000	17.333	7.616	.009
Personality * Vord_cb	6.208	3.000	2.069	.909	.447
Personality * Hair Colour	.002	1.000	.002	.001	.979
Error (Personality)	72.833	32.000	2.276		
Agent Gender	.058	1.000	.058	.034	.854
Agent Gender * Gender	.000	1.000	.000	.000	1.000
Agent Gender * Age Group	.579	1.000	.579	.344	.562
Agent Gender * Vord_cb	3.604	3.000	1.201	.714	.551
Agent Gender * Hair Colour	2.077	1.000	2.077	1.235	.275
Error (Agent Gender)	53.833	32.000	1.682		
Personality * Agent Gender	.923	1.000	.923	.654	.425
Error (Personality*Agent Gender)	45.167	32.000	1.411		

**Table 4.36: Within-Subjects Effects ANOVA for Usability Attribute “Engaged”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	5026.348	1	5026.348	1510.264	.000
Gender	.271	1	.271	.081	.777
Age Group	9.750	1	9.750	2.930	.097
Vord_cb	11.603	3	3.868	1.162	.339
Hair Colour	18.348	1	18.348	5.513	.025
Gender * Age Group	4.333	1	4.333	1.302	.262
Gender * Vord_cb	5.589	3	1.863	.560	.645
Age Group * Vord_cb	4.181	3	1.394	.419	.741
Gender * Hair Colour	.130	1	.130	.039	.845
Age Group * Hair Colour	4.333	1	4.333	1.302	.262
Vord_cb * Hair Colour	5.598	3	1.866	.561	.645
Error	106.500	32	3.328		

**Table 4.37: Between-Subject Effects ANOVA for Usability Attribute “Engaged”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	5.579	1.000	5.579	5.821	.022
Personality * Gender	.194	1.000	.194	.202	.656
Personality * Age Group	7.194	1.000	7.194	7.507	.010
Personality * Vord_cb	9.118	3.000	3.039	3.171	.037
Personality * Hair Colour	.040	1.000	.040	.042	.839
Error(Personality)	30.667	32.000	.958		
Agent Gender	.002	1.000	.002	.002	.967
Agent Gender * Gender	1.002	1.000	1.002	1.105	.301
Agent Gender * Age Group	.361	1.000	.361	.398	.533
Agent Gender * Vord_cb	3.269	3.000	1.090	1.202	.325
Agent Gender * Hair Colour	.579	1.000	.579	.638	.430
Error (Agent Gender)	29.000	32.000	.906		
Personality * Agent Gender	.410	1.000	.410	.508	.481
Error (Personality*Agent Gender)	25.833	32.000	.807		

**Table 4.38: Within-Subjects Effects ANOVA for Usability Attribute “Efficient”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	6920.006	1	6920.006	2832.924	.000
Gender	.519	1	.519	.213	.648
Age Group	10.776	1	10.776	4.411	.044
Vord_cb	3.218	3	1.073	.439	.727
Hair Colour	4.673	1	4.673	1.913	.176
Gender * Age Group	4.006	1	4.006	1.640	.210
Gender * Vord_cb	.697	3	.232	.095	.962
Age Group * Vord_cb	.499	3	.166	.068	.977
Gender * Hair Colour	1.641	1	1.641	.672	.418
Age Group * Hair Colour	.006	1	.006	.003	.959
Vord_cb * Hair Colour	3.032	3	1.011	.414	.744
Error	78.167	32	2.443		

**Table 4.39: Between-Subjects Effects ANOVA for Usability Attribute “Efficient”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	23.077	1.000	23.077	13.550	.001
Personality * Gender	1.963	1.000	1.963	1.153	.291
Personality * Age Group	10.002	1.000	10.002	5.873	.021
Personality * Vord_cb	19.674	3.000	6.558	3.851	.018
Personality * Hair Colour	1.540	1.000	1.540	.904	.349
Error (Personality)	54.500	32.000	1.703		
Agent Gender	.271	1.000	.271	.222	.641
Agent Gender * Gender	.006	1.000	.006	.005	.943
Agent Gender * Age Group	.314	1.000	.314	.258	.615
Agent Gender * Vord_cb	3.789	3.000	1.263	1.036	.390
Agent Gender * Hair Colour	.000	1.000	.000	.000	1.000
Error (Agent Gender)	39.000	32.000	1.219		
Personality * Agent Gender	8.079	1.000	8.079	11.322	.002
Error (Personality*Agent Gender)	22.833	32.000	.714		

**Table 4.40: Within-Subject Effects ANOVA for Usability Attribute “Needs Improvement”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4195.391	1	4195.391	721.788	.000
Gender	.848	1	.848	.146	.705
Age Group	18.348	1	18.348	3.157	.085
Vord_cb	3.281	3	1.094	.188	.904
Hair Colour	46.861	1	46.861	8.062	.008
Gender * Age Group	.923	1	.923	.159	.693
Gender * Vord_cb	4.381	3	1.460	.251	.860
Age Group * Vord_cb	3.034	3	1.011	.174	.913
Gender * Hair Colour	6.160	1	6.160	1.060	.311
Age Group * Hair Colour	.006	1	.006	.001	.974
Vord_cb * Hair Colour	16.230	3	5.410	.931	.437
Error	186.000	32	5.813		

**Table 4.41: Between-Subjects Effects ANOVA for Usability Attribute “Needs Improvement”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	61.564	1.000	61.564	36.370	.000
Personality * Gender	1.442	1.000	1.442	.852	.363
Personality * Age Group	9.014	1.000	9.014	5.325	.028
Personality * Vord_cb	18.645	3.000	6.215	3.672	.022
Personality * Hair Colour	.707	1.000	.707	.418	.523
Error (Personality)	54.167	32.000	1.693		
Agent Gender	1.002	1.000	1.002	1.308	.261
Agent Gender * Gender	.130	1.000	.130	.170	.683
Agent Gender * Age Group	1.083	1.000	1.083	1.415	.243
Agent Gender * Vord_cb	4.137	3.000	1.379	1.801	.167
Agent Gender * Hair Colour	.314	1.000	.314	.410	.526
Error (Agent Gender)	24.500	32.000	.766		
Personality * Agent Gender	3.103	1.000	3.103	4.380	.044
Error (Personality*Agent Gender)	22.667	32.000	.708		

**Table 4.42: Within-Subject Effects ANOVA for Usability Attribute “Friendly”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	6339.938	1	6339.938	4112.392	.000
Gender	.707	1	.707	.458	.503
Age Group	1.083	1	1.083	.703	.408
Vord_cb	17.160	3	5.720	3.710	.021
Hair Colour	2.564	1	2.564	1.663	.206
Gender * Age Group	.103	1	.103	.067	.798
Gender * Vord_cb	1.190	3	.397	.257	.856
Age Grp * Vord_cb	11.082	3	3.694	2.396	.086
Gender * Hair Colour	.410	1	.410	.266	.609
Age Group * Hair Colour	.707	1	.707	.458	.503
Vord_cb * Hair Colour	5.707	3	1.902	1.234	.313
Error	49.333	32	1.542		

**Table 4.43: Between-Subjects Effects ANOVA for Usability Attribute “Friendly”**



Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	66.366	1.000	66.366	32.693	.000
Personality * Gender	1.590	1.000	1.590	.783	.383
Personality * Age Group	5.866	1.000	5.866	2.890	.099
Personality * Vord_cb	12.426	3.000	4.142	2.040	.128
Personality * Hair Colour	3.770	1.000	3.770	1.857	.182
Error(Personality)	64.958	32.000	2.030		
Agent Gender	1.125	1.000	1.125	.323	.574
Agent Gender * Gender	6.260	1.000	6.260	1.797	.189
Agent Gender * Age Group	3.032	1.000	3.032	.871	.358
Agent Gender * Vord_cb	17.788	3.000	5.929	1.702	.186
Agent Gender * Hair Colour	.177	1.000	.177	.051	.823
Error (Agent Gender)	111.458	32.000	3.483		
Personality * Agent Gender	16.186	1.000	16.186	8.405	.007
Error (Personality*Agent Gender)	61.625	32.000	1.926		

**Table 4.44: Within-Subject Effects ANOVA for Usability Attribute “Liked Voice”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	46.861	1.000	46.861	33.824	.000
Personality * Gender	1.002	1.000	1.002	.723	.401
Personality * Age Group	14.769	1.000	14.769	10.660	.003
Personality * Vord_cb	24.274	3.000	8.091	5.840	.003
Personality * Hair Colour	.923	1.000	.923	.666	.420
Error(Personality)	44.333	32.000	1.385		
Agent Gender	.002	1.000	.002	.001	.975
Agent Gender * Gender	.271	1.000	.271	.170	.683
Agent Gender * Age Group	1.442	1.000	1.442	.905	.349
Agent Gender * Vord_cb	5.410	3.000	1.803	1.131	.351
Agent Gender * Hair Colour	.314	1.000	.314	.197	.660
Error (Agent Gender)	51.000	32.000	1.594		
Personality * Agent Gender	3.540	1.000	3.540	3.161	.085
Error (Personality*Agent Gender)	35.833	32.000	1.120		

**Table 4.45: Within-Subject Effects ANOVA for Usability Attribute “Enjoyment”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4615.079	1	4615.079	1218.838	.000
Gender	4.168	1	4.168	1.101	.302
Age Group	16.673	1	16.673	4.403	<b>.044</b>
Vord_cb	10.412	3	3.471	.917	.444
Hair Colour	27.083	1	27.083	7.153	<b>.012</b>
Gender * Age Group	.410	1	.410	.108	.744
Gender * Vord_cb	6.816	3	2.272	.600	.620
Age Group * Vord_cb	8.550	3	2.850	.753	.529
Gender * Hair Colour	.006	1	.006	.002	.967
Age Group * Hair Colour	3.540	1	3.540	.935	.341
Vord_cb * Hair Colour	9.908	3	3.303	.872	.466
Error	121.167	32	3.786		

**Table 4.46: Between-Subjects Effects ANOVA for Usability Attribute “Enjoyment”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	6.160	1.000	6.160	9.063	<b>.005</b>
Personality * Gender	.579	1.000	.579	.851	.363
Personality * Age Group	.361	1.000	.361	.531	.472
Personality * Vord_cb	5.666	3.000	1.889	2.779	.057
Personality * Hair Colour	.579	1.000	.579	.851	.363
Error (Personality)	21.750	32.000	.680		
Agent Gender	1.853	1.000	1.853	3.686	.064
Agent Gender * Gender	.040	1.000	.040	.080	.780
Agent Gender * Age Group	.002	1.000	.002	.003	.955
Agent Gender * Vord_cb	.663	3.000	.221	.440	.726
Agent Gender * Hair Colour	1.168	1.000	1.168	2.324	.137
Error (Agent Gender)	16.083	32.000	.503		
Personality * Agent Gender	1.641	1.000	1.641	4.533	<b>.041</b>
Error(Personality*Agent Gender)	11.583	32.000	.362		

**Table 4.47: Within-Subject Effects ANOVA for Usability Attribute “Polite”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	.519	1.000	.519	.457	.504
Personality * Gender	.519	1.000	.519	.457	.504
Personality * Age Group	.040	1.000	.040	.035	.852
Personality * Vord_cb	2.883	3.000	.961	.846	.479
Personality * Hair Colour	.014	1.000	.014	.013	.911
Error (Personality)	36.333	32.000	1.135		
Agent Gender	.160	1.000	.160	.496	.486
Agent Gender * Gender	.026	1.000	.026	.079	.780
Agent Gender * Age Group	2.438	1.000	2.438	7.548	.010
Agent Gender * Vord_cb	.081	3.000	.027	.083	.969
Agent Gender * Hair Colour	.079	1.000	.079	.243	.625
Error (Agent Gender)	10.333	32.000	.323		
Personality * Agent Gender	8.079	1.000	8.079	10.624	.003
Error (Personality*Agent Gender)	24.333	32.000	.760		

**Table 4.48: Within-Subject Effects ANOVA for Usability Attribute “Intimidating”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	6.564	1.000	6.564	8.157	.007
Personality * Gender	.058	1.000	.058	.072	.791
Personality * Age Group	5.391	1.000	5.391	6.700	.014
Personality * Vord_cb	1.468	3.000	.489	.608	.615
Personality * Hair Colour	.848	1.000	.848	1.054	.312
Error(Personality)	25.750	32.000	.805		
Agent Gender	.006	1.000	.006	.017	.899
Agent Gender * Gender	.314	1.000	.314	.809	.375
Agent Gender * Age Group	.026	1.000	.026	.066	.799
Agent Gender * Vord_cb	.973	3.000	.324	.836	.484
Agent Gender * Hair Colour	.194	1.000	.194	.500	.485
Error (Agent Gender)	12.417	32.000	.388		
Personality * Agent Gender	.519	1.000	.519	1.126	.296
Error (Personality*Agent Gender)	14.750	32.000	.461		

**Table 4.49: Within-Subject Effects ANOVA for Usability Attribute “Prefer Human”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Personality	5.579	1.000	5.579	3.570	.068
Personality * Gender	.848	1.000	.848	.543	.467
Personality * Age Group	1.083	1.000	1.083	.693	.411
Personality * Vord_cb	8.407	3.000	2.802	1.794	.168
Personality * Hair Colour	2.827	1.000	2.827	1.809	.188
Error (Personality)	50.000	32.000	1.563		
Agent Gender	9.750	1.000	9.750	6.000	.020
Agent Gender * Gender	4.333	1.000	4.333	2.667	.112
Agent Gender * Age Group	.014	1.000	.014	.009	.926
Agent Gender * Vord_cb	30.087	3.000	10.029	6.172	.002
Agent Gender * HairColour	3.848	1.000	3.848	2.368	.134
Error (Agent Gender)	52.000	32.000	1.625		
Personality * Agent Gender	11.308	1.000	11.308	8.448	.007
Error (Personality*Agent Gender)	42.833	32.000	1.339		

**Table 4.50: Within-Subject Effects ANOVA for Usability Attribute “Appearance Distracting”**

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Acceptable to be in Debt	34.549(a)	7	4.936	1.861	.094
	Fall into Debt	28.290(b)	7	4.041	1.657	.139
Intercept	Acceptable to be in Debt	436.208	1	436.208	164.479	.000
	Fall into Debt	594.361	1	594.361	243.731	.000
Age Group	Acceptable to be in Debt	25.081	1	25.081	9.457	.003
	Fall into Debt	.046	1	.046	.019	.891
Gender	Acceptable to be in Debt	.673	1	.673	.254	.616
	Fall into Debt	.219	1	.219	.090	.766
Higher Ed	Acceptable to be in Debt	1.530	1	1.530	.577	.451
	Fall into Debt	.214	1	.214	.088	.768
Age Group * Gender	Acceptable to be in Debt	.753	1	.753	.284	.596
	Fall into Debt	14.469	1	14.469	5.933	.018
Age Group * Higher Ed	Acceptable to be in Debt	14.905	1	14.905	5.620	.021
	Fall into Debt	1.968	1	1.968	.807	.373
Gender * Higher Ed	Acceptable to be in Debt	.488	1	.488	.184	.670
	Fall into Debt	5.405	1	5.405	2.216	.142
Age Group * Gender * Higher Ed	Acceptable to be in Debt	.108	1	.108	.041	.841
	Fall into Debt	3.721	1	3.721	1.526	.222
Error	Acceptable to be in Debt	145.863	55	2.652		
	Fall into Debt	134.123	55	2.439		
Total	Acceptable to be in Debt	1057.000	63			
	Fall into Debt	1252.000	63			

a R Squared = .192 (Adjusted R Squared = .089)

b R Squared = .174 (Adjusted R Squared = .069)

**Table 4.67: Tests of Between-Subjects Effects for the Saving-Debt Dimension**

Source	Dependent Variable	Type III SS	df	Mean Square	F	Sig.
<b>Corrected</b>	Think Long and Hard	5.505(a)	7	.786	1.750	.116
	Think Carefully	1.088(b)	7	.155	.514	.820
	Risk Reward	19.194(c)	7	2.742	1.196	.320
	Look Best Deals	2.820(d)	7	.403	.939	.484
	Gut Feelings	30.462(e)	7	4.352	2.337	.037
<b>Intercept</b>	Think Long and Hard	1253.377	1	1253.377	2788.998	.000
	Think Carefully	1316.082	1	1316.082	4353.665	.000
	Risk Reward	698.722	1	698.722	304.813	.000
	Look Best Deals	1284.280	1	1284.280	2993.942	.000
	Gut Feelings	762.142	1	762.142	409.372	.000
<b>Age Group</b>	Think Long and Hard	.064	1	.064	.142	.707
	Think Carefully	.115	1	.115	.381	.540
	Risk Reward	3.047	1	3.047	1.329	.254
	Look Best Deals	1.051	1	1.051	2.451	.123
	Gut Feelings	.781	1	.781	.419	.520
<b>Gender</b>	Think Long and Hard	.215	1	.215	.479	.492
	Think Carefully	.105	1	.105	.348	.558
	Risk Reward	3.031	1	3.031	1.322	.255
	Look Best Deals	.222	1	.222	.518	.475
	Gut Feelings	1.961	1	1.961	1.053	.309
<b>Higher Ed</b>	Think Long and Hard	.824	1	.824	1.834	.181
	Think Carefully	.076	1	.076	.251	.619
	Risk Reward	1.113	1	1.113	.486	.489
	Look Best Deals	.368	1	.368	.858	.358
	Gut Feelings	.269	1	.269	.144	.705
<b>Age*Gender</b>	<b>Think Long and Hard</b>	2.589	1	2.589	5.760	<b>.020</b>
	Think Carefully	.620	1	.620	2.052	.158
	Risk Reward	.211	1	.211	.092	.763
	Look Best Deals	.784	1	.784	1.828	.182
	Gut Feelings	.468	1	.468	.252	.618
<b>Age*H Ed</b>	Think Long and Hard	1.042	1	1.042	2.319	.134
	Think Carefully	.120	1	.120	.397	.531
	<b>Risk Reward</b>	13.641	1	13.641	5.951	<b>.018</b>
	Look Best Deals	.967	1	.967	2.255	.139
	<b>Gut Feelings</b>	9.845	1	9.845	5.288	<b>.025</b>
<b>Gender*H Ed</b>	Think Long and Hard	.656	1	.656	1.459	.232
	Think Carefully	.131	1	.131	.433	.513
	Risk Reward	.029	1	.029	.013	.911
	Look Best Deals	.005	1	.005	.011	.918
	Gut Feelings	.729	1	.729	.391	.534
<b>Error</b>	Think Long and Hard	24.717	55	.449		
	Think Carefully	16.626	55	.302		
	Risk Reward	126.076	55	2.292		
	Look Best Deals	23.593	55	.429		
	Gut Feelings	102.395	55	1.862		

**Table 4.68: Tests of Between-Subjects Effects for the Cognitive-Expressive Dimension**

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
<b>Corrected Model</b>	Success	41.325(a)	7	5.904	2.007	.071
	Budget	7.463(b)	7	1.066	1.715	.125
	Banks Adv	36.822(c)	7	5.260	2.820	.014
<b>Intercept</b>	Success	508.472	1	508.472	172.892	.000
	Budget	1161.704	1	1161.704	1868.905	.000
	Banks Adv	681.521	1	681.521	365.314	.000
<b>Age Group</b>	<b>Success</b>	21.141	1	21.141	7.188	<b>.010</b>
	Budget	.029	1	.029	.047	.829
	Banks Adv	1.630	1	1.630	.874	.354
<b>Gender</b>	Success	.182	1	.182	.062	.805
	<b>Budget</b>	2.598	1	2.598	4.180	<b>.046</b>
	<b>Banks Adv</b>	25.083	1	25.083	13.445	<b>.001</b>
<b>Higher Ed</b>	Success	6.196	1	6.196	2.107	.152
	Budget	1.314	1	1.314	2.114	.152
	Banks Adv	1.990	1	1.990	1.066	.306
<b>Age Group * Gender</b>	Success	2.112	1	2.112	.718	.400
	Budget	.959	1	.959	1.543	.219
	Banks Adv	.192	1	.192	.103	.750
<b>Age Group * Higher Ed</b>	Success	4.897	1	4.897	1.665	.202
	Budget	.504	1	.504	.811	.372
	Banks Adv	.237	1	.237	.127	.723
<b>Gender * Higher Ed</b>	Success	9.318	1	9.318	3.168	.081
	Budget	.158	1	.158	.254	.617
	Banks Adv	6.946	1	6.946	3.723	.059
<b>Age Group * Gender * Higher Ed</b>	Success	2.358	1	2.358	.802	.374
	Budget	.195	1	.195	.314	.578
	Banks Adv	.544	1	.544	.292	.591
<b>Error</b>	Success	161.754	55	2.941		
	Budget	34.188	55	.622		
	Banks Adv	102.607	55	1.866		
<b>Total</b>	Success	1021.000	63			
	Budget	2076.000	63			
	Banks Adv	1456.000	63			
<b>Corrected Total</b>	Success	203.079	62			
	Budget	41.651	62			
	Banks Adv	139.429	62			

**Table 4.69: Tests of Between-Subjects Effects for MAS Items**

## Appendix 8

### Pecuniary Questionnaire (revised)

*This questionnaire relates to your financial and economic behaviour and attitudes.*

Please tick the box that most closely represents how you feel about each of the statements.

1. **I don't associate being wealthy with success.**

<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 believe you have to spend more to get the very best.**

<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 sometimes buy things I don't need just to impress other 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"/>

4. **I think it is pointless to worry about money.**

<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 often buy things to make myself feel better.**

<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 often worry that I don't have enough money.**



<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 don't always know how much money I have in my bank accounts.

<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 never pay my bills on time.

<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 am proud of my ability to save.

<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 believe it is important to put money aside for unexpected events.

<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 think it is important to stick to a budget.

<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 often buy things just because they are in a sale or reduced in price.

<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"/>

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

13. I think it is important to know what financial terms really mean.

<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 think it is important to think long and hard before making financial 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"/>
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

15. I think it is important to look around for the best deals when it comes to financial matters.

<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 think it is important to go with gut feelings when making decisions about financial matters.

<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 always trust my intuition when dealing with financial matters.

<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 don't like using credit cards.

<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>
---------------------------	--------------	---------------------------	----------------	------------------------------	-----------------	------------------------------

19. **I often reach the limit on my credit or store cards.**

**Strongly Agree**    **Agree**    **Slightly Agree**    **Neutral**    **Slightly Disagree**    **Disagree**    **Strongly Disagree**

20. **I often use my overdraft to buy things that are not essential.**

**Strongly Agree**    **Agree**    **Slightly Agree**    **Neutral**    **Slightly Disagree**    **Disagree**    **Strongly Disagree**

21. **I find it difficult to save on a regular basis.**

**Strongly Agree**    **Agree**    **Slightly Agree**    **Neutral**    **Slightly Disagree**    **Disagree**    **Strongly Disagree**

22. **I save for the long-term.**

**Strongly Agree**    **Agree**    **Slightly Agree**    **Neutral**    **Slightly Disagree**    **Disagree**    **Strongly Disagree**

23. **I save for the things I want to do or buy.**

**Strongly Agree**    **Agree**    **Slightly Agree**    **Neutral**    **Slightly Disagree**    **Disagree**    **Strongly Disagree**

24. **I like to reward myself with purchases.**

**Strongly Agree**    **Agree**    **Slightly Agree**    **Neutral**    **Slightly Disagree**    **Disagree**    **Strongly Disagree**

25. I feel a rush of excitement when I purchase things.

Strongly Agree    Agree    Slightly Agree    Neutral    Slightly Disagree    Disagree    Strongly Disagree

26. I often feel a sense of guilt about things I purchase.

Strongly Agree    Agree    Slightly Agree    Neutral    Slightly Disagree    Disagree    Strongly Disagree

27. When I was a child my parents often argued about money.

Strongly Agree    Agree    Slightly Agree    Neutral    Slightly Disagree    Disagree    Strongly Disagree

28. When I was a child my parents discussed family finances with me.

Strongly Agree    Agree    Slightly Agree    Neutral    Slightly Disagree    Disagree    Strongly Disagree

29. I believe the risk of investing in stocks and shares is outweighed by the potential financial rewards.

Strongly Agree    Agree    Slightly Agree    Neutral    Slightly Disagree    Disagree    Strongly Disagree

30. I don't find gambling exciting.

Strongly Agree    Agree    Slightly Agree    Neutral    Slightly Disagree    Disagree    Strongly Disagree

31. I usually prefer to do things alone.

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

32. I am a social and talkative person.

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

33. I don't like to plan ahead.

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

34. I have a lot of self-discipline.

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

35. I like to try new things and experiences.

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

36. I am often flexible in my plans.

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

37. I think it is unwise to use any credit cards.

<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 think people who fall into debt are not managing their money properly.**

<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 think it is important to save on a regular basis.**

<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. **Saving is only important when we get older.**

<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 9

### Product Purchase Questionnaire

Participant ID:  
Date:  
Session Number:

*The following series of statements relates to your thoughts and opinions of the product offer.*

Please tick one box for each statement.

1. I did not like the way that the product was presented.

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

2. I thought the text describing the product offer was useful.

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

3. I was happy to listen to information about the product.

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

4. I would not find this product useful.

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

5. I did not feel the product was relevant to me.

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

6. I feel the product could be of benefit 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"/>

7. I would be interested in finding out more about the product.

<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 would not consider applying for the product.

<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 feel the bank have looked at my personal financial situation and tailored the product offer for 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"/>

10. I felt that the product had been specially chosen for 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"/>



# Appendix 10

## Usability Questionnaire

<b>Participant ID:</b>
<b>Date:</b>
<b>Session Number:</b>

*This questionnaire relates to the virtual person you have just interacted with.*

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

1. I would be happy to interact with this person 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"/>

2. I thought this person spoke 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"/>

3. I felt intimidated by this 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"/>

4. I think the information supplied by this person is 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"/>

5. I found interacting with this person 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"/>

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

6. I found it difficult to interact with this 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"/>

7. I felt under stress while interacting with this 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"/>

8. I found this person 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"/>

9. I enjoyed interacting with this 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"/>

10. I got flustered when interacting with this 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"/>

11. This person helped me feel engaged with the service.

<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 didn't like the voice of this 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"/>

13. 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"/>

14. I felt in control when interacting with this 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"/>

15. I had to concentrate hard when interacting with this 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"/>

16. I understood the information I was given by this 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"/>

17. I thought this person 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"/>

18. I found it very frustrating interacting with this 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 thought this person 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"/>

20. I thought interacting with this person 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"/>

21. I feel this service needs a lot of improvement.

<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 this service 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"/>

23. I felt that the process 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"/>

24. I found interacting with this person 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>
-----------------------	--------------	-----------------------	----------------	--------------------------	-----------------	--------------------------

**Agree**   **Agree**   **Disagree**   **Disagree**

25. **I found the appearance of this person distracting.**

**Strongly Agree**  **Agree**  **Slightly Agree**  **Neutral**  **Slightly Disagree**  **Disagree**  **Strongly Disagree**

26. **I thought the text box was useful.**

**Strongly Agree**  **Agree**  **Slightly Agree**  **Neutral**  **Slightly Disagree**  **Disagree**  **Strongly Disagree**

# Appendix 11

## Exit Questionnaire

Today you tried four different versions of a new financial service for Lloyds TSB. We would now like to ask you a few questions relating to your experience and opinions of those different versions.

**1. Thinking about your experiences today, what differences did you notice between the four versions you used (and what did you think of those differences)?**

.....  
 .....

*(If the participant has not noticed any difference between the four versions point to the screen shots and tell them that they were offered two different products in two different ways).*

**2. Which version of the service did you prefer?**

1st       2nd       3rd       4th       None

Why.....  
 .....

**3. Which version of the service did you like the least?**

1st       2nd       3rd       4th       None

Why.....  
 .....

**4. Thinking about those four different versions you experienced today, do you feel that one of the four versions 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. Overall, can you rate how relevant each of the four product offers are to you and your current financial situation?**

Place the magnets along the ruler scale between 'Not at All' and 'Very Relevant'. Remember to ask for a reason for their order. Record the order and positions to the nearest 0.5cm

Version	Measurement (cm)	Order	Reason
1			
2			
3			
4			

*I would now like to ask you a few about how you would feel if Lloyds TSB employed this type of service in the future?*

**6. How likely would you be to use such a service in real life?**

Very likely  Likely  Not very likely  Not at all

**7. 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	<input type="checkbox"/>	Wouldn't use them	<input type="checkbox"/>
Easier	<input type="checkbox"/>	Would use it only if I had to	<input type="checkbox"/>
Prefer Computers	<input type="checkbox"/>	Other (please state)	<input type="checkbox"/>
Like the Technology	<input type="checkbox"/>	.....	
.....			

**8. For what purpose would you be most likely to use such a service (like the one you experienced today)?**

Checking Balance	<input type="checkbox"/>	Requesting Information (e.g. for mortgages, loans, different accounts)	<input type="checkbox"/>
Ordering Chequebooks	<input type="checkbox"/>	Transferring money	<input type="checkbox"/>
Making Payments	<input type="checkbox"/>	Set-up, Change or Cancel Standing Orders Or Direct Debits	<input type="checkbox"/>
Other.....			
.....			

**9. How do you feel about Lloyds TSB giving you information about products they feel would be of benefit to you even if you have not asked about them?**

.....  
.....  
.....  
.....

*Finally I'd just like to ask you a few questions about different financial products.*

**10. Can you tell me what the financial term APR means?**

Yes  No

Definition.....  
.....

**11. Can you tell me what the financial term 'gross' means?**

Yes  No

Definition.....  
.....

**12. Can you tell me what the financial term 'ISA' means?**

Yes  No

Definition.....  
.....

**13. Finally, do you have any other comments you would like to add?**

.....  
.....  
.....  
.....



# Appendix 12

Participant ID:

Date:

## Demographic Questionnaire

1. Age: .....

2. Gender: Female  Male

3. Occupation: .....  
(if retired or unemployed give previous occupation)

4. Did you go to or are you at University, college, or any other higher education establishment? Yes  No

5. Do you have any dependants? Yes  No

6. If yes (to Q.10) how many? 1  2  3  4+

Now thinking about your relationship with money I would like you to place these markers ...

(SHOW LAMINATE WITH TABLE AND MARKERS  
Record the order and the positions to the nearest 0.5cm)

7. In order of importance?

ITEM	MEASUREMENT(cm)	ORDER
Spending		
Giving		
Saving		
Investing		

And now can you think about...

(SHOW LAMINATE WITH TABLE AND MARKERS)

8. What having money means to you (rate in order of relevance)?

Participant can rate items with a zero if feel that it has no relevance to them.

"The ability to do good"	
"The ability to do evil"	
Envy	
Power	
Achievement	
Freedom	
Security	
Respect	

Now I'd just like to ask you a few more general questions regarding how you use various financial products and your habits. Please feel free to let me know if you do not wish to answer any of them.

9. Do you have a mortgage? Yes  No

10. Do you own a car? Yes  No

11. If yes (to Q.8) Do you have or did you use a car loan for that purchase?  
Yes  No

12. If yes to Q.4 Do you have or have you ever had a student loan? Yes  No

13. Do you have or have you ever had a personal loan for any purpose?  
Yes  No

14. Do you have or ever had an overdraft? Yes  No

15. If yes to Q.14 Do you use it? Yes  No

16. How many credit cards or store cards do you have?

0  1  2  3  4+

17. If have 1 or more credit cards or store cards How often would you say you use them?

Weekly  A few times a month  Once a month   
A few times a year  Less than once a year  Never

18. (If they use their credit/store cards) Do you pay off -  
The full balance every month   
A fixed amount (that is not the minimum or full balance) every month   
The minimum amount required every month

19. How many non-savings bank accounts do you have (with any bank)?

0  1  2  3  4+

20. How many savings accounts do you have (with any bank)?

0  1  2  3  4+

21. What is your total yearly household income?  
£25,000 and under  £25,000 - £35,000  £35,000 - £45,000   
£45,000 and over   
Do not wish to disclose

## **Appendix 13**

### **Scripts**

**1a** Hi how can I help you?

**2a** Certainly, can you please swipe your card?

**3a** Can I have the first digit from your pin number please?

**4a** Can I have the second digit from your pin number please?

**5a** Can I have the third digit from your pin number please?

**6a** Can I have the fourth digit from your pin number please?

**7a** And the first digit please?

**8a** And the second digit please?

**9a** And the third digit please?

**10a** And the fourth digit please?

**12a** Thanks

**13a** Your balance is £1352 in credit

**13b** Your balance is £942.22 in credit

**13c** Your balance is £683.60 in credit

**13d** Your balance is £523 in credit

**14a** Is there anything else I can help you with?

**15a** Ok, I've requested that for you and it will be sent out to you in the next few days.

**16a** I'm sorry I didn't catch that can you repeat it?

**16b** I'm sorry I didn't catch that

### **High Planning Propensity version**

**17a** I'm looking at your current financial situation here and I can see that you have a standard savings account with us at Lloyds TSB.

**17b** You seem to pay money into this account on a fairly regular basis.

- 17c** So it seems to me that you are just the sort of person who'd be interested in our Monthly Savers Account.
- 17d** I think it could improve your circumstances and make life easier for you.
- 17e** The Monthly Savers Account will offer you a great gross fixed interest rate of 8% for the first year and after one year your account will automatically convert to a Guaranteed Tracker.
- 17f** The Guaranteed Tracker means you won't need to worry about the interest rate on your savings as it tracks the Bank of England base rate so you can always be sure of a fair return.
- 17g** This'll enable you to continue to save regularly whilst gaining the best interest rate on your money that we offer.
- 17h** You can pay in anything up to £500 in the first 7 days and £25 to £250 a month there after.
- 17i** So this account is ideal for those expected and unexpected events that you want to be prepared for.

**Low Planning Propensity version**

- 18a** I'm looking at your current financial situation here and I can see that you don't have a savings account with us at Lloyds TSB.
- 18b** You also seem to use your Lloyds TSB current account to pay out large sums of money every so often.
- 18c** So it seems to me that you are just the sort of person who'd be interested in our Monthly Savers Account.
- 18d** I think it could improve your circumstances and make life easier for you.
- 18e** The Monthly Savers Account will offer you a great gross fixed interest rate of 8% for 1 full year and instant access to your cash with no penalties.
- 18f** This'll enable you to continue to be flexible and adjust your plans at the same time as getting the best interest rate on your money that we offer.
- 18g** You can pay in anything up to £500 in the first 7 days and from then on you choose how much you pay in each month from as little as £25 to £250.
- 18h** So even for that holiday you save up for every year this account would be ideal in helping you along the way as well as allowing you unrestricted access for those unexpected events.

**High Risk Averse version**

- 19a** I'm looking at your current financial situation here and I can see that you don't have any type of investment account with us at Lloyds TSB but that you have a sum of money that could be invested.
- 19b** So it seems to me that you are just the sort of person who'd be interested in our Guaranteed Investment Account.
- 19c** I think it could improve your circumstances and make life easier for you.
- 19d** There is no risk to your investment and are guaranteed 15% gross minimum return at the end of the 5-year term.
- 19e** Or you could benefit from 75% of any potential stock market growth, which ever is greater.
- 19f** You can watch your money grow without the risk associated with stocks and shares.

**Low Risk Averse version**

- 20a** I'm looking at your current financial situation here and I can see that you already have a Mini Cash ISA with us here at Lloyds TSB and that you also have a sum of money that could be invested.
- 20b** So it seems to me that you are just the sort of person who'd be interested in our Guaranteed Investment Account.
- 20c** I think it could improve your financial situation.
- 20d** You're guaranteed a 15% gross minimum return at the end of the 5-year term.
- 20e** Or you could benefit from 75% of any potential stock market growth, which ever is greater.
- 20f** You also have the flexibility to invest more in your account until the investment date as well as no initial or annual charges.
- 21a** Would you like to know more about this product?
- 22a** Great I'll send you out a booklet and an application form in the post.
- 23a** You can also click on the link to fill out our online application form.
- 24a** Thanks very much for your time
- 25a** Thanks
- 26a** Thanks Goodbye

# Appendix 14

## Results from Chapter 5, ANOVA Tables

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4153.121	1	4153.121	1363.670	.000
Version	23.793	3	7.931	2.604	.071
Age	14.063	1	14.063	4.618	<b>.040</b>
Gender	.007	1	.007	.002	.961
Higher_Ed	11.468	1	11.468	3.765	.062
Dependants	11.244	1	11.244	3.692	.065
Version_Order * Age	57.294	3	19.098	6.271	<b>.002</b>
Version_Order * Gender	2.789	3	.930	.305	.821
Age * Gender	.845	1	.845	.277	.602
Version * Higher_Ed	20.294	3	6.765	2.221	.107
Age * Higher_Ed	.028	1	.028	.009	.924
Gender * Higher_Ed	.933	1	.933	.306	.584
Version_Order * Depend	32.118	3	10.706	3.515	<b>.027</b>
Age * Dependants	5.186	1	5.186	1.703	.202
Gender * Dependants	.233	1	.233	.077	.784
Error	88.321	29	3.046		

**Table 5.18: Between-Subjects Effects for Usability Attribute “Interact Again”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4848.428	1	4848.428	2002.318	.000
Version_Order	9.416	3	3.139	1.296	.294
Age	7.159	1	7.159	2.956	.096
Gender	2.328	1	2.328	.961	.335
Higher_Ed	1.610	1	1.610	.665	.422
Dependants	11.099	1	11.099	4.584	<b>.041</b>
Version_Order * Age	18.358	3	6.119	2.527	.077
Version_Order * Gender	5.588	3	1.863	.769	.521
Age * Gender	2.113	1	2.113	.872	.358
Age * Higher_Ed	.050	1	.050	.021	.887
Gender * Higher_Ed	.171	1	.171	.071	.792
Version_Order * Dependants	11.694	3	3.898	1.610	.209
Age * Dependants	2.976	1	2.976	1.229	.277
Gender* Dependants	.868	1	.868	.358	.554
Higher_Ed * Dependants	.000	0			
Error	70.221	29	2.421		

**Table 5.19: Between-Subjects Effects for Usability Attribute “Intimidated”**

(I) Dependants	(J) Dependants	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
					Lower Bound	Upper Bound
No	Yes	-.213(b,c)	.219	.339	-.661	.235
Yes	No	.213(b,c)	.219	.339	-.235	.661

Based on estimated marginal means

a Adjustment for multiple comparisons: Bonferroni.

b An estimate of the modified population marginal mean (I).

c An estimate of the modified population marginal mean (J).

**Table 5.20: Pairwise Comparisons for Usability Attribute “Intimidated”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Product	.465	2.434	.191	1.183	.318
Product * Version_Order	2.275	7.302	.312	1.930	.075
Product * Age	.241	2.434	.099	.612	.576
Product * Gender	1.902	2.434	.782	4.841	.007
Product * Higher_Ed	.624	2.434	.256	1.587	.207
Product * Dependants	.164	2.434	.067	.417	.700
Error(Product)	11.396	70.591	.161		

**Table 5.21: Within-Subject Effects for Usability Attribute “Information Reliable”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4509.483	1	4509.483	5297.216	.000
Version_Order	11.217	3	3.739	4.392	.012
Age	1.508	1	1.508	1.771	.194
Gender	9.172	1	9.172	10.774	.003
Higher_Ed	1.318	1	1.318	1.548	.223
Dependants	.117	1	.117	.138	.713
Version_Order * Age	.068	3	.023	.027	.994
Version_Order * Gender	4.686	3	1.562	1.835	.163
Age * Gender	3.025	1	3.025	3.553	.069
Version_Order * Higher_Ed	5.947	3	1.982	2.329	.095
Age * Higher_Ed	.078	1	.078	.092	.764
Gender * Higher_Ed	.019	1	.019	.022	.882
Version_Order * Dependants	1.237	3	.412	.485	.696
Age * Dependants	.119	1	.119	.140	.711
Gender * Dependants	.005	1	.005	.006	.941
Higher_Ed * Dependants	.000	0	.	.	.
Error	24.688	29	.851		

**Table 5.22: Between-Subjects Effects for Usability Attribute “Information Reliable”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4287.182	1	4287.182	1530.037	.000
Version_Order	38.633	3	12.878	4.596	<b>.009</b>
Age	7.928	1	7.928	2.830	.103
Gender	3.452	1	3.452	1.232	.276
Higher_Ed	1.707	1	1.707	.609	.441
Dependants	4.446	1	4.446	1.587	.218
Version_Order * Age	4.637	3	1.546	.552	.651
Version_Order * Gender	7.823	3	2.608	.931	.438
Age * Gender	.056	1	.056	.020	.889
Version_Order * Higher_Ed	32.170	3	10.723	3.827	<b>.020</b>
Age * Higher_Ed	.153	1	.153	.055	.817
Gender * Higher_Ed	1.219	1	1.219	.435	.515
Version_Order * Dependants	5.137	3	1.712	.611	.613
Age * Dependants	2.305	1	2.305	.823	.372
Gender * Dependants	7.430	1	7.430	2.652	.114
Error	81.258	29	2.802		

**Table 5.23: Between-Subjects Effects for Usability Attribute “Difficult”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4542.537	1	4542.537	2032.925	.000
Version_Order	13.359	3	4.453	1.993	.137
Age	9.056	1	9.056	4.053	.053
Gender	1.785	1	1.785	.799	.379
Higher_Ed	.918	1	.918	.411	.527
Dependants	10.359	1	10.359	4.636	<b>.040</b>
Version_Order * Age	11.365	3	3.788	1.695	.190
Version_Order * Gender	11.560	3	3.853	1.725	.184
Age * Gender	.450	1	.450	.201	.657
Version_Order * Higher_Ed	20.407	3	6.802	3.044	<b>.045</b>
Age * Higher_Ed	.012	1	.012	.006	.941
Gender * Higher_Ed	.011	1	.011	.005	.945
Age * Dependants	3.471	1	3.471	1.554	.223
Gender * Dependants	1.296	1	1.296	.580	.452
Higher_Ed * Dependants	.000	0			
Error	64.800	29	2.234		

**Table 5.24: Between-Subjects Effects for Usability Attribute “Stressed”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Product	.712	2.556	.279	1.932	.141



Product * Version_Order	1.463	7.669	.191	1.323	.247
Product * Age	.522	2.556	.204	1.417	.247
Product * Gender	.266	2.556	.104	.722	.521
Product * Higher_Ed	.494	2.556	.193	1.341	.269
Product * Dependants	1.136	2.556	.444	3.083	<b>.040</b>
Error(Product)	10.688	74.136	.144		

**Table 5.25: Within Subjects Effects for Usability Attribute “Friendly”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3962.795	1	3962.795	1121.728	.000
Version_Order	27.671	3	9.224	2.611	.070
Age	37.922	1	37.922	10.734	<b>.003</b>
Gender	2.616	1	2.616	.741	.397
Higher_Ed	14.491	1	14.491	4.102	.052
Dependants	22.651	1	22.651	6.412	<b>.017</b>
Version_Order * Age	53.224	3	17.741	5.022	<b>.006</b>
Version_Order * Gender	3.418	3	1.139	.322	.809
Age * Gender	.939	1	.939	.266	.610
Version_Order * Higher_Ed	25.968	3	8.656	2.450	.084
Age * Higher_Ed	6.613	1	6.613	1.872	.182
Gender * Higher_Ed	1.376	1	1.376	.390	.537
Version_Order * Dependants	24.552	3	8.184	2.317	.096
Age * Dependants	13.376	1	13.376	3.786	.061
Gender * Dependants	.744	1	.744	.211	.650
Error	102.450	29	3.533		

**Table 5.26: Between-Subjects Effects for Usability Attribute “Enjoyed Interaction”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Product	.731	2.561	.286	.553	.620
Product * Version_Order	10.882	7.682	1.416	2.742	<b>.011</b>
Product * Age	.908	2.561	.355	.686	.541
Product * Gender	.939	2.561	.366	.709	.528
Product * Higher_Ed	.488	2.561	.191	.369	.744
Product * Dependants	1.412	2.561	.551	1.067	.361
Error(product)	38.363	74.263	.517		

**Table 5.27: Within-Subjects Effects for Usability Attribute “Flustered”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3771.911	1	3771.911	973.108	.000

Version_Order	55.879	3	18.626	4.805	<b>.008</b>
Age	10.664	1	10.664	2.751	.108
Gender	6.013	1	6.013	1.551	.223
Higher_Ed	10.530	1	10.530	2.716	.110
Dependants	3.924	1	3.924	1.012	.323
Version_Order * Age	19.034	3	6.345	1.637	.202
Version_Order * Gender	5.067	3	1.689	.436	.729
Age * Gender	2.392	1	2.392	.617	.438
Version_Order * Higher_Ed	31.412	3	10.471	2.701	.064
Age * Higher_Ed	.003	1	.003	.001	.978
Gender * Higher_Ed	.268	1	.268	.069	.795
Version_Order * Dependants	4.352	3	1.451	.374	.772
Age * Dependants	10.296	1	10.296	2.656	.114
Gender * Dependants	9.643	1	9.643	2.488	.126
Error	112.408	29	3.876		

**Table 5.28: Between-Subjects Effects for Usability Attribute “Engaged with Service”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4324.802	1	4324.802	2106.707	.000
Version_Order	13.548	3	4.516	2.200	.109
Age	2.919	1	2.919	1.422	.243
Gender	13.242	1	13.242	6.451	<b>.017</b>
Higher_Ed	.001	1	.001	.001	.979
Dependants	3.726	1	3.726	1.815	.188
Version_Order * Age	16.209	3	5.403	2.632	.069
Version_Order * Gender	4.202	3	1.401	.682	.570
Age * Gender	2.335	1	2.335	1.137	.295
Version_Order * Higher_Ed	15.144	3	5.048	2.459	.083
Age * Higher_Ed	1.128	1	1.128	.550	.464
Gender * Higher_Ed	.043	1	.043	.021	.886
Version_Order * Dependants	4.147	3	1.382	.673	.575
Age * Dependants	1.719	1	1.719	.837	.368
Gender * Dependants	.171	1	.171	.084	.775
Error	59.533	29	2.053		

**Table 5.29: Between-Subjects Effects for Usability Attribute “Didn’t Like Voice”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3965.577	1	3965.577	1700.266	.000
Version_Order	36.314	3	12.105	5.190	<b>.005</b>

Age	19.308	1	19.308	8.279	<b>.007</b>
Gender	1.845	1	1.845	.791	.381
Higher_Ed	13.643	1	13.643	5.849	<b>.022</b>
Dependants	6.201	1	6.201	2.659	.114
Version_Order * Age	23.653	3	7.884	3.380	<b>.031</b>
Version_Order * Gender	5.387	3	1.796	.770	.520
Age * Gender	.394	1	.394	.169	.684
Version_Order * Higher_Ed	25.466	3	8.489	3.640	<b>.024</b>
Age * Higher_Ed	.253	1	.253	.109	.744
Gender * Higher_Ed	.305	1	.305	.131	.720
Version_Order * Dependants	8.847	3	2.949	1.264	.305
Age * Dependants	2.519	1	2.519	1.080	.307
Gender * Dependants	5.833	1	5.833	2.501	.125
Error	67.638	29	2.332		

**Table 5.30: Between-Subjects Effects for Usability Attribute “Control”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3904.532	1	3904.532	1010.920	.000
Version_Order	48.712	3	16.237	4.204	<b>.014</b>
Age	37.447	1	37.447	9.695	<b>.004</b>
Gender	8.458	1	8.458	2.190	.150
Higher_Ed	9.621	1	9.621	2.491	.125
Dependants	17.434	1	17.434	4.514	<b>.042</b>
Version_Order * Age	35.722	3	11.907	3.083	<b>.043</b>
Version_Order * Gender	13.024	3	4.341	1.124	.356
Age * Gender	.735	1	.735	.190	.666
Version_Order * Higher_Ed	30.864	3	10.288	2.664	.067
Age * Higher_Ed	3.200	1	3.200	.829	.370
Gender * Higher_Ed	.525	1	.525	.136	.715
Version_Order * Dependants	46.255	3	15.418	3.992	<b>.017</b>
Age * Dependants	24.344	1	24.344	6.303	<b>.018</b>
Gender * Dependants	10.296	1	10.296	2.666	.113
Error	112.008	29	3.862		

**Table 5.31: Between-Subjects Effects for Usability Attribute “Concentration”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4613.646	1	4613.646	3139.823	.000
Version_Order	9.702	3	3.234	2.201	.109
Age	1.328	1	1.328	.904	.350

Gender	.073	1	.073	.050	.825
Higher_Ed	7.973	1	7.973	5.426	.027
Dependants	.890	1	.890	.605	.443
Version_Order * Age	6.826	3	2.275	1.548	.223
Version_Order * Gender	.224	3	.075	.051	.985
Age * Gender	16.653	1	16.653	11.333	.002
Version_Order * Higher_Ed	7.122	3	2.374	1.616	.207
Age * Higher_Ed	.013	1	.013	.009	.927
Gender * Higher_Ed	.268	1	.268	.182	.673
Version_Order * Dependants	7.325	3	2.442	1.662	.197
Age * Dependants	.630	1	.630	.429	.518
Gender * Dependants	6.696	1	6.696	4.557	.041
Error	42.613	29	1.469		

**Table 5.32: Between-Subjects Effects for Usability Attribute “Understood Information”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4321.786	1	4321.786	1562.822	.000
Version_Order	23.313	3	7.771	2.810	.057
Age	10.207	1	10.207	3.691	.065
Gender	.639	1	.639	.231	.634
Higher_Ed	6.746	1	6.746	2.440	.129
Dependants	17.906	1	17.906	6.475	.017
Version_Order * Age	23.837	3	7.946	2.873	.053
Version_Order * Gender	4.385	3	1.462	.529	.666
Age * Gender	5.483	1	5.483	1.983	.170
Version_Order * Higher_Ed	21.242	3	7.081	2.560	.074
Age * Higher_Ed	.013	1	.013	.005	.947
Gender * Higher_Ed	.011	1	.011	.004	.951
Version_Order * Dependants	15.185	3	5.062	1.830	.164
Age * Dependants	2.201	1	2.201	.796	.380
Gender * Dependants	.868	1	.868	.314	.580
Error	80.196	29	2.765		

**Table 5.33: Between-Subjects Effects for Usability Attribute “Frustrated”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
product	1.312	1.863	.704	2.018	.146
product * Version_Order	8.609	5.589	1.540	4.414	.001
product * Age	.166	1.863	.089	.255	.760

product * Gender	.385	1.863	.207	.592	.545
product * Higher_Ed	.272	1.863	.146	.418	.646
product * Dependants	.686	1.863	.368	1.056	.351
Error(product)	18.854	54.026	.349		

**Table 5.34: Within-Subjects Effects for Usability Attribute “Complicated”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4372.971	1	4372.971	2016.289	.000
Version_Order	28.709	3	9.570	4.412	.011
Age	8.125	1	8.125	3.746	.063
Gender	5.434	1	5.434	2.505	.124
Higher_Ed	.526	1	.526	.243	.626
Dependants	2.555	1	2.555	1.178	.287
Version_Order * Age	8.156	3	2.719	1.253	.309
Version_Order * Gender	2.339	3	.780	.359	.783
Age * Gender	1.050	1	1.050	.484	.492
Version_Order * Higher_Ed	24.390	3	8.130	3.749	.022
Age * Higher_Ed	.078	1	.078	.036	.851
Gender * Higher_Ed	.171	1	.171	.079	.781
Version_Order * Dependants	.397	3	.132	.061	.980
Age * Dependants	.430	1	.430	.198	.660
Gender * Dependants	2.100	1	2.100	.968	.333
Error	62.896	29	2.169		

**Table 5.35: Between-Subjects Effects for Usability Attribute “Complicated”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4349.266	1	4349.266	3275.007	.000
Version_Order	11.577	3	3.859	2.906	.052
Age	2.753	1	2.753	2.073	.161

Gender	.354	1	.354	.266	.610
Higher_Ed	2.547	1	2.547	1.918	.177
Dependants	.665	1	.665	.501	.485
Version_Order * Age	8.481	3	2.827	2.129	.118
Version_Order * Gender	2.602	3	.867	.653	.588
Age * Gender	12.359	1	12.359	9.307	.005
Version_Order * Higher_Ed	2.574	3	.858	.646	.592
Age * Higher_Ed	.113	1	.113	.085	.773
Gender * Higher_Ed	1.219	1	1.219	.918	.346
Version_Order * Dependants	3.928	3	1.309	.986	.413
Age * Dependants	.001	1	.001	.001	.976
Gender * Dependants	.305	1	.305	.229	.635
Error	38.513	29	1.328		

**Table 5.36: Between-Subjects Effects for Usability Attribute “Efficient”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3306.048	1	3306.048	821.995	.000
Version_Order	75.170	3	25.057	6.230	.002
Age	12.912	1	12.912	3.210	.084
Gender	12.169	1	12.169	3.026	.093
Higher_Ed	6.211	1	6.211	1.544	.224
Dependants	7.255	1	7.255	1.804	.190
Version_Order * Age	23.264	3	7.755	1.928	.147
Version_Order * Gender	5.139	3	1.713	.426	.736
Age * Gender	2.392	1	2.392	.595	.447
Version_Order * Higher_Ed	23.389	3	7.796	1.938	.145
Age * Higher_Ed	.113	1	.113	.028	.868
Gender * Higher_Ed	.019	1	.019	.005	.946
Version_Order * Dependants	9.897	3	3.299	.820	.493
Age * Dependants	2.858	1	2.858	.711	.406
Gender * Dependants	7.058	1	7.058	1.755	.196
Error	116.638	29	4.022		

**Table 5.37: Between-Subjects Effects for Usability Attribute “Interaction Satisfying”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4653.690	1	4653.690	5739.798	.000
Version_Order	.696	3	.232	.286	.835
Age	2.070	1	2.070	2.554	.121
Gender	.023	1	.023	.028	.868

Higher_Ed	3.674	1	3.674	4.531	<b>.042</b>
Dependants	.228	1	.228	.281	.600
Version_Order * Age	6.060	3	2.020	2.491	.080
Version_Order * Gender	.190	3	.063	.078	.971
Age * Gender	1.850	1	1.850	2.282	.142
Version_Order * Higher_Ed	1.436	3	.479	.590	.626
Age * Higher_Ed	.003	1	.003	.004	.951
Gender * Higher_Ed	.096	1	.096	.119	.733
Version_Order * Dependants	6.440	3	2.147	2.648	.068
Age * Dependants	.001	1	.001	.001	.970
Gender * Dependants	.868	1	.868	1.070	.309
Error	23.513	29	.811		

**Table 5.38: Between-Subjects Effects for Usability Attribute "Text Box"**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4131.356	1	4131.356	3014.991	.000
Version_Order	17.409	3	5.803	4.235	<b>.013</b>
Age	7.234	1	7.234	5.279	<b>.029</b>
Gender	2.743	1	2.743	2.002	.168
Higher_Ed	4.035	1	4.035	2.945	.097
Dependants	4.464	1	4.464	3.258	.081
Version_Order * Age	14.332	3	4.777	3.486	<b>.028</b>
Version_Order * Gender	.233	3	.078	.057	.982
Age * Gender	2.146	1	2.146	1.566	.221
Version_Order * Higher_Ed	14.648	3	4.883	3.563	<b>.026</b>
Age * Higher_Ed	.008	1	.008	.006	.940
Gender * Higher_Ed	.001	1	.001	.000	.985
Version_Order * Dependants	7.602	3	2.534	1.849	.160
Age * Dependants	2.519	1	2.519	1.838	.186
Gender * Dependants	.134	1	.134	.097	.757
Error	39.738	29	1.370		

**Table 5.39: Between-Subjects Effects for the Mean Usability Score**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3972.797	1	3972.797	1229.323	.000
Version_Order	15.755	3	5.252	1.625	.206
Age	6.633	1	6.633	2.053	.163

Gender	4.394	1	4.394	1.360	.253
Higher_Ed	27.290	1	27.290	8.444	<b>.007</b>
Depend	4.369	1	4.369	1.352	.255
Version_Order * Age	34.450	3	11.483	3.553	<b>.027</b>
Version_Order * Gender	2.986	3	.995	.308	.819
Age * Gender	11.812	1	11.812	3.655	.066
Version_Order * Higher_Ed	8.293	3	2.764	.855	.476
Age * Higher_Ed	.528	1	.528	.163	.689
Gender * Higher_Ed	1.042	1	1.042	.322	.575
Version_Order * Depend	22.073	3	7.358	2.277	.102
Age * Depend	6.876	1	6.876	2.128	.156
Gender * Depend	.032	1	.032	.010	.922
Age * Gender * Depend	1.905	1	1.905	.589	.449
Error	90.488	28	3.232		

**Table 5.44: Tests of Between-Subjects Effects on the Attribute “Presentation”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4480.869	1	4480.869	4766.731	.000
Version_Order	.195	3	.065	.069	.976
Age	.563	1	.563	.599	.445
Gender	1.081	1	1.081	1.150	.293
Higher_Ed	4.176	1	4.176	4.442	<b>.044</b>
Depend	.966	1	.966	1.027	.320
Version_Order * Age	3.226	3	1.075	1.144	.348
Version_Order * Gender	1.001	3	.334	.355	.786
Age * Gender	3.781	1	3.781	4.022	.055
Version_Order * Higher_Ed	.905	3	.302	.321	.810
Age * Higher_Ed	.200	1	.200	.213	.648
Gender * Higher_Ed	.010	1	.010	.011	.917
Version_Order * Depend	3.849	3	1.283	1.365	.274
Age * Depend	.525	1	.525	.558	.461
Gender * Depend	.002	1	.002	.003	.960
Error	26.321	28	.940		

**Table 5.45: Tests of Between-Subjects Effects on the Attribute “Text Useful”**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	4114.220	1	4114.220	2154.915	.000
Version_Order	3.654	3	1.218	.638	.597
Age	.000	1	.000	.000	.992



Gender	.215	1	.215	.112	.740
Higher_Ed	20.949	1	20.949	10.973	<b>.003</b>
Depend	2.262	1	2.262	1.185	.286
Version_Order * Age	34.513	3	11.504	6.026	<b>.003</b>
Version_Order * Gender	1.862	3	.621	.325	.807
Age * Gender	7.449	1	7.449	3.902	.058
Version_Order * Higher_Ed	1.852	3	.617	.323	.808
Age * Higher_Ed	1.953	1	1.953	1.023	.320
Gender * Higher_Ed	1.500	1	1.500	.786	.383
Version_Order * Depend	20.178	3	6.726	3.523	<b>.028</b>
Age * Depend	.019	1	.019	.010	.921
Gender * Depend	1.114	1	1.114	.584	.451
Error	53.458	28	1.909		

**Table 5.46: Tests of Between-Subjects Effects on the Attribute "Listen"**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Product	14.791	2.302	4.930	2.731	<b>.049</b>
Product * Version_Order	16.643	6.906	2.410	1.024	.423
Product * Age	3.589	2.302	1.559	.663	.539
Product * Gender	.048	2.302	.021	.009	.995
Product * Higher_Ed	5.175	2.302	2.248	.955	.401
Product * Depend	5.031	2.302	2.185	.929	.412
Error(Product)	151.667	64.458	2.353		

**Table 5.47: Tests of Within-Subjects Effects on the Attribute "Product Useful"**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Product	11.794	2.125	5.550	2.817	<b>.044</b>
Product * Version_Order	16.501	6.375	2.588	1.314	.263
Product * Age	2.030	2.125	.955	.485	.630
Product * Gender	3.229	3.229	2.125	1.520	.771
Product * Higher_Ed	2.638	2.125	1.241	.630	.545
Product * Depend	2.557	2.125	1.203	.611	.556
Error(Product)	117.242	59.500	1.970		

**Table 5.48: Tests of Within-Subjects Effects on the Attribute "Tailored"**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Product	10.945	2.395	4.570	3.546	<b>.027</b>
Product * Version_Order	20.148	7.185	2.804	2.176	<b>.046</b>
Product * Age	2.653	2.395	1.108	.860	.445

Product * Gender	8.794	2.395	3.672	2.849	<b>.042</b>
Product * Higher_Ed	4.838	2.395	2.020	1.567	.212
Product * Depend	6.696	2.395	2.796	2.169	.113
Error(Product)	86.421	67.059	1.289		

**Table 5.49: Tests of Within-Subjects Effects on the Attribute "Chosen"**

		Risk Stocks Shares	Gambling
<b>Age</b>	Pearson Correlation	-.155	<b>-.405(**)</b>
	Sig. (2-tailed)	.217	<b>.001</b>
	N	65	65
<b>Sex</b>	Pearson Correlation	-.114	<b>-.362(**)</b>
	Sig. (2-tailed)	.367	<b>.003</b>
	N	65	65
<b>Higher_Ed</b>	Pearson Correlation	.230	.112
	Sig. (2-tailed)	.065	.374
	N	65	65
<b>Depend</b>	Pearson Correlation	-.035	-.147
	Sig. (2-tailed)	.782	.242
	N	65	65

\*\* Correlation is significant at the 0.01 level (2-tailed).

**Table 5.51: Correlations for Four Demographic Variables and Risk Aversion Items**

		Mortgage	Car	Car Loan	Student Loan
<b>Risk Stocks Shares</b>	Pearson Correlation	-.067	.105	-.266	.221
	Sig. (2-tailed)	.596	.403	.064	.076
	N	65	65	49	65
<b>Gambling</b>	Pearson Correlation	-.146	-.019	.038	<b>.440(**)</b>
	Sig. (2-tailed)	.245	.883	.793	<b>.000</b>
	N	65	65	49	65

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

**Table 5.52: Correlations for Four Demographic Variables and Risk Aversion Items**

		Age	Sex	University	Depend
<b>Proud</b>	Pearson Correlation	0.044	0.096	-0.038	0.017
	Sig. (2-tailed)	0.727	0.446	0.765	0.891
	N	65	65	65	65
<b>Difficult to</b>	Pearson	0.219	0.003	-0.092	0.076

Save	Correlation				
	Sig. (2-tailed)	0.08	0.982	0.467	0.546
	N	65	65	65	65
Long-Term	Pearson Correlation	<b>.367(**)</b>	-0.064	-0.163	0.152
	Sig. (2-tailed)	<b>0.003</b>	0.61	0.193	0.227
	N	65	65	65	65
To Do Buy	Pearson Correlation	-0.11	0.03	0.034	-0.157
	Sig. (2-tailed)	0.382	0.815	0.791	0.212
	N	65	65	65	65
Plan Ahead	Pearson Correlation	0.225	-0.035	0.019	0.221
	Sig. (2-tailed)	0.072	0.783	0.879	0.077
	N	65	65	65	65
Flexible	Pearson Correlation	-0.018	-0.02	-0.155	-0.056
	Sig. (2-tailed)	0.887	0.873	0.216	0.66
	N	65	65	65	65

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

**Table 5.53: Correlations for Four Demographic Variables and Planning Propensity Items**

		Mortgage	Car	Car Loan	Student Loan
Proud	Pearson Correlation	<b>.319(**)</b>	-0.011	-0.096	-0.113
	Sig. (2-tailed)	<b>0.01</b>	0.93	0.511	0.372
	N	65	65	49	65
Difficult to Save	Pearson Correlation	<b>.295(*)</b>	0.16	-0.115	-0.243
	Sig. (2-tailed)	<b>0.017</b>	0.203	0.433	0.051
	N	65	65	49	65
Long-Term	Pearson Correlation	<b>.349(**)</b>	0.126	0.097	<b>-.374(**)</b>
	Sig. (2-tailed)	<b>0.004</b>	0.318	0.506	<b>0.002</b>
	N	65	65	49	65
To Do Buy	Pearson Correlation	0.07	-0.2	-0.135	0.014
	Sig. (2-tailed)	0.578	0.11	0.356	0.911
	N	65	65	49	65
Plan Ahead	Pearson Correlation	<b>.307(*)</b>	<b>.325(**)</b>	-0.14	<b>-.313(*)</b>
	Sig. (2-tailed)	<b>0.013</b>	<b>0.008</b>	0.339	<b>0.011</b>
	N	65	65	49	65
Flexible	Pearson Correlation	-0.194	-0.046	0.059	-0.028
	Sig. (2-tailed)	0.121	0.715	0.689	0.827
	N	65	65	49	65
Regularly	Pearson Correlation	0.017	-0.009	-0.106	0.057
	Sig. (2-tailed)	0.895	0.944	0.469	0.655
	N	65	65	49	65

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

**Table 5.54: Correlations for Four Demographic Variables and Planning Propensity Items**

		Personal Loan	Overdraft	Use Overdraft	Credit cards
Proud	Pearson Correlation	-0.113	-0.134	-0.153	-0.014
	Sig. (2-tailed)	0.372	0.289	0.290	0.911

	N	65	65	50	65
<b>Difficult to Save</b>	Pearson Correlation	-0.165	-0.035	-0.177	0.017
	Sig. (2-tailed)	0.189	0.782	0.220	0.893
	N	65	65	50	65
<b>Long-Term</b>	Pearson Correlation	-0.108	-0.160	<b>-0.435</b>	0.081
	Sig. (2-tailed)	0.390	0.204	<b>0.002(**)</b>	0.520
	N	65	65	50	65
<b>To Do Buy</b>	Pearson Correlation	<b>-0.301</b>	-0.130	-0.147	-0.128
	Sig. (2-tailed)	<b>0.015 (*)</b>	0.302	0.310	0.308
	N	65	65	50	65
<b>Plan Ahead</b>	Pearson Correlation	0.085	0.118	-0.077	0.209
	Sig. (2-tailed)	0.500	0.348	0.597	0.095
	N	65	65	50	65
<b>Flexible</b>	Pearson Correlation	0.152	0.143	-0.079	0.026
	Sig. (2-tailed)	0.227	0.256	0.584	0.835
	N	65	65	50	65
<b>Regularly</b>	Pearson Correlation	-0.237	-0.099	-0.091	0.125
	Sig. (2-tailed)	0.057	0.433	0.530	0.322
	N	65	65	50	65

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

**Table 5.55: Correlations for Four Demographic Variables and Planning Propensity Items**

		<b>Use Credit Cards</b>	<b>Pay Off Credit Cards</b>	<b>Non-Savings A/C</b>	<b>Savings A/C</b>	<b>Income</b>
<b>Proud</b>	Pearson Correlation	-0.019	<b>.494(**)</b>	0.062	0.236	-0.068
	Sig. (2-tailed)	0.898	<b>0.001</b>	0.622	0.059	0.593
	N	48	44	65	65	65

<b>Difficult to Save</b>	Pearson Correlation	0.153	<b>.527(**)</b>	0.062	<b>.259(*)</b>	0.09
	Sig. (2-tailed)	0.299	<b>0</b>	0.624	<b>0.037</b>	0.477
	N	48	44	65	65	65
<b>Long-Term</b>	Pearson Correlation	0.058	<b>.407(**)</b>	0.007	<b>.299(*)</b>	0.023
	Sig. (2-tailed)	0.695	<b>0.006</b>	0.959	<b>0.016</b>	0.856
	N	48	44	65	65	65
<b>To Do Buy</b>	Pearson Correlation	-0.045	0.19	0.081	0.125	-0.169
	Sig. (2-tailed)	0.764	0.216	0.523	0.322	0.179
	N	48	44	65	65	65
<b>Plan Ahead</b>	Pearson Correlation	-0.172	0.15	<b>.311(*)</b>	0.164	0.172
	Sig. (2-tailed)	0.243	0.331	<b>0.012</b>	0.191	0.171
	N	48	44	65	65	65
<b>Flexible</b>	Pearson Correlation	-0.024	-0.197	-0.018	-0.094	-0.105
	Sig. (2-tailed)	0.871	0.201	0.887	0.455	0.404
	N	48	44	65	65	65
<b>Regularly</b>	Pearson Correlation	0.099	<b>.303(*)</b>	0.227	<b>.267(*)</b>	0.047
	Sig. (2-tailed)	0.502	<b>0.045</b>	0.069	<b>0.031</b>	0.71
	N	48	44	65	65	65

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

**Table 5.56: Correlations for Five Demographic Variables and Planning Propensity Items**