

Human-Centred Information Systems: Designing Avatars for Users from Arab Culture

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A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in
Information Systems

School of Electrical Engineering and Computing

Faculty of Engineering and Built Environment

The University of Newcastle, Australia

April / 2020

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ABSTRACT

This research explores avatar design aimed at being part of a user interface, which is human-centred and enhances user experience. Avatars here refer to images or digital representations of users or computer agents in an online environment. We first carry out a comprehensive review of the relevant literature to investigate and synthesise findings related to avatar design. Through the review, we develop a theoretical framework to capture commonly investigated constructs, interaction types, application domains, and design considerations for digital representations. We also identify the knowledge gaps and establish our research objectives.

Based on the established research objectives, we conducted two qualitative studies exploring avatar design in the context of health applications. To derive avatar design guidelines, we adopted a co-design approach, which involved stakeholders in the design process. For the first study, we focused on empathic avatar design for stroke rehabilitation in a culturally neutral manner. Here, empathic design refers to paying attention to users' needs and building an emotional relationship between users and avatars. This study was rooted in *behaviour change theory* to engage stroke survivors. For the second study, we focused on designing avatars for Arab culture by creating a health scenario that provided a context for participants' responses. Here, in designing avatars, we considered the expertise of stakeholders who have experience with Arab culture. This study was based on *social response theory*, which posits that humans behave socially to computers. To the best of our knowledge, this is the first time that Arab culture has been considered in developing design guidelines for avatars comprehensively.

Based on the design guidelines developed in the second study, a set of 12 avatars covering the dimensions of culture, gender and clothing were designed. For the Arab avatars, we additionally considered Arab *cultural markers*, which involve design elements prevalent

within Arab culture. Then, we investigated the appropriateness of avatar design, i.e., the extent to which an avatar was perceived as culturally appropriate to Arab culture. We collected data from Arab users through an online questionnaire to test our research model and hypotheses. This study broadens our understanding of the influence of cultural appropriateness. The findings reveal that Arab avatars yield higher cultural appropriateness, which, in turn, is associated with higher trust and usage intention.

This research as a whole enriches our understanding of avatar design, as it explains why involving users in the design of avatars can provide a heightened user experience. The findings reveal that including design considerations that match the context, address users' needs, and reflect users' culture can provide better human–avatar interactions. Our work emphasises the importance of *empathic elements* and *cultural markers* in achieving human-centred design. The research adds to the existing knowledge base through the development of design guidelines that assist designers create more suitable avatars. The research also offers a deeper understanding of how avatars that are culturally appropriate can improve usage intention. It provides designers of user interfaces with a better understanding of how to design avatars for health applications in Arab culture.

STATEMENT OF ORIGINALITY

I hereby certify that the work embodied in the thesis is my own work, conducted under normal supervision.

The thesis contains no material that has been accepted, or is being examined, for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to the final version of my thesis being made available worldwide when deposited in the University's Digital Repository, subject to the provisions of the Copyright Act 1968.

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ACKNOWLEDGEMENT OF AUTHORSHIP

I hereby certify that the work embodied in this thesis contains published paper/s/scholarly work of which I am a joint author. I have included as part of the thesis a written declaration endorsed in writing by my supervisor, attesting to my contribution to the joint publication/s/scholarly work.

Hussain M. Al Jaroodi

By signing below, I confirm that Hussain M. Al Jaroodi contributed to the following papers:

Aljaroodi, H. M., Adam, M. T. P., Chiong, R., Cornforth, D. J. Minichiello, M (2017). Empathic avatars in stroke rehabilitation: A co-designed mHealth artifact for stroke survivors. *Proceedings of the International Conference on Design Science Research in Information System and Technology (DSRIST)*, (pp. 73-89), Karlsruhe, Germany. Nominated for the Herbert A. Simon Award for the Best Design Research Paper. Link: https://doi.org/10.1007/978-3-319-59144-5_5

Aljaroodi, H. M., Chiong, R., Adam, M. T. P. (2017). Designing persuasive avatars in mHealth for Arabic culture: A qualitative study. *Proceedings of the Australasian Conference on Information Systems (ACIS)*, (pp. 1-10), Hobart, Australia. Selected as one of top six research-in-progress papers. Link: <https://aisel.aisnet.org/acis2017/38>

Aljaroodi, H. M., Adam, M. T. P., Chiong, R., Teubner, T. (2019). Avatars and embodied agents in experimental information systems research: A systematic review and conceptual framework. *Australasian Journal of Information Systems*, vol. 23, pp. 1-37. Link: <https://doi.org/10.3127/ajis.v23i0.1841>

Aljaroodi, H. M., Chiong, R., Adam, M. T. P. (2020). Exploring the design of avatars for users from Arabian culture through a hybrid approach of deductive and inductive reasoning. *Computers in Human Behavior*, vol. 106, 106246. Link: <https://doi.org/10.1016/j.chb.2020.106246>

Aljaroodi, H. M., Adam, M. T. P., Teubner, T., Chiong, R. Designing avatars for Arab users: The impact of cultural appropriateness on trust and usage intention. *MIS Quarterly*, submitted on 28/11/2019 (under review)

Dr Raymond Chiong

ACKNOWLEDGEMENTS

This thesis encompasses my PhD journey at the University of Newcastle, Australia. First of all, I would like to express my sincere gratitude to my supervisors, Dr Raymond Chiong and Dr Marc Adam, for their continuous support during my PhD journey and related research, as well as their patience, motivation, and immense knowledge. Their constant guidance assisted me in the research and writing of this thesis; I could not have imagined having better supervisors and mentors for my PhD study. I could not have achieved this milestone in my life without their encouragement.

Besides my supervisors, I would like to thank Professor Timm Teubner from the Technical University of Berlin, Germany, for his insightful comments and encouragement during my PhD journey. Professor Teubner's expertise and knowledge assisted me in developing sound research skills in terms of data analysis and measurement. I could not have achieved this without his help and support.

Nobody has been more important to me in the pursuit of this PhD study than the members of my family. I would like to thank my parents whose love and guidance are always with me wherever I go or whatever I do. Most importantly, I wish to thank my loving and supportive wife, Fatimah Al Hubayl, for her encouragement and sacrifice, and I also thank my two boys, Rayan and Morad, for their smiles and hugs when I got home at the end of the day, which provided unending inspiration and kept me going.

I also recognise and thank my sponsor, the Institute of Public Administration (IPA), Saudi Arabia, for granting me this opportunity to pursue my PhD. Their financial and administration support made it easier for me and my family. I also thank the Saudi Arabian Cultural Mission (SACM) for cooperation with my sponsor to make this journey easier.

I also thank my fellow PhD candidates in the office. A special thank goes to Philipp Rouast for his advice and chats during this time. Also, I wish to thank Jacqueline Bailey, Tyler Noorbergen and Ashlea Rendell for their feedback and suggestions on my writing, structure of papers, and figures. I much appreciated the good times and memories we all shared in the office (ICT 3.43).

TABLE OF CONTENTS

ABSTRACT.....	II
STATEMENT OF ORIGINALITY.....	IV
ACKNOWLEDGEMENT OF AUTHORSHIP.....	V
ACKNOWLEDGEMENTS	VI
TABLE OF CONTENTS.....	VII
LIST OF TABLES	XI
LIST OF FIGURES.....	XII
LIST OF ABBREVIATIONS	XIII
 CHAPTER 1: INTRODUCTION	 1
 CHAPTER 1 OVERVIEW.....	 1
1.1 BACKGROUND AND MOTIVATION.....	1
1.2 RESEARCH CONTEXT AND SCOPE.....	5
1.3 RESEARCH QUESTIONS AND OBJECTIVES.....	6
1.4 RESEARCH METHODOLOGY	9
1.4.1 SYSTEMATIC LITERATURE REVIEW METHODS	10
1.4.2 QUALITATIVE METHODS.....	11
1.4.3 QUANTITATIVE METHODS.....	13
1.5 RESEARCH SIGNIFICANCE AND CONTRIBUTIONS.....	14
1.6 ETHICAL CONSIDERATIONS	18
1.7 THESIS STRUCTURE.....	19
1.8 CHAPTER SUMMARY.....	22
 CHAPTER 2: BACKGROUND AND LITERATURE REVIEW	 23
 CHAPTER 2 OVERVIEW	 23
2.1 INTRODUCTION.....	23
2.2 BACKGROUND AND MOTIVATION.....	24
2.3 METHODS	26
2.4 CONCEPTUAL FRAMEWORK	28
2.4.1 AVATARS.....	32
2.4.2 EMBODIED AGENTS.....	32
2.4.3 ARTEFACT DESIGN.....	33
2.4.4 PRESENCE AND IMMERSION	34
2.4.5 EXPERIMENTAL RESEARCH ON AVATARS AND EMBODIED AGENTS.....	35
2.4.6 APPLICATION CONTEXTS	36
2.5 INTERACTION WITH SELF-AVATARS	36
2.5.1 SELF-AVATAR CONCEPTS	37
2.5.2 INFLUENCES ON USER PERCEPTIONS AND BEHAVIOUR.....	38
2.6 INTERACTION WITH ANOTHER PERSON'S AVATAR.....	40

2.6.1	AVATAR CONCEPTS.....	40
2.6.2	INFLUENCES ON USER PERCEPTIONS AND BEHAVIOURS	41
2.7	INTERACTION WITH EMBODIED AGENTS.....	44
2.7.1	EMBODIED AGENT CONCEPTS.....	44
2.7.2	REALISM.....	45
2.7.3	PERSUASIVE AND EMPATHIC EMBODIED AGENTS.....	46
2.7.4	THE UNCANNY VALLEY	47
2.8	DISCUSSION.....	48
2.8.1	SUMMARY OF FINDINGS	48
2.8.2	PRACTICAL IMPLICATIONS	52
2.8.3	LIMITATIONS AND FUTURE DIRECTIONS.....	55
2.9	CONCLUDING REMARKS AND CHAPTER SUMMARY.....	56
 CHAPTER 3: EXPLORING EMPATHIC AVATAR DESIGN FOR STROKE SURVIVORS.58		
CHAPTER 3 OVERVIEW		58
3.1	INTRODUCTION	58
3.2	BACKGROUND AND MOTIVATION	59
3.3	RELATED WORK: AVATARS IN HEALTH APPLICATIONS.....	61
3.4	PROBLEM IDENTIFICATION AND REQUIREMENT ELICITATION.....	63
3.5	DESIGN.....	67
3.5.1	EMPATHIC SELF-AVATARS	69
3.5.2	ANIMATIONS IN A FAMILIAR ENVIRONMENT.....	71
3.5.3	SHAPE AND COLOUR AESTHETICS	72
3.6	IMPLEMENTATION AND EVALUATION	74
3.6.1	IMPLEMENTATION	74
3.6.2	FUTURE DEVELOPMENT	78
3.6.3	EVALUATION	78
3.7	DISCUSSION.....	80
3.7.1	SUMMARY OF FINDINGS	80
3.7.2	LIMITATIONS AND FUTURE DIRECTIONS.....	83
3.8	CONCLUDING REMARKS AND CHAPTER SUMMARY	84
 CHAPTER 4: EXPLORING THE DESIGN OF AVATARS FOR USERS FROM ARAB CULTURE THROUGH A HYBRID APPROACH OF DEDUCTIVE AND INDUCTIVE REASONING.....86		
CHAPTER 4 OVERVIEW		86
4.1	INTRODUCTION	86
4.2	BACKGROUND AND MOTIVATION	87
4.3	RELATED WORK	90
4.3.1	USER INTERFACE DESIGN FOR ARAB CULTURE	90
4.3.2	SOCIAL RESPONSE THEORY AND AVATAR DESIGN IN HUMAN–COMPUTER INTERACTION.....	92
4.3.3	DESIGNING AVATARS FOR USERS FROM ARAB CULTURE	94
4.4	RESEARCH METHODOLOGY.....	96
4.4.1	DEDUCTION: DEVELOPMENT OF AN INTEGRATIVE THEORETICAL FRAMEWORK.....	96

4.4.2	INDUCTION: QUALITATIVE INTERVIEWS.....	97
4.4	THE FRAMEWORK.....	102
4.5.1	COLOURS IN AVATAR DESIGN FOR ARAB USERS (P1).....	104
4.5.2	CULTURAL MARKERS IN AVATAR DESIGN FOR ARAB USERS (P2)	105
4.5.3	ANDROGYNY IN AVATAR DESIGN FOR ARAB USERS (P3).....	107
4.6	RESULTS: DESIGN GUIDELINES.....	108
4.6.1	GUIDELINE 1: CLEAR GENDER CLASSIFICATION	109
4.6.2	GUIDELINE 2: FACIAL HAIR	110
4.6.3	GUIDELINE 3: CULTURAL CLOTHING.....	111
4.6.4	GUIDELINE 4: MODESTY IN CLOTHING	113
4.6.5	GUIDELINE 5: DARKER COLOURS FOR HAIR, EYES, AND SKIN.....	114
4.6.6	GUIDELINE 6: CULTURAL LANDMARKS AND LOCATIONS	115
4.7	DISCUSSION.....	116
4.7.1	GENERAL DISCUSSION	116
4.7.2	RESEARCH LIMITATIONS.....	119
4.7.3	FUTURE RESEARCH	120
4.8	CONCLUDING REMARKS AND CHAPTER SUMMARY	121

CHAPTER 5: DESIGNING AVATARS FOR ARAB USERS: THE IMPACT OF CULTURAL APPROPRIATENESS ON TRUST AND USAGE INTENTION.....123

CHAPTER 5: OVERVIEW	123
5.1 INTRODUCTION	123
5.2 BACKGROUND AND MOTIVATION	124
5.3 RELATED WORK.....	127
5.3.1 SOCIAL RESPONSE THEORY AND AVATAR DESIGN	127
5.3.2 CULTURAL APPROPRIATENESS	128
5.3.3 USER INTERFACE DESIGN FOR ARAB CULTURE.....	130
5.3.4 AVATAR DESIGN FOR ARAB CULTURE	131
5.4 RESEARCH MODEL AND HYPOTHESES DEVELOPMENT	132
5.4.1 IMPACT OF CULTURAL APPROPRIATENESS ON PERCEIVED FAMILIARITY, SOCIAL PRESENCE, AND ANTHROPOMORPHISM.....	132
5.4.2 IMPACT OF CULTURAL APPROPRIATENESS ON INTENTION TO USE	134
5.5 METHODS	135
5.5.1 SCENARIO	135
5.5.2 TREATMENT DESIGN	136
5.5.2 PROCEDURE AND SAMPLE.....	137
5.5.3 MEASUREMENT AND INSTRUMENT	138
5.6 RESULTS.....	140
5.6.1 MANIPULATION CHECKS.....	140
5.6.2 CULTURAL APPROPRIATENESS	141
5.6.3 MEASUREMENT MODEL	143
5.6.5 HYPOTHESES TESTING	145
5.6.5 MULTI-GROUP ANALYSIS	146
5.6.6 SUPPLEMENTARY ANALYSIS: AVATAR SELECTION.....	147
5.7 DISCUSSION AND CONCLUSION	151

5.7.1 THEORETICAL CONTRIBUTIONS	151
5.7.2 PRACTICAL IMPLICATIONS	154
5.7.3 LIMITATIONS AND FUTURE DIRECTIONS.....	155
5.8 CONCLUDING REMARKS AND CHAPTER SUMMARY.....	156
 CHAPTER 6: DISCUSSION AND CONCLUSION.....	 158
 CHAPTER 6 OVERVIEW	 158
6.1 INTRODUCTION	158
6.2 ADDRESSING THE RESEARCH QUESTIONS	159
6.3 SUMMARY OF KEY RESEARCH FINDINGS	161
6.4 OVERALL CONTRIBUTIONS OF THE RESEARCH PROJECT	163
6.4.1 THEORETICAL CONTRIBUTIONS	164
6.4.2 PRACTICAL CONTRIBUTIONS	165
6.5 RESEARCH VALIDATION	167
6.6 RESEARCH LIMITATIONS.....	169
6.7 FUTURE RESEARCH DIRECTIONS	170
6.8 CONCLUDING REMARKS	172
REFERENCES.....	173
APPENDICES.....	193
APPENDIX A – INFORMATION STATEMENTS.....	193
APPENDIX B – CONSENT FORM.....	197
APPENDIX C – A SUMMARY OF STUDIES INCLUDED IN THE LITERATURE REVIEW	198
APPENDIX D – INTERVIEW GUIDE USED FOR THE SEMI-STRUCTURED INTERVIEWS IN CHAPTER 4	204
APPENDIX E – SAMPLE SURVEY/QUESTIONNAIRE USED IN CHAPTER 5	206
APPENDIX F – FURTHER RESULTS OF CONSTRUCTS INCLUDED IN CHAPTER 5	208
APPENDIX G – PARTICIPANTS INVITATION EMAIL (CHAPTERS 4 AND 5)	216
APPENDIX H – WRITTEN PERMISSION TO USE IMAGE IN CHAPTER 4	217
APPENDIX I – INTERVIEW GUIDE USED FOR THE INTERVIEWS AND WORKSHOPS IN CHAPTER 3 ..	218

LIST OF TABLES

Table 2.1 Definitions of constructs and their usage in different interaction types.....	31
Table 2.2 Artefact design for different interaction types.....	33
Table 2.3 Application contexts for different interaction types.....	36
Table 2.4 Summary of findings from the literature review	49
Table 3.1 Summary of design requirements.....	64
Table 3.2 Summary of our design principles.....	69
Table 4.1 Participants' background information.....	98
Table 4.2 Interviews' summary table	99
Table 4.3 Examples of our coding.....	102
Table 4.4 A summary of design guidelines for avatars for users from Arab culture	116
Table 5.1 Avatars used in the study.....	136
Table 5.2 Participants' distribution across avatar treatments	137
Table 5.3 Participants' demographic information	138
Table 5.4 Constructs dimensions (items)	139
Table 5.5 Self-assessment of culture and manipulation checks	140
Table 5.6 A regression summary of avatars' cultural appropriateness perception.....	143
Table 5.7 Items' loadings	144
Table 5.8 Construct descriptive, reliability measures, and correlations (n = 313).....	145
Table 5.9 Discriminant validity (Heterotrait–Monotrait Ratio; HTMT).....	145
Table 5.10 The outcomes of the multi-group analysis	147
Table 5.11 Themes, codes, and their frequencies.....	149
Table 5.12 Selection popularity of the 12 different avatars (ordered by selection frequency)	150
Table 5.13 Avatar selection based on participant gender.....	151
Table C.1 Experimental studies on avatars and embodied agents in IS literature.....	198
Table F.1 Female and male participants perception of avatar for respective constructs.....	212
Table F.2 Participants' perceptions of avatars	213
Table F.3 Path coefficient between male and female participants	214
Table F.4 Path coefficient between female and male avatars.....	214
Table F.5 Path coefficient between users having same or different gender to the avatar	215
Table F.6 Path coefficient between avatars with medical and non-medical clothing	215

LIST OF FIGURES

Figure 1.1 Overview of thesis structure	20
Figure 2.1 Stages of the SLR (left) and the distribution of studies (right)	28
Figure 2.2 Conceptual framework of digital representations and their interactions	30
Figure 2.3 Distribution of laboratory and field experiments	35
Figure 3.1 Illustration of the co-design process used in developing the prototype	68
Figure 3.2 Empathic avatars developed for animation from the <i>early prototype</i>	75
Figure 3.3 A screenshot of the <i>early prototype</i> with the avatar animated into a sequence	75
Figure 3.4 Selection of exercises in the <i>full prototype</i>	77
Figure 3.5 Instructions provided for a typical rehabilitation exercise in the <i>full prototype</i>	77
Figure 3.6 Illustration of the implementation process of the commercial app	78
Figure 3.7 Mapping design principles with design requirements	80
Figure 4.1 An example of a male avatar used in social media by Arab users (the image is used with permission from the Saudi Students Club in London; see Appendix H)	89
Figure 4.2 An integrative theoretical framework for designing avatars in Arab culture	103
Figure 4.3 Design guidelines	108
Figure 4.4 Mapping of theoretical propositions and design guidelines	117
Figure 5.1 Research model	132
Figure 5.2 Cultural appropriateness across avatar culture, gender, and clothing	142
Figure 5.3 Female and male participants' perception of cultural appropriateness of avatar culture	142
Figure 5.4 Structural model results (n = 313)	145
Figure 5.5 Participants' usage intentions across avatar culture, gender, and clothing	146
Figure F.1 Trust across avatar culture, gender, and clothing	208
Figure F.2 Female and male participants' perception of trust of avatar culture	208
Figure F.3 Familiarity across avatar culture, gender, and clothing	209
Figure F.4 Female and male participants' perception of familiarity of avatar culture	209
Figure F.5 Anthropomorphism across avatar culture, gender, and clothing	210
Figure F.6 Female and male participants' perception of anthropomorphism of avatar culture	210
Figure F.7 Social presence across avatar culture, gender, and clothing	211
Figure F.8 Female and male participants' perception of social presence of avatar culture ..	211

LIST OF ABBREVIATIONS

ABBREVIATION	DESCRIPTION
ACE	Arab Culture Expert
AGFI	Adjusted Goodness of Fit Index
ANTH	Perceived Anthropomorphism
AVE	Average Extracted Variance
CA	Perceived Cultural Appropriateness
CASA	Computers are Social Actors
CB-SEM	Covariance-Based Structural Equation Modelling
CFI	Comparative Fit Index
CR	Composite reliability
FAM	Perceived Familiarity
H2A	Human to Avatar Interaction
H2EA	Human to Embodied Agent Interaction
H2SA	Human to Self-Avatar Interaction
HCI	Human–Computer Interaction
HCIS	Human-Centred Information System
HTMT	Heterotrait–Monotrait Ratio
IS	Information System
IT	Information Technology
ITU	Intention to Use
KSA	Kingdom of Saudi Arabia
mHealth	Mobile Health
NCD	Non-Communicable Disease
NIH	National Institutes of Health
PSP	Perceived Social Presence
PSY	Psychologist
RMSEA	Root Mean Square Error of Approximation
RT	Representation Theory
SA2A	Self-Avatar to Avatar Interaction
SA2EA	Self-Avatar to Embodied Agent Interaction
SEM	Structural Equation Modelling
SLR	Systematic Literature Review
SRMR	Standardised Root Mean Square Residual
SRT	Social Response Theory
TLI	Tucker Lewis Index
TRT	Trust
UI	User Interface
WHF	World Heart Federation
WHO	World Health Organisation
α	Cronbach or Alpha Coefficient