

Digital Skills and Accessible Technology: Two Perspectives on Digital Engagement and Their Relations to Psychosocial Outcomes

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Summary

This thesis investigates the influence of technology on social wellbeing. The first section addresses the role of digital skills, which constitute the most robust predictor of digital engagement and a common barrier to digital inclusion. Chapter 2 presents a structural equation model developed using a large, general population sample, demonstrating that digital skills significantly predict psychosocial wellbeing outcomes, with notable variations by age and gender. However, the chapter is limited by its reliance on a digitally recruited sample. To overcome this limitation, Chapter 3 largely replicates the model using a digitally excluded cohort of older adults residing in social housing, a demographic frequently targeted by digital inclusion initiatives. This reinforces the association between digital skills and psychosocial wellbeing.

The second section narrows the focus to the role of smart speakers as an example of accessibly designed, socially interactive technology. Chapter 4 provides a scoping review of existing literature on smart speakers as social companions, from which a model of parasocial relationship development is proposed. In response to concerns regarding the methodological quality of the reviewed studies, Chapter 5 presents findings from an open-ended survey capturing users' experiences and perceptions of smart speakers. The results underscore the disproportionate benefits for specific groups, particularly older adults and individuals with limited digital skills. This chapter highlights the dual social functions such technologies can serve: facilitating interpersonal connections and providing a source of social interaction in their own right.

Together, these two sections reflect the predominant strategies for addressing the digital divide. Section 1 conceptualizes digital skills as both a key predictor and barrier to engagement, whereas Section 2 underscores the potential of accessible technologies to enable engagement irrespective of skill level. Collectively, the findings contribute to the development of equitable, evidence-based approaches to enhancing digital access and its associated psychosocial benefits.

Contents

Declaration.....	Error! Bookmark not defined.
Summary	i
Contents	ii
List of Tables	vii
List of Figures.....	ix
Acknowledgements.....	x
Chapter 1. General Introduction.....	1
1.1. Background	1
1.2. Thesis Overview	3
1.2.1. Research Objectives	3
1.2.2. Significance of the research	4
1.2.3. Thesis structure.....	4
1.3. Literature Review	7
1.3.1. The Digital Divide	7
1.3.2 Human-Computer Interactions	20
1.3.3. Smart Speakers	34
1.3.4. Summary	38
Chapter 2. The Mediated Effect of Digital Skills on Psychosocial Outcomes: A Relationship with Age, Gender, and Education	39
2.1. Introduction.....	39
2.1.1. Background	39
2.1.2. Examining the Relationship Between Digital Inclusion and Psychosocial Outcomes	41
2.1.3. This Chapter	44
2.2. Methods	47
2.2.1. Participants.....	47
2.2.2. Measures	49
2.2.3. Design.....	54
2.2.4. Procedure	54
2.2.5. Structural Equation Modelling Procedure.....	54
2.3. Study 1 Results	55
2.3.1. Descriptive Statistics	55
2.3.2. Model Development	57
2.3.3. Final Model	62
2.4. Study 1 Discussion.....	68

2.4.1. Overview	68
2.4.2. Evaluation of Findings	68
2.4.3. Summary	71
2.5. Study 2 Results	72
2.5.1. Single Variable Comparisons	72
2.5.2. Intersectional Analyses.....	81
2.6. Study 2 Discussion.....	88
2.6.1. Overview	88
2.6.2. Evaluation of Findings	88
2.6.3. Summary	90
2.7. General Discussion.....	91
2.7.1. Overview	91
2.7.2. Evaluation of the Research.....	92
2.7.3. Limitations and Future Directions.....	93
2.7.4. Conclusion.....	94
Chapter 3. Replicating the Mediated Effect of Digital Skills on Psychosocial Outcomes: A Digitally Excluded Sample of Older Adults in Social Housing.....	96
3.1. Introduction.....	96
3.1.1. Background.....	96
3.1.2. This Chapter	97
3.2. Methods	100
3.2.1. Participants.....	100
3.2.2. Measures	102
3.2.3. Design.....	106
3.2.4. Procedure	106
3.2.5. Structural Equation Modelling Analysis.....	107
3.3. Results	108
3.3.1. Descriptive Statistics	108
3.3.2. Model Fit Assessment.....	110
3.3.3. Interpretation of the Structural Equation Model	116
3.4. Discussion.....	119
3.4.1. Overview	119
3.4.2. Evaluation of Findings	120
3.4.3. Implications	121
3.4.4. Limitations and Future Research.....	122
3.4.5. Conclusion.....	124

Chapter 4. “Alexa, What Do You Mean to Me?”: A Scoping Review and Model of Parasocial Relationship Formation with Smart Speakers.....	125
4.1. Introduction.....	125
4.1.1. Background.....	125
4.1.2. Anthropomorphism	126
4.1.3. Computers are Social Actors (CASA) Paradigm	126
4.1.4. Parasocial Relationships.....	127
4.1.5. This Chapter.....	128
4.2. Methods	129
4.2.1. Protocol	129
4.2.2. Sources of Information	129
4.2.3. Study Identification	135
4.3. Results	153
4.3.1. RQ1: What outcomes arise from forming a relationship with a smart speaker?	159
4.3.2. RQ2: What user attributes have been reported in association with forming relationships with smart speakers?.....	167
4.3.3. RQ3: What methodological approaches have been used to research relationship development with smart speakers? What are the merits and drawbacks of these approaches?.....	169
4.4. Discussion.....	172
4.4.1. Development of Parasocial Relationships with Smart Speakers	174
4.4.2. Limitations	179
4.4.3. Recommendations for Future Research	180
4.4.4. Conclusion.....	182
Chapter 5. Smart Speaker Users: Who and Why? An Open-Ended, Data-Driven Content Analysis and Validation of Users Experiences	183
5.1. Introduction.....	183
5.1.1. Background.....	183
5.1.2. Existing Literature	184
5.1.3. This Chapter	188
5.2. Study 1 Methods	189
5.2.1. Participants.....	189
5.2.2. Measures	190
5.2.3. Procedure	190
5.2.4. Analysis	190
5.3. Study 1 Results	191
5.3.1. RQ1: Group Traits and Differential Experiences	192

5.3.2. RQ2: Benefits	198
5.3.3. RQ3: Limitations.....	202
5.4. Study 1 Discussion.....	217
5.4.1. Overview	217
5.4.2. Evaluation of Findings	217
5.4.3. Summary	220
5.5. Study 2 Methods	221
5.5.1. Participants.....	221
5.5.2. Measures	221
5.5.3. Procedure	223
5.5.4. Analysis	223
5.6. Study 2 Results	224
5.6.1. Descriptive Statistics	224
5.6.2. RQ1: Group Traits and Differential Experience.....	225
5.6.3. RQ2: Benefits	230
5.6.4. RQ3: Limitations.....	395
5.7. Study 2 Discussion.....	399
5.7.1. Overview	399
5.7.2. Evaluation of the Findings	400
5.7.3. Summary	405
5.8. General Discussion	406
5.8.1. Overview	406
5.8.2. Examination of the Research.....	407
5.8.3. Limitations and Future Research.....	408
5.8.4. Conclusion.....	409
Chapter 6. General Discussion.....	411
6.1. Summary.....	411
6.1.1. Chapter 2: The Mediated Effect of Digital Skills on Psychosocial Outcomes: A Relationship with Age, Gender, and Education	412
6.1.2. Chapter 3: Replicating the Mediated Effect of Digital Skills on Psychosocial Outcomes: A Digitally Excluded Sample of Older Adults in Social Housing	413
6.1.3. Section 1 Summary	413
6.1.4. Chapter 4: “Alexa, what do you mean to me?”: A scoping review and model of parasocial relationship formation with smart speakers.....	414
6.1.5. Chapter 5: Smart Speaker Users: Who and Why? An Open-Ended, Data-Driven Content Analysis and Validation of Users Experiences.....	415
6.1.6. Section 2 Summary	416

6.2. Evaluation of the Main Findings	417
6.2.1. Digital Skills.....	418
6.2.2. Accessible technology	420
6.2.3. Digital Technology and Loneliness.....	422
6.3. Theoretical Implications.....	425
6.4. Limitations and Future Research	427
6.5. Conclusion.....	429
References	430
Appendices	455
Appendix A: Information sheet, consent form, and survey tools administered to all HWW participants.....	455
Appendix B: Single Variable Comparison of Age	491
Appendix C: Single Variable Comparison of Gender	495
Appendix D: Single Variable Comparison of Education with Automatic Weighting for All Latent Variables.....	501
Appendix E: Single Variable Comparison of Education with an Equal Weighting of Wellbeing	502
Appendix F: Information and Consent Form for the Housing Association Study	508
Appendix G: Interview Schedule for the Housing Association Study	512
Appendix H: Database Search Terms for Scoping Review	513
Appendix I: Coding of the qualitative survey responses as part of the content analysis	516
Appendix J: Initial Factor Analysis of All Terms Relating to Social Benefit	673

List of Tables

Table 1. Areas of inequality that influence the digital divide are summarised from the literature by van Dijk, 2006.	9
Table 2. <i>The eight key hypotheses for this study.</i>	47
Table 3. <i>Demographic information of the 3512 participants involved in the study.</i>	48
Table 4. <i>Constructs involved in the SEM and their indicator variables, along with descriptions of each variable and scoring information.</i>	51
Table 5. <i>Descriptive statistics of the constructs used in the SEM and their subscales.</i>	56
Table 6. <i>Matrix of Spearman's Rho correlation coefficients amongst the four key variables represented in the SEM.</i>	57
Table 7. <i>Assessment of the created construct and variable reliability, validity, and unidimensionality, indicating appropriateness of the model.</i>	59
Table 8. <i>Matrix of collinearity (VIF) and discriminant validity (HTMT) between the constructs in the SEM.</i>	61
Table 9. <i>Indicator variables iteratively removed.</i>	62
Table 10. <i>Assessment of the created construct and variable reliability, validity, and unidimensionality, indicating appropriateness of the final model.</i>	64
Table 11. <i>Matrix of collinearity (VIF) and discriminant validity (HTMT) between the constructs in the SEM.</i>	66
Table 12. <i>A summary of the outcomes of the structural equation model and their relationship to the key hypotheses.</i>	66
Table 13. <i>A summary of the differences between the path coefficients and specific indirect effect of the structural equation model in relation to the first seven hypotheses for the Younger and Older groups.</i>	77
Table 14. <i>A summary of the differences between the path coefficients and specific indirect effect of the structural equation model in relation to the first seven hypotheses for the Men and Women groups.</i>	79
Table 15. <i>A summary of the differences between the path coefficients and specific indirect effect of the structural equation model in relation to the first seven hypotheses for the School and University education groups.</i>	80
Table 16. <i>A summary of the differences between the path coefficients and specific indirect effect of the structural equation model in relation to the first seven hypotheses for the four groups representing the intersection of age and gender.</i>	83
Table 17. <i>A summary of the differences between the path coefficients and specific indirect effect of the structural equation model in relation to the first seven hypotheses for the four groups representing the intersection of age and education.</i>	85
Table 18. <i>A summary of the differences between the path coefficients and specific indirect effect of the structural equation model in relation to the first seven hypotheses for the four groups representing the intersection of gender and education.</i>	87
Table 19. <i>The seven key hypotheses for Chapter 3.</i>	99
Table 20. <i>Demographic information of the 100 participants involved in the study.</i>	101
Table 21. <i>Constructs involved in the SEM and their indicator variables, along with descriptions of each variable and scoring information.</i>	104
Table 22. <i>Descriptive statistics of the constructs used in the SEM and their subscales.</i>	109
Table 23. <i>Matrix of Spearman's Rho correlation coefficients amongst the four key variables represented in the SEM.</i>	110
Table 24. <i>Assessment of created construct and variable reliability, validity, and unidimensionality, indicating appropriateness of the SEM.</i>	113
Table 25. <i>Matrix of collinearity (VIF) and discriminant validity (HTMT) between the constructs in the SEM.</i>	115

Table 26. <i>A summary of the outcomes of the structural equation model and their relationship to the key hypotheses.</i>	117
Table 27. <i>Summary of the 30 papers included in this scoping review (step 17 of the PRISMA-ScR: Results of individual sources of evidence (Tricco et al., 2018).</i>	138
Table 28. <i>A brief summary of the findings of the scoping review in relation to the three research questions, in line with step 18 of the PRISMA-ScR (Tricco et al., 2018).</i>	154
Table 29. <i>Descriptive statistics of the 1306 smart speaker owners who completed the HealthWise Wales survey</i>	189
Table 30. <i>Descriptive statistics of the variables explored in Study 2, including relevant subscales.</i>	225
Table 31. <i>Predicting ownership of smart speakers based on quantitative versions of the groups/traits identified from the content analysis in response to RQ1 from Study 1.</i>	228
Table 32. <i>The 11 predictor variables and their odds ratios associated with the dependent variable of smart speaker ownership.</i>	230
Table 33. <i>Descriptions of the quantitative variables relating to social benefits.</i>	389
Table 34. <i>Correlation Matrix conducted between the variables related to social benefit, reflecting the themes identified in RQ2 of Study 1, as a precursor to factor analysis.</i>	390
Table 35. <i>Parallel analysis and the Eigenvalues from the simulated correlations in comparison to the Eigenvalues of the raw data.</i>	391
Table 36. <i>Summary of the two factors produced through principal axis factoring.</i>	392
Table 37. <i>Pattern Matrix for the Factors Created from Social Benefit-Related Items.</i>	393
Table 38. <i>Multiple regression results for offering intrinsic social benefit.</i>	395
Table 39. <i>Descriptions of the quantitative variables relating to privacy concerns.</i>	396
Table 40. <i>Correlation Matrix conducted between the variables hypothesised to related to privacy, reflecting the themes identified in RQ3 of Study 1, as a precursor to factor analysis.</i>	397
Table 41. <i>Parallel analysis and the Eigenvalues from the simulated correlations in comparison to the Eigenvalues of the raw data.</i>	398
Table 42. <i>Factor matrix for the Factors Created from Privacy Related Items.</i>	399

List of Figures

Figure 1. <i>Hypothesised model labelled with hypothesised pathways 1-6.</i>	46
Figure 2. <i>The proposed SEM being assessed for fit, reliability, and validity.</i>	58
Figure 3. <i>The pathways and loadings of the final structural equation model.</i>	67
Figure 4. <i>Differences in the loadings and pathways of the structural equation model between the Younger and Older groups.</i>	76
Figure 5. <i>Hypothesised model labelled with hypothesised pathways 1-6.</i>	99
Figure 6. <i>The proposed SEM being assessed for fit, reliability, and validity.</i>	112
Figure 7. <i>A structural equation model reflecting the key hypotheses, linking digital skills to isolation, loneliness and wellbeing.</i>	118
Figure 8. <i>Study selection process based on PRISMA guidelines for scoping reviews (Page et al., 2021). This constitutes stage 14 (selection of sources of evidence) from the PRISMA-ScR (Tricco et al., 2018).</i>	137
Figure 9. <i>A thematic map of the themes and subthemes identified as outcomes arising from interactions with smart speakers.</i>	160
Figure 10. <i>Frequency of relationship classifications ascribed to smart speakers, identified through the literature in this scoping review.</i>	161
Figure 11. <i>The range and frequency of methods used in the 30 studies included in this scoping review.</i>	170
Figure 12. <i>The proposed ASAP Pathway (Anthropomorphic – Social Agent – Parasocial Pathway) based on research with smart speakers and broader parasocial literature, including moderating factors and outcomes.</i>	173
Figure 13. <i>The frequencies of top-level themes identified through content analysis of the 1243 responses to the open-ended question.</i>	192
Figure 14. <i>The frequencies of themes and subthemes identified through content analysis relating to the first research question; traits that are relevant to smart speaker ownership and users' differential experiences.</i>	193
Figure 15. <i>The frequencies of themes and subthemes identified through content analysis relating to the second research question; the benefits that users report experiencing.</i>	199
Figure 16. <i>The frequencies of themes and subthemes identified through content analysis relating to the third research question; the limitations that users experience and how it impacts them. The charts represent Frustrations, Fears and Barriers, respectively.</i>	203
Figure 17. <i>Scree plot showing the Eigenvalues of proposed components arising from principal component analysis.</i>	391
Figure 18. <i>Scree plot showing the Eigenvalues of proposed components arising from principal component analysis.</i>	398

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Chapter 1. General Introduction

1.1. Background

In an increasingly digital world, digital aptitude and technology use are becoming more important for all aspects of life. Increasing international mobility, leisure and entertainment trends, and changing patterns within education and employment emphasise the increasing integration of technology into all aspects of modern life (Sparks, 2013). Digitisation offers the opportunity to stay connected to social networks (Genoe et al., 2018; Hill et al., 2015), maintain and develop independence (Karavidas et al., 2005), and search for critical information (Heart & Kalderon, 2013). For many, the nature of the internet and digital technology overcomes the constraints of both time and space (Mellor et al., 2008), thereby allowing individuals to access support and resources that they may otherwise be excluded from. Therefore, digital engagement can facilitate a wide range benefits.

The practical benefits of digital engagement range from educational access to economic benefits. For example, digital access provides children with convenient ways to complete their schoolwork and allows parents the flexibility to engage with education and training (Yelland & Neal, 2013). Further, being able to shop and pay bills online allows consumers to compare vendors and prices and is associated with a household saving of up to £1500 per year (Elliott, 2023). Similarly, financial benefits are possible for businesses, as moving in-person services online can save £3-£12 per transaction (Bradshaw, 2011). Additionally, technology can offer social benefits. Individuals can engage in a greater diversity of interactions than could be afforded in person as people around the world can be reached digitally (Wellman et al., 2003). Further, geographical boundaries can be overcome to stay in contact with dispersed loved ones (Neves, Franz, et al., 2019). This is afforded through asynchronous and synchronous online activities, such as Facebook posts and Skype calls respectively. Asynchronous online activities are particularly beneficial in overcoming time and space to maintain social connections (Nimrod & Adoni, 2012), as they remove the issue of time zones that may hinder synchronous communication. In this way, digital engagement can afford a host of practical and social benefits.

There is also evidence to suggest that engaging with digital technology may particularly benefit certain subgroups. For example, a wealth of research focuses on the digital engagement of older adults (generally considered to be those over 65) and associated outcomes. This is possibly due to the extreme heterogeneity of technology use amongst this age group; 31% of older adults do not use the internet at home compared to only 4% of 25–34-year-olds (Ofcom, 2023). This is thought to be heavily influenced by older adults' previous employment, personal motivation, and knowledge of technology, all of which can vary greatly (Lee & Coughlin, 2015). Generally, older adults who frequently access the internet show a more positive outlook on life and greater satisfaction (Vroman et al., 2015). This may arise from increased practical benefits, such as the ability to seek health information, order medication, or communicate with medical professionals online (Hong & Cho, 2017). Alternatively, the positive effects of digital engagement may arise from increased social opportunities. For example, a study focusing on Romanian and Canadian grandmothers found that their use of Facebook helped them to feel more engaged in their children's and grandchildren's lives, particularly when their families lived far away and frequent face-to-face contact was impractical (Ivan & Hebblethwaite, 2016). Similarly, emailing family was the most common online activity amongst the older adults surveyed by Vroman et al. (2015). Collectively, this evidence shows that technology use may be associated with positive outcomes for some older adults.

However, while the majority of the research focusses on digital engagement as a facilitator for positive outcomes, there is a small body of research suggesting that the relationship between digital use and positive outcomes may be bidirectional; older adults who are more engaged with their families or experience better health, for example, may be more likely to pursue digital engagement. Many studies emphasise the importance of family members in promoting initial adoption of digital technology and supporting the skill acquisition that underpins sustained engagement for older adults (Chang et al., 2015; Chopik, 2016; Fischl et al., 2017; Wang et al., 2011). Similarly, older adults who are more impaired as a result of disabilities are less likely to be digitally engaged (Heponiemi et al., 2023). Other factors, such as self-esteem or self-efficacy and curiosity can also significantly predict digital engagement and technology usage

(Lund, 2021; Wilson et al., 2023). This body of evidence suggests that, in addition to digital engagement promoting positive outcomes for older adults, pre-existing protective factors such as familial engagement, health, self-efficacy, etc. may also positively predict digital engagement. This suggests there is a bidirectional nature to the relationships between digital engagement and some relevant factors.

Societies' march of progress and drive to streamline and automate all possible aspects of life underpin the transition to an increasingly digital world. We see communication, education, and services move online to minimise costs, increase access, and expand individuals' options. As more of our lives move online to capitalise on the benefits and affordances that digitisation brings, digital engagement increasingly becomes a necessity and an assumption. As with all societal transitions, this creates a divide between the (digital) haves and have-nots. This represents the digital divide.

1.2. Thesis Overview

This thesis focusses on the digital divide and the role of technology in loneliness. Current approaches to tackling the digital divide tend to focus on digital skills, as this has been evidenced as the strongest predictor of digital engagement and effective digital interventions (Dogruel et al., 2015; Martins Van Jaarsveld, 2020). This leads to two perspectives: focussing on the digital upskilling of the user as the barrier to engagement, or the use of accessibly designed technology that has intentionally lower barriers to engagement. In line with this, this thesis will reflect both perspectives to better understand the benefits associated with digital engagement. A further focus of this thesis is the role of technology in loneliness. The relationship between digital skills and loneliness will be directly examined, as will the potential of smart speakers as a social agent in relation to loneliness.

1.2.1. Research Objectives

The aims and objectives of this thesis are as follows:

1. To produce a model reflecting the relationship between digital skills, isolation, loneliness and wellbeing.

2. To investigate potential differences in this model based on relevant demographic factors.
3. To test the applicability of this model amongst digitally excluded older adults living in social housing.
4. To review the literature on the social benefit of smart speakers.
5. To provide a holistic, data-driven overview of factors that influence smart speaker use and the outcomes arise from this.

1.2.2. Significance of the research

This research aimed to understand the relationship between two major societal problems: digital exclusion and loneliness. Firstly, by exploring how digital engagement is related to psychosocial outcomes amongst different populations, particularly populations at risk of digital exclusion and/or loneliness, it can support the development of evidence-informed targeted interventions to improve quality of life for at-risk individuals. Secondly, by scrutinising the role of smart speakers as an example of affordable, accessible technology that is already being used as an intervention for loneliness, this research may make suggestions to improve these interventions. This may be in terms of who may benefit, how they benefit, and what barriers they face that will need to be considered to facilitate engagement.

1.2.3. Thesis structure

Section 1

Digital skills are the most robust predictor of digital engagement and associated psychosocial outcomes. They are also a common barrier to digital inclusion that is targeted by variety of interventions. Section 1 reflects this by focussing on the capacity of digital skills to predict psychosocial outcomes of isolation, loneliness, and wellbeing.

Chapter 2

This chapter contains two studies, addressing the first and second objectives respectively. Study 1 develops a structural equation model linking digital skills to wellbeing via the mediators of isolation and loneliness. Study 2 then investigates differences in this model based on the demographic variables of age, gender, and educational experience. Through all of these analyses, the robustness of the model is emphasised. However, the study is limited by compromising data collection method (i.e. an online survey) for the sample size required for sufficiently powered analyses.

Chapter 3

This chapter addresses the third research objective by replicating the model presented in Chapter 2 with the data from digitally excluded older adults living in social housing. These data were gathered through analogue sampling, avoiding the sampling bias issues present in Chapter 2 and providing an examination of a sample at high risk of digital and social exclusion. The replication of the model's pathways from Chapter 2, again, supports the robustness of the model.

Section 2

This section narrows the focus substantially from the research focus on digital skills as a broad entity in section 1. Section 2 centres on interactions with smart speakers as an example of accessibly designed and socially interactive technology. While Section 1 reflects the view that digital skills perpetuate the digital divide and should be the key focus of related interventions, Section 2 reflects the view that accessibly designed technology can enable digital engagement regardless of skills level and therefore this should be the focus of digital divide interventions.

Chapter 4

This chapter begins to focus on the social benefit of technology to address the psychosocial issues of isolation and loneliness by conducting a scoping review on the topic of social benefit from smart speakers. This addresses the fourth objective. Smart speakers were selected as an accessible and increasingly ubiquitous form of mainstream technology that has been shown to have pro-social potential. User features associated with socially benefitting from their smart speakers and the outcomes of the relationships formed are discussed. Additionally, a pathway is suggested for the development of parasocial relationships with smart speakers based on the reviewed literature. Issues around the methodological rigour of the literature base are raised.

Chapter 5

This final empirical chapter contains two studies drawing from the same dataset as Chapter 2, collectively addressing the 5th objective of the thesis and overcoming the methodological issues identified by Chapter 4. Study 1 conducts a content analysis of smart speaker users' responses to an open-ended question asking how they feel about their smart speaker. A discussion of the personal factors, benefits, and limitations that arose from the content analysis are presented. In Study 2, various quantitative analyses are conducted to validate the key findings from the content analysis.

Chapter 6

The final section of this thesis presents a summary and discussion of the key findings from Chapters 2-5. The findings are presented against the backdrop of the two approaches to tackling the issue of insufficient digital skills (digital upskilling and accessible technology) and the two ways that technology can reduce loneliness (facilitating connection with other humans and offering a social presence directly). Theoretical implications of these findings are discussed. Finally, the limitations of this thesis are acknowledged and future research to overcome these issues are suggested.

1.3. Literature Review

1.3.1. The Digital Divide

Despite the previously discussed potential benefits arising from digital participation, digital engagement is not easily achievable for all members of society. When we acknowledge the distinction between the digital haves and have-nots, we are acknowledging the existence of the digital divide. The digital divide reflects differences across many axes, ultimately culminating in an individual's ability to access and engage with digital technology. The digital divide arises from the assumption that digital access is ubiquitous, despite clear, contrary data; the most recent figures show that 92% of UK adults use the internet at home (Ofcom, 2023), implicitly reflecting over 4 million individuals who do not have internet access at home and are at risk of digital exclusion. For some of these 4 million individuals, internet non-use is a choice. However, digital skills, digital access, and financial status may have forced others into a state of digital exclusion.

Historically, the digital divide was conceptualised in the late 1990s to reflect differences in access to new media, replacing terms such as 'digital literacy' and 'information inequality' (van Dijk, 2006). Originally, the digital divide encapsulated only a binary distinction of access to the internet and related ICT (van Dijk, 2006). This implied a level of technological determinism; an absolute, rather than relative, digital divide that is static, vast, and difficult to overcome (van Dijk, 2006). Since the conception of the term, academic, sociological, and political focus have been applied to better understand the digital divide, in terms of factors influencing it and outcomes arising from it (Philip et al., 2017).

As such, in recent years the term 'digital divide' has developed to encompass a multitude of issues that are more complex and nuanced than simple presence or absence of an internet connection. Individuals' digital skills, reflecting their ability to effectively engage with ICT, and motivation are now considered key components of the digital divide (Sparks, 2013). These additional aspects of the digital divide have become increasingly important in recent years (Helsper & Reisdorf, 2017) as technology becomes more complex and varied. Van Dijk (2006) conducted a literature review to summarise the key areas of inequality that had been discussed in the literature on the

digital divide (see Table 1 for an adaptation of this). Additionally, common demographic factors have consistently been found to relate to the digital divide, with gender, ethnicity, urbanicity, health, age, education and income all influencing the likelihood of being digitally engaged (Bradshaw, 2011; Hong & Cho, 2017; Singh et al., 2020). By viewing an individual's digital engagement as a complex culmination of these demographic factors and inequalities, we begin to understand the digital divide, not as the binary it originally reflected, but as a graduated scale or continuum. This is particularly well reflected by research that stratifies digital users; rather than considering a binary separation between the 92% of UK adults who use the internet, and the 8% who do not, this 92% can be meaningfully divided. Ofcom suggest that this population could be divided into "narrow", "medium", and "broad" to reflect the range of internet activities that they are able to engage in, with roughly a third of internet users falling into each category (Ofcom, 2023). When considering digital engagement, it would be erroneous to assume that narrow users are equally digitally engaged as broad users, and therefore it would be expected that they show differential benefits from their engagement.

For these reasons, despite the term 'digital divide' implying a fixed and binary separation between the technological haves and have-nots, and indeed originally conceptualising this binary, viewing digital engagement as a spectrum may be more accurate (Sparks, 2013). The highly digitally included end of the spectrum would constitute possessing the most recent technology, access to high-speed internet, and having the skills to complete any desired digital task. Conversely, the highly digitally excluded end of the spectrum would involve owning no digital technology, not having access to an internet connection, not having the skills to interact with digital technology, and not having the means to remedy any of these issues. Most individuals will fall somewhere between these two extremes on the spectrum. Each individual has varying experiences of inequalities (see Table 1). For example, the quantity and quality of social connections determines the social position and power or influence that one holds in the community, and the social activities that are available for them to participate in. Collectively, these social inequalities can influence an individual's experience of the digital divide (van Dijk, 2006). Additionally, demographic factors, digital skills, and access to technology

influence where an individual falls between the two extremes of complete digital exclusion and inclusion. As such, it is more accurate to think of the digital divide as a series of gaps, influenced by many factors coming together (Organisation for Economic Co-Operation and Development, 2000). This is better able to reflect the true heterogeneity of digital access and engagement present in society.

Table 1. *Areas of inequality that influence the digital divide are summarised from the literature by van Dijk, 2006.*

Domain	Inequality
Technological	Technological Opportunities
Immaterial	Life Chances Freedom
Material	Capital (economic, social, cultural) Resources
Social	Positions Power Participation
Educational	Capabilities Skills

Note: adapted from van Dijk, 2006, p.3.

1.3.1.1 Digital Exclusion

Digital exclusion is a state of being disconnected from ICT and, therefore, disengaged and unable to access the associated benefits (Genoe et al., 2018). Previous research has defined it as when “a discrete sector of the population suffers significant and possibly indefinite lags in its adoption of ICT through circumstances beyond its immediate control” (Warren, 2007, p. 375). As alluded to by this definition, a distinction must be made between volitional digital non-use and digital exclusion. Non-use reflects an individual's choice not to engage with ICT, often due to not perceiving a need to engage, perceiving technology as dangerous, or simple preference not to engage (van Dijk, 2006). Conversely, digital exclusion reflects an inability to engage with ICT due to circumstances beyond individuals' control. This becomes an issue and can be compounded society's expectation of ubiquitous engagement with ICT, thereby excluding and disadvantaging those who cannot meet this societal expectation. Digital non-use reflects a personal choice, whereas digital exclusion reflects societal and

structural issues producing personal consequences. While the number of digitally excluded individuals in society continues to fall, this population is becoming increasingly concentrated within the most vulnerable groups of society (Helsper & Reisdorf, 2017). Research shows that short experience with formal education is the strongest predictor of digital exclusion, followed by older age and social isolation (Helsper & Reisdorf, 2017). These compounding social disadvantages provoke fears for the formation of a 'digital underclass' (Helsper & Reisdorf, 2017). The issues experienced by digitally excluded individuals are pervasive and far-reaching, with potentially severe consequences including, but not limited to, independence, financial freedom, social inclusion, and health. Two recent cases will be examined to exemplify the issues arising from digital exclusion.

In 2022, the UK government's proposals to close almost all of the 1007 ticket offices in English train stations were leaked. This was assumed to be an attempt to cut the running costs of rail services. These proposals faced severe backlash, with an overwhelming 99% of the 750,000 individuals consulted opposing the closures (Topham, 2023). Much of the concerns centred on disabled and digitally excluded individuals, who may struggle if in-person services at train stations were removed in favour of online provisions. Michael Roberts, chief executive for London TravelWatch, voiced concerns that these vulnerable groups may be excluded from buying tickets, getting travel information and advice, and accessing assistance if the ticket offices were to close. This would jeopardise the independence of many individuals who rely on these in-person services. As a result of the backlash, and concerns for digitally excluded groups, the proposal was scrapped in October of 2023 (Topham, 2023). Mick Lynch, general secretary of the National Union of Rail, Maritime and Transport Workers, spoke about the "need for accessibility" when considering service provision and future decision-making (Topham, 2023). This is a positive case highlighting the importance of considering digitally excluded groups and accessibility for all while warning against the assumption of digital ubiquity.

A less positive outcome, however, is seen when examining the case study of bank closures across the UK. Reflecting the rise in popularity of online banking, many UK banks have decided to close an increasing number of local branches, viewing them as

financially untenable; since 2015, over 5500 bank branches have closed (Which? Money Team, 2023). Those from vulnerable groups who are already digitally excluded now face the compounding issue of financial exclusion. Removing local bank branches forces individuals to travel further to a remaining branch, (which may not be a viable option for a variety of reasons), immediately gain the required ICT set-up and skills required to engage with online banking, or lose control of their finances (Age UK, 2023). A survey by Age UK found that over 40% of older adults, do not bank online, reflecting over 4 million UK citizens, with a lack of ICT skills cited as the main reason (Age UK, 2023). As expected, some of the most vulnerable groups are at increased risk of digital exclusion and at a heightened disadvantage from the bank closures. These bank closures seem to be particularly impactful for women over 85 with low income (Age UK, 2023). While Age UK has called for the protection of physical banking to support those who cannot bank online, little action has been seen from UK banks or the government (Age UK, 2023). This represents a loss of independence and financial security for digitally excluded individuals, who are already some of the most vulnerable in society and represents a compounding of inequalities that can be associated with digital exclusion.

Beyond limiting independence and financial security, digital exclusion can be viewed as a factor that is broadening the social divide. Increasingly, digital communication is being used to fulfil social needs, access social support, and facilitate social inclusion (Gabbiadini et al., 2020). This is particularly beneficial for groups that may struggle to achieve regular in-person socialisation, such as older adults (Choi & Dinitto, 2013; Heart & Kalderon, 2013; Karavidas et al., 2005) or individuals with disabilities (Glencross et al., 2021). While these benefits can be tremendously positive for those who can access them, the underlying digital requirements translate the digital divide into a social divide. The European Commission has identified digital engagement as a necessary part of engaging in and maintaining a social life in this digital age (Gabbiadini et al., 2020), reflecting the issues created when an individual is not digitally engaged. Through this lens, digital exclusion is a risk factor for reduced social inclusion and weakening social ties because it facilitates a culture with reduced face-to-face contact and an increasing amount of expected online socialisation (Chen, 2013). Unfortunately, it is the same groups that are likely to socially benefit most from digital engagement that

are at increased risk of digital exclusion. For example, Vicente and López (2010) found that disabled adults were more likely to be digitally excluded than their non-disabled counterparts, even when other demographic factors such as age, socioeconomic status, etc. were controlled for. Similarly, older adults and those living in social housing were at increased risk of digital exclusion compared to their counterparts (Ueno et al., 2023). These are all groups at increased risk of isolation and loneliness that could benefit from online social opportunities. Instead, we see that social exclusion and inequalities can be compounded by the assumptions of ubiquitous digital engagement.

Further, digital exclusion poses a risk to health outcomes. Digital exclusion can be viewed as a social determinant of a range of health issues because it prevents individuals from accessing vital health information or proactively managing their conditions (Warren, 2007). Additionally, the factors associated with digital exclusion, such as older age and lower income, are also associated with poorer health outcomes (Mackenbach et al., 2008; World Health Organisation, 2022), further linking digital exclusion and health. It is perhaps for these reasons that the US counties with the highest levels of digital exclusion show 1.5 times increase in the rate of chronic illnesses, such as obesity and diabetes, compared to the most digitally engaged counties (FCC, 2017). Building from this, digitally excluded individuals can experience a 7-year shorter life expectancy than their digitally engaged counterparts (Singh et al., 2020)

Society creates issues for those who are digitally excluded when an increasing number of resources and services become exclusively digitally accessible (McMellon & Schiffman, 2002). The digitisation of increasing aspects of society acts as a risk factor for reduced independence, financial security, social equity and inclusion, and poorer health outcomes as more tasks and interactions take place online, excluding those who cannot participate in online activities (Chen, 2013; Hill et al., 2015). Further, those who are digitally excluded face an ever-steepening learning curve due to the constantly evolving nature of technology and associated levels of digital skills required to navigate this increasingly digital world (Hill et al., 2015).

1.3.1.2. Closing the Digital Divide

For the reasons discussed above, it is essential to understand the precursors to and effects of digital exclusion, so we may better support vulnerable members of society and prevent the development of a ‘digital underclass’ (Helsper & Reisdorf, 2017). This has become a particular interest of many policymakers in recent years (European Commission, 2010) who seek ways to identify both those at risk of digital exclusion and effective interventions to narrow the digital divide.

Many early interventions to close or narrow the digital divide focus on practical solutions to external factors, such as internet access or financial support to own a device. As part of the latest UK Government Digital Inclusion Strategy in 2014, the UK Government invested over £1 billion in infrastructure improvements to extend the coverage of superfast internet availability (Maude, 2014). Local councils were then, partially, tasked with allocating this fund to where it will be best used. This is often targeted at hard-to-reach groups, such as economically disadvantaged areas and rural communities (Edwards, 2021). Beyond improving internet access, there is a drive to provide free ICT to those who may otherwise struggle to afford it. For example, during the COVID-19 pandemic and amidst school closure, many local councils provided laptops/computers/tablets to children and support to have internet connections in homes without to support children in continuing their learning (Edwards, 2021). While such practical interventions have doubtlessly had a positive impact on many lives, improving internet connectivity or gifting someone a tablet is not a silver bullet that can solve the issue of digital exclusion in isolation. Further, as internet coverage across the UK approaches saturation, the outstanding issues that are still contributing to the digital divide are more insidious, multi-faceted, and difficult to tackle.

This is exemplified by the issue of technology non-use amongst those who have access to technology, and research into the factors underpinning this choice. This has been commonly reported across Africa, following the donation of computers and other technology by charitable organisations hoping to close the digital divide on an international scale (James, 2008). For this group, providing access to technology did not solve the digital divide because it did not target the underlying issue of lacking digital

skills leading to many of the devices stacked in boxes, unused in the corners of classrooms (James, 2008).

Similarly, much European research focusses on older adults. The cut-off age for older adults is generally accepted within practice and psychological literature as 65+ years (Chang et al., 2015; Gitlow, 2014; Mitzner et al., 2010). This age group is likely of particular interest for digital interventions due to having a lower acceptance of technology on average than other age groups (Prescott, 2021) and age related-changes, such as loss of relationships (Khosravi et al., 2016) or reduced mobility (Wang et al., 2011), that may compound disadvantage. Research with this age group consistently finds that lack of digital skills, motivation, and usefulness are the most important factors influencing technology non-use (Dogruel et al., 2015; Martins Van Jaarsveld, 2020), while access to technology is only a minor predictor (Friemel, 2016). From this cross-cultural and cross-age group evidence, we clearly see that access to the internet or technology is not the driving issue and solving this alone will not close the digital divide.

There is promising evidence from interventions aiming to tackle these more nuanced and pervasive issues, such as digital skills and access. These interventions tend to take one of two perspectives towards the digital divide. The first views an individual's digital skills as the main reason for their digital exclusion. While this may be influenced by underlying factors such as income or motivation, it is ultimately a lack of sufficient skills to effectively engage with technology that causes an individual to be digitally excluded. The second perspective lays the blame for the digital divide with the technology companies by arguing that it is the complex design of much modern technology that creates a barrier to engagement. Complex and inaccessible technology requires a high level of digital skills to engage effectively with, and this perspective views this as the heart of the digital divide.

These two perspectives give rise to two complimentary approaches: digital upskilling and training programmes to allow users to overcome the barrier to digital engagement, or innovative technology that is designed to be accessible and lowers the barrier of required digital skills to allow engagement. Digital upskilling programmes comprise skills-training interventions to teach new users how to complete set digital tasks and

support them as they practice. Commonly, such interventions take the form of computer training programmes for groups in community settings, such as retirement homes or community centres, or individuals in their own homes. For example, the Open University of Japan ran a semester-long digital training course for over 1000 adults and found it produced a significant increase in users perceived digital skills and confidence (Miwa et al., 2017). Similarly, a training course consisting of only eight sessions was enough for the older adults participating to report significant improvements in the perceived ease of use, perceived usefulness, and continuance intention (Castilla et al., 2018). Alternatively, Wilson-Menzfeld et al. (2023) led a one-to-one online training scheme to improve digital skills and emphasise the importance of individualised training. From these examples, and many like them, we see that training programmes can be effective for increasing digital skills while facilitating and promoting engagement.

Alternative interventions are based on the premise of lowering the barriers to engagement through accessible design, rather than training potential users to overcome existing barriers. This has been attempted using a variety of technologies. For example, Neves et al. (2019) designed a tablet with an interface that was intended to be simplified and, therefore, accessible to and intuitive for older adults with limited digital skills. They found that the sample was able to use the device, despite all participants previously struggling with digital engagement (to varying extents). Particularly, the tablet was found to be beneficial for facilitating communication with geographically distant family members, with the most isolated members of the sample reporting the greatest benefit, potentially due to having the greatest motivation to succeed, and led to an overall increase in technology confidence. Gutierrez et al. (2017) similarly designed a tablet that could be controlled by simple touch or voice commands and was able to send voice or text messages, send multimedia, and make calls. This was primarily designed for older adults to connect with family members and was found to be well-used and successful in reducing isolation. Beyond tablets, Isaacson et al. (2019) added software and hardware (a webcam and simplified remote control) to participants' television sets. This was designed to facilitate video calls and participation in live classes by offering an intuitive interface and building upon hardware that the

participants were familiar with to reduce the fear of new technology. Adoption levels were high, despite low baseline digital skills, with most participants able to access all of the potential features. These findings highlight that both approaches (digital upskilling and accessible technology) can effectively support digital engagement.

While practical interventions to provide access to the internet and technology are common and often impact large sectors of society, evidence shows that this alone cannot close the digital divide. Further, despite the abundance of research supporting possible other interventions to close the digital divide, such as digital skills training or designing accessible technology, there is a lack of implementation of these suggestions on an equivalent scale (Martins Van Jaarsveld, 2020). As long as we lack effective and large-scale interventions to target the barriers to digital skills, either through effective upskilling or widely implemented accessible technology, the digital divide will continue to deepen.

The continued existence of the digital divide both reflects and contributes to societal issues. The presence and continuation of the digital divide creates a barrier to societal ideals of social inclusion, economic growth, and true sociopolitical equity (Sparks, 2013). Beyond this moral need to offer access and inclusion to all aspects of society, digital exclusion is a key predictor of a range of negative outcomes that impact quality of life and lead to societal costs. This thesis is concerned with the psychosocial outcomes associated with the digital divide, particularly isolation, loneliness, wellbeing and the relationships between these factors.

1.3.1.2.1. Isolation and Loneliness: Two Sides of the Same Coin?

Humans are innately social beings, evolutionarily hardwired with a motivation for social connection as a means to achieve security and safety (Savage & Kanazawa, 2002). This social motivation manifests as three core social needs in modern society: affection, behavioural confirmation and social status (Steverink & Lindenberg, 2006). This reflects the Social Productive Functions Theory, which posits that these are inherent and universal needs that must be fulfilled to achieve a sense of wellbeing (Steverink & Lindenberg, 2006). As such, humans readily form social bonds and strive to maintain these as a way to ensure their social needs are met (Baumeister & Leary, 1995). This can

also be viewed through the lens of the Belongingness Hypothesis, which suggests that the need to belong is a fundamental and intensely motivating desire (Baumeister & Leary, 1995). As such, achieving social connection and a sense of belonging have evolved to be essential for wellbeing.

Through these mechanisms, psychological issues can arise when these fundamental social needs are not met. This can be conceptualised in two ways: lack of social quantity, and lack of social quality. Isolation is defined as an objective lack of social support and connections (Cornwell & Waite, 2009; Gierveld et al., 2009), and reflects an insufficient frequency or quantity of social interactions. In contrast, loneliness is the subjective and troubling feeling of one's social needs going unfulfilled (Perissinotto et al., 2012; Weiss, 1973), reflecting an insufficient quality of social interactions (Neves, Sanders, et al., 2019). There is a volume of evidence to suggest that isolation can influence one's feelings of loneliness (e.g. Cacioppo & Patrick, 2008), however, it is not a perfectly direct relationship (Shiovitz-Ezra & Ayalon, 2012). This is potentially due to the distinction between voluntary isolation, often thought of as solitude, and involuntary or enforced isolation. Whereas voluntary isolation can lead to enhanced psychological wellbeing from selective privacy, enforced isolation tends to lead to loneliness and negative wellbeing outcomes (Biordi & Nicholson, 2013).

Digital engagement offers a means to fulfil one's social needs to combat isolation and loneliness. The European Commission notes that ICT is increasingly essential to develop and maintain social relations (European Commission, 2010), reflecting the increasing digitisation of society. Appropriate internet use allows for access to online communities and the opportunities to connect with new people with similar interests, which can be effective for lowering isolation by fostering a sense of belonging (Nimrod, 2011). This may be due to the increased access to social capital that is afforded by increasing opportunities for social connections and community building (Sum, Mathews, Pourghasem, et al., 2008). This increase in digital communication possibilities is particularly beneficial for those who are limited by spatial and social separation, such as older adults, as ICT allows them to transcend these barriers (Winstead et al., 2013). Indeed, much of the empirical literature focuses on the benefit of digital communication for reducing isolation and loneliness in older adults and those

living in social housing as a particularly vulnerable group; 7% of UK adults from a general population study report chronic loneliness (Payne, 2021) compared to 61% of older adults living in an aged care setting (Gardiner et al., 2020). Şar et al. (2012) show that loneliness is significantly lower amongst over 50s who regularly use the internet. Expanding on this, Hogeboom et al. (2010) report that the internet is particularly effective for strengthening the social networks of those over 50. Winstead et al. (2013) find that communicating through ICT allows older adults in residential care to maintain and enhance their social networks and feel more connected to the wider world. Similarly, Hill et al. (2015) report that older adults benefit from overcoming barriers such as spatial separation and mobility issues by using ICT to access resources related to their hobbies and facilitate social communication. This results in a sense of empowerment from being able to fulfil their social needs in an alternative way (Hill et al., 2015).

However, for each of the studies discussed that show the benefits of digitally facilitated communication, there is an implicit reflection of those who are digitally excluded and, thus, barred from accessing these benefits. This double-edged nature of digitally mediated social inclusion is reported directly in some literature. Older adults in focus groups discuss the division between being empowered and disempowered by ICT, dependent on one's ability to engage with it (Hill et al., 2015). Similarly, qualitative data from a large survey reflects older adults' awareness that the social benefits of ICT can only be accessed by knowing how to engage with it, which not all can do (Sum, Mathews, Pourghasem, et al., 2008). Through this pathway, we see the social impact of digital exclusion: digital exclusion can compound or produce a state of enforced isolation and loneliness.

1.3.1.2.2. Health and Wellbeing

While isolation and loneliness are societal issues in and of themselves, they are often linked in the literature to broader health and wellbeing outcomes, including depression (Taylor et al., 2018), PTSD (Brooks et al., 2020), cardiovascular issues (Valtorta et al., 2016), and dementia (Fratiglioni et al., 2000). There are two prominent suggestions for how social inclusion, increasingly facilitated by digital engagement, influences

wellbeing outcomes: directly through offering support and resources in the form of social capital, and indirectly as a buffer.

Social Capital reflects the benefits reaped as a result of successful social integration. From an evolutionary perspective, this can be viewed as features of social relationships that maximise reproductive success (Savage & Kanazawa, 2002), while in modern society, it reflects the embedded social resources that are only accessible to network members (Bourdieu, 1985). Social Capital Theory, therefore, reasons that social connections and structural networks directly and positively influence health and wellbeing, because the connections provide emotional and practical support (Berkman & Glass, 2000; Coleman, 1990). This theory is supported by an array of empirical evidence. For example, Mulvaney et al. (2007) found that family and friend support were positively associated with physical and mental health. Further, Berkman and Glass (2000) expand upon this by suggesting this is because social networks offer support, such as access to jobs and information, and positive influences on health and social behaviours. Through this mechanism, Social Capital positively influences wellbeing outcomes.

An alternative, indirect way that social connections influence health and wellbeing is represented by the Stress-Buffering Model. This model posits that social isolation is a psychologically and physically stressful state, which can be protected against by the buffer of sufficient social contact (Cohen & Wills, 1985). This is thought to be because quality social connections protect against a range of stressors, thereby buffering against the associated health and wellbeing consequences (Wong & Waite, 2016). Empirical evidence in support of this model finds that the physiological stress induced by isolation weakens the immune and cardiovascular systems, increasing the risk of health issues (Seeman, 1996). Further, Lubben and Gironde (1996) suggest that social connections represent a positive buffer, as those with strong social ties have reduced susceptibility to stress-related illnesses.

Integrating the perspectives of these two models, there is much empirical evidence supporting digital inclusion as a means to achieve social, and suggesting this can improve wellbeing. For example, computer training courses are found to be effective for facilitating digital and social engagement, leading to life satisfaction, and decreased depression and loneliness (Shapira et al., 2007). Similarly, a novel, accessibly designed

tablet to support digital engagement for older adults with low digital skills was found to be effective for increasing communication and social inclusion, but also increasing general wellbeing (Neves, Franz, et al., 2019). Further, social inclusion fostered by playing video games leads to increased well-being and decreased negative affect and depression (Allaire et al., 2013). Through these examples, and many like them, we see that a variety of digital methods are effective for enhancing wellbeing, through the implied mechanism of increased social support and connection.

1.3.2 Human-Computer Interactions

The previous research discussed focuses on computers as simple tools used by humans to achieve a set outcome, for example facilitating communication with friends and/or family, leading to reductions in isolation and loneliness and an improvement in wellbeing. However, technology facilitating social connection is only one way in which positive social outcomes can be achieved; technology is also able to simulate social relationship and, by design or accident, offer intrinsic social value to its users. There are many forms of technology that can achieve this, but the concept is well demonstrated by socially assistive robots, such as PARO (Hung et al., 2019) or RoLA (Song et al., 2008). Such devices are primarily designed to be viewed as pets or companions, offering beneficially pseudo-social interactions to their users (Hung et al., 2019). From interactions with socially assistive robots, users can show a reduction in negative mood (Hung et al., 2019) and decreased loneliness (Chen et al., 2020).

Technology has progressed from being perceived as an inanimate tool present only to be controlled by humans. No longer is the only social benefit of technology found in facilitating human-human connections. This potential is rapidly advancing as even complex socially assistive robots no longer represent the forefront of technologies intrinsic social capability. Now, it can represent entities that are capable of cooperation and able to act as a social presence, offering intrinsic social value through companionship. This progression is reflected in the literature, describing a shift from technology created to automate or carry out strictly defined and limited processes towards technology with the capability to act autonomously and dynamically adapt to

novel situations (de Visser et al., 2018). This adheres to a principle in ergonomic design (i.e., friendly, usable, transparent technology) that technology should be able to act cooperatively with users and respond dynamically (Hoc, 2000) to enhance their usefulness. This is increasingly relevant in the era of artificial intelligence (AI) as machines move far beyond being mere tools and develop into socially engaging artificial agents (Cross & Ramsey, 2021).

As the capabilities of technology increase, so too does the diversity of technology. Artificial intelligence can be used in seemingly simple devices, such as smart thermostats, up to complex and socially capable androids, such as Pepper or iCub (Cross & Ramsey, 2021). As the diversity of smart technology is so vast, naturally, so too is the diversity of interactions possible with these devices (Cross & Ramsey, 2021). For this reason, taking a one-size-fits-all approach to understanding how humans interact with machines is too broad of a brush and implies an inappropriate level of homogeneity. The diversity of interactions contributes to the need to understand the array of psychological experiences within the field of HCI (Sundar, 2020). For this reason, examining instances of human interactions with specific artificially intelligent social devices is more appropriate to reflect the heterogeneity of HCI. To do this, three key paradigms will be explored to better understand human reactions to and interactions with socially capable technology: anthropomorphism, the Computers as Social Actors paradigm, and Parasocial Relationship Theory.

1.3.2.1. The Anthropomorphisation of Technology

Anthropomorphism is the tendency to assign human traits and characteristics to non-humans. This can involve ascribing psychological and social attributes, such as motivations, emotions and intentions, to objects or non-human animals (Epley et al., 2007; Nass & Moon, 2000). This could be perceiving a happy face in a cloud formation or assigning a complex emotive or cognitive inner narrative to a pet (Nass & Moon, 2000). However, anthropomorphism is not invariantly applied to all objects and non-human animals in our environment. Epley's Three-Factor Theory of Anthropomorphism suggests why humans are more likely to anthropomorphise some things at some times (Epley et al., 2007). The three factors are elicited - agent knowledge, effectance

motivation, and sociality motivation. Elicited agent knowledge reflects the human tendency for top-down processing. Assumptions about an agent are based not only on objective presentation and observed behaviour but individual prior knowledge that is accessed at the time of perception and judgement. In this way, the information received from the agent is combined with the prior knowledge it elicits that shapes our perception and influences our likelihood of anthropomorphic perception. Secondly, effectance motivation arises from the human need to understand and make sense of our, often complex, environment. In this way, anthropomorphism is a tool through which we may increase our comprehension, although not necessarily the accuracy of our understanding, of the world around us. Finally, the third factor is sociality motivation. As previously discussed, sociality is a seemingly universal human need, comparable to thirst or hunger; in the absence of sufficient social engagement, a powerful innate drive to seek out social connection arises (Epley et al., 2007). Anthropomorphism, therefore, is a means to view non-human animals or objects as sufficiently human-like to satiate that social need.

This human tendency to attribute objects with human-like qualities is frequently exploited in design. The goal of anthropomorphic design is to create an object that triggers widely held schemata about positive traits and leads to the attribution of these traits to the device (Aggarwal & McGill, 2007; Schweitzer et al., 2019). For example, car grilles and lights may be designed to appear happy or smiling if these are the attributes the designers wish to be associated with the car (Schweitzer et al., 2019). This is, perhaps, most relevant and complex when considering socially capable technology, such as artificially intelligent agents or robots. Designing these entities to be human-like requires consideration of three aspects; the physical shape of the device (e.g., functional, anthropomorphic, zoomorphic, etc.), the behaviour it expresses, and the interactions it facilitates and engages in with the human user (Fink, 2012). The choices made within these three categories can have a profound impact on the reception of the device.

When anthropomorphism has been achieved, users can view devices as socially capable, human-like entities, producing unique perceptions that are not afforded to other, non-anthropomorphic devices. For example, users are more likely to have

positive perceptions of anthropomorphic devices than non-anthropomorphic devices, manifesting as higher ratings of “liking” (Wan et al., 2017) or “favour” (Aggarwal & McGill, 2007) and increased loyalty (Chandler & Schwarz, 2010) to the object. Directly, greater anthropomorphic perception of conversational agents (e.g., Alexa or Google Assistant) is correlated with increased relationship perception from the user (Seymour & Van Kleek, 2021). These positive perceptions facilitate the forming of parasocial relationships with the anthropomorphic objects (Aggarwal & McGill, 2007; Schweitzer et al., 2019) which can be classified by the users in a variety of ways, reflecting interpersonal differences and differences in the qualities being attributed to the object. For example, Schweitzer et al. (2019) find that an anthropomorphic phone-based agent can be classified as a friend, servant, master, and more. All of these examples reflect a deeper and more positive relationship than one would report with a non-anthropomorphic object.

However, anthropomorphising objects does not universally lead to positive outcomes for the users or the manufacturers. Studies have found that users report stronger negative reactions to anthropomorphic objects following device or brand wrongdoing than in response to wrongdoing associated with non-anthropomorphic objects (Puzakova et al., 2013). Similarly, anthropomorphic tutorial or support characters in video games can evoke a more negative response from players than non-anthropomorphic support, due to an undermining of player autonomy and enjoyment (Kim et al., 2016). Further, designing a robot that is too closely human may artificially raise users’ expectations of its capabilities, leading to intense displeasure and reduced satisfaction if these expectations cannot be met (Fink, 2012). Creating an artificial entity that is almost perfectly human-like will produce the “uncanny valley” effect; the positive association between human-likeness and likeability suddenly switches from positive perception to eeriness and feelings of discomfort as the representation approaches perfection (Zhang et al., 2020).

From these examples, we see that anthropomorphising objects and creating anthropomorphic entities leads to user perceptions that are distinct from benign objects in the environment, generally by being more intense. However, this endeavour should be treated with caution as anthropomorphism can be a double-edged sword,

offering opportunities for more positive receptions and relationship formation while risking undermining user agency, enjoyment, trust, and comfort.

1.3.2.2. The Computers are Social Actors Paradigm

The anthropomorphisation of technology, or viewing technology as having human-like features, is essential for indicating social potential (Gambino et al., 2020). As technology ceaselessly progresses, we see an increase in the social cues and social affordances that can be demonstrated to users, such as personalised feedback to user inputs (Fox & McEwan, 2017). With this comes a greater and more widespread activation of social scripts and a perception of heightened social potential (Fox & McEwan, 2017).

Reflecting this, the ‘Computers are Social Actors (CASA) Paradigm’ (Reeves & Nass, 1996) suggests that humans tend to mindlessly produce social behaviour towards computers because they activate our “social scripts”. A computer must meet two criteria to be viewed as socially capable: the computer must present sufficient social cues, and be an agent/social source in and of itself, rather than transmitting social information from other humans or sources (Nass & Moon, 2000). Designing computers to present characteristics that are associated with humanity/sociality leads to users making social attributions about the computer, and subsequently displaying reciprocal social behaviours towards the computer (Nass et al., 1994). As with anthropomorphism, designers aim to trigger schemas of social interactions, or “social scripts” by designing interfaces that reflect natural human-human forms of interaction, thus minimising the effort needed to effectively interact with the technology (Gambino et al., 2020). Triggering social schemas and the perception of computers as social actors in this way commonly manifests in two outcomes: users’ preference for pro-social over non-social computers, and users adhering to social norms, such as politeness, when engaging with pro-social computers.

A preference for computers that are perceived as a social actor is consistently documented across multiple types of technology, indicating this is a reliable phenomenon. Generally, it is found that technology capable of engaging in personalised social communication (i.e., making tailored responses based on user input, as opposed

to generic, pre-programmed outputs) is viewed as being more socially capable. This, in turn, triggers the activation of social schema and leads to these devices evoking greater social responses from users. For example, a snack delivery robot was found to evoke greater social responses from users when it was offered personalised responses based on the users' interaction style (Lee et al., 2012). This led to users viewing the robot as a social agent, developing a feeling of rapport, and increased engagement and cooperation when compared to a robot that could only give generic responses (Lee et al., 2012). Similarly, children have been shown to learn more from and engage more with pro-social robots that offer personalised feedback, compared to robots only offering generic feedback (Baxter et al., 2017). Features that seem to enhance users' tendency to view computers as social agents, and therefore preferentially engage with them, include flattery and human-like appearance. Fogg and Nass (1997) showed that users would respond similarly to flattery from a computer-based social agent as they would to flattery from another human; there was a strong preference for computers that flattered the user over ones that gave neutral feedback, even with the users knowing the flattery was non-contingent. Further, Gong (2008) found a positive, linear relationship between the degree of anthropomorphic design of a virtual agent and social responses elicited by the users. Users interacting with real human images produced more social responses and perceived the agent to be more competent and trustworthy than those interacting with a low-anthropomorphic agent (Gong, 2008). From these examples, we see that features such as flattery or human-like appearance underpin users' perceptions that devices are socially capable, and therefore contribute to the preferential engagement users show with such pro-social devices.

Further, viewing computers as social entities with social capacity leads to the activation of social schema and the, arguably mindless, production of normative social behaviour. Nass, Steuer and Tauber (1994) had participants receive tutoring from computer-based agents. Following the tutoring, participants were asked to give feedback on their experience with the virtual tutor. Participants were observed to follow the norms of politeness, as more favourable feedback was given when the virtual tutor asked for it compared to when feedback was delivered to another virtual agent or recorded on a paper form. This indicates that they are behaving as if the virtual tutor is a social entity

with feelings and emotions that they are trying to protect by offering more positive feedback. Similarly, smart speaker users showed politeness to their devices by frequently saying “please” and “thank you” when making a request or command (Jones et al., 2021). The presentation of such socially normative behaviour is in contrast to the conscious knowledge and explicit statement that individuals are aware that computers are not social; they , do not possess feelings, a sense of self, or other, similar, human attributes (Nass et al., 1994).

The Computers are Social Actors paradigm and associated research suggests that computers presenting social characteristics can and will be treated as social entities. This is supported by multiple studies evidencing user behaviour towards such social computers. The more strongly computers activate users’ social schemas, the stronger the sense that the computer is a social actor, and the more pro-social behaviour is shown by users. In this way, not all technology is created equal when it comes to being perceived as a social actor.

1.3.2.3. Parasociality and Technology

Parasocial Relationships (PSR) are historically phenomena reflecting a media consumer's perception of their social relationship with a media character (Rubin et al., 1985). This was first documented by Horton and Wohl (1956) in relation to the illusion of intimacy expressed by some television viewers about their favourite personalities. The viewers described feeling that they have grown to know the television personae through repeated observation and interpretation of their on-screen actions, leading to perceiving them as similar to friends. However, distinct from human-human friendships, PSRs are defined by their unidirectional interaction; viewers are unable to engage with the personae and the interactions are ultimately non-reciprocal (Horton & Wohl, 1956). In this way, parasocial relationships can be thought of as a ‘quasi-relationship’ (Rubin & Step, 2000); sharing similarities in terms of how the relationship is perceived, but being distinctly non-reciprocal and, as a result, generally less intense than reciprocal relationships (Rubin & Mchugh, 1987).

PSRs are thought to develop as an artefact of the strength of humans' social drive. As previously discussed, humans are evolutionarily social animals with an innate need for connection. This is reflected in the predictive strength of social engagement on wellbeing outcomes such as reduced stress (Seeman, 1996) and better mental (Brooks et al., 2020; Taylor et al., 2018) and physical health (Fratiglioni et al., 2000; Mulvaney-Day et al., 2007; Valtorta et al., 2016). When considering this social drive in conjunction with the ability of modern, mass media to create an illusion of face-to-face interaction (Horton & Wohl, 1956) and the Panksepp-Jakobson Hypothesis (suggesting that the human race has had insufficient time to evolve and adapt to the abundance and presence of modern media, so default to demonstrating affective and behavioural responses to mass media as would be to a peer (Panksepp, 1998)), it appears inevitable that media offers a deep, parasocial gratification (Tsay & Bodine, 2012) similar to human-human interactions (HHI). With knowledge of how socially rewarding media can be, content is often designed to evoke parasocial interactions. For example, interactions whereby actors or content creators speak directly to the camera are particularly effective for creating the illusion of a conversation with the viewer, triggering parasocial perceptions and gratification (Horton & Wohl, 1956). Through repeated exposure to such parasocial interactions, viewers' social tendencies may lead them to develop PSRs (Tukachinsky, 2010), mirroring the iterative nature of reciprocal relationship development (Knapp, 1978).

However, it is worth noting that PSRs are not universally and equally developing; personality, relational, affective, and behavioural differences are all evidenced to relate to differences in parasocial tendencies. Firstly, the personality traits of neuroticism, openness and agreeableness have all been linked to PSR formation. While those who are highly neurotic are more likely to form PSRs and engage in parasocial interactions because they view these as a functional alternative to interpersonal gratification (Tsay & Bodine, 2012; Wang et al., 2008), those who are open or highly agreeable are less likely to form PSR (Tsay & Bodine, 2012). This is thought to be because open and agreeable individuals are likely to consume less media as they seek a greater variety of experiences and, therefore, have lower exposure to repeated parasocial interactions, inhibiting PSR development (Tsay & Bodine, 2012). Secondly, those with anxious

ambivalent attachment styles and those who are lonely are more likely to develop PSRs. Reflecting a desire for intimacy and the use of stable media personae to meet unmet, and often unrealistic, relational needs, those with anxious ambivalent attachment styles are the most likely to form PSRs (Cole & Leets, 1999). This is in contrast to those with avoidant attachments, whose relational hesitancy generalises from reciprocal human-human relationships to also inhibit PSR formation (Cole & Leets, 1999). Additionally, loneliness is well-studied as an antecedent to PSR formation. Some suggest that general loneliness can account for 10% of the variance in PSR formation (Andriani et al., 2023) while others stratify loneliness, suggesting that familial loneliness for women and chronic loneliness for men are the strongest predictors of PSRs and seeking parasocial interactions online (Wang et al., 2008). To achieve consensus on the topic, a meta-analysis on the relationship between antecedent loneliness and PSRs determined that general loneliness could not sufficiently predict PSRs (Tukachinsky et al., 2021). However, they suggest that parasocial interaction-seeking and subsequent PSR development are related to immediate social needs and the required short-term gratification that can be achieved through parasocial interactions, rather than in response to long-term loneliness or isolation (Tukachinsky et al., 2021). Finally, those who show behavioural patterns of consuming media for pleasure or escapism are more likely to form PSRs. Those who consume for pleasure reflect the hedonic gratification that can be achieved from the parasocial value that media offers while consuming to escape from reality reflects how this social value can be used as a way to relieve distress, which is particularly valuable for tense or anxious individuals (Tsay & Bodine, 2012). These factors may explain the differences in an individual's likelihood of forming PSRs.

Just as PSRs are not equally likely to be formed by all individuals, so too exist inequalities in the subjects of PSRs. Much research has focussed on understanding why PSRs form from the perspective of understanding what subjects promote PSRs, and what features underpin this. Largely, these factors seem to be similar to those that draw people together and encourage them to form social relationships. For example, personae that are perceived to be similar to the viewer, particularly in terms of attitude and gender are more likely to be the subject of PSRs (Hoffner & Buchanan, 2005; Tian &

Hoffner, 2010). Similarly, PSRs are supported by interpersonal attraction; persona perceived as being attractive are likely to encourage the viewer to frequently engage with the media, supporting the development of PSRs (Rubin & Mchugh, 1987). Particularly, social attraction (possessing personal qualities that are likeable and appealing) is more strongly related to PSRs compared to the other factors of interpersonal attraction (task and physical attraction) (Han & Yang, 2018). Further, the consistency and reliability of media personae are considered highly attractive. This relates to the desire for uncertainty reduction, which theorises that humans experience cognitive discomfort arising from uncertainty and so prefer to be able to predict the trajectory of social interactions (Berger & Calabrese, 1975). Parasocial interactions with media personae are far more standardised to the personality of the character than interactions with real people (i.e. there is less variability and complexity in characters' personae than within real people), therefore there is a 'reliable sameness' offered by media personae which reduces uncertainty and cognitive discomfort for the viewer than may otherwise be elicited by reciprocal interactions (Horton & Wohl, 1956). This has been seen with soap opera characters who consistently conform to a caricature personality, offering a sense of predictability and limiting uncertainty for the viewer (Perse & Rubin, 1989). From perceived similarity and interpersonal attraction to uncertainty reduction, we consistently see that the factors that facilitate PSR formation overlap heavily with the factors that support reciprocal human-human relationship development.

While the concept of PSRs was originally defined to reflect the relationships viewers perceive with media personae (real or fictional), in more recent years research on PSRs has expanded to consider the emotional closeness shown to computers and digital agents (Han & Yang, 2018). In the advent of complex digital media and artificial intelligence (e.g., smart speakers, socially capable robots, chatbots such as Replika), some suggest that traditional forms of media, such as television, are comparably ineffective for triggering PSRs in the modern day (Wang et al., 2008), suggesting that the focus of PSR research should shift. Advances in technology facilitate new opportunities to encourage engagement from viewers/users, and this increased engagement positively influences their likelihood of developing PSRs. Firstly, new media can be

created with highly intentional design to maximise attractiveness to users. For example, socially interactive robots are designed to elicit strong feelings of social attraction and perceptions that they have a personality (Lee et al., 2006). This links to evidence suggesting that social attractiveness (being personable and socially engaging) is highly important for promoting PSR development, even above an attractive or competent design (Han & Yang, 2018). Secondly, new media allows for reciprocal communication between the personae and the viewer/user. Natural language and speech processing is nearing the level of human processing (Greene, 2017) and with this comes a wealth of options for communicative, social technology to be developed. The opportunity for users to deliver natural language commands, particularly through the medium of speech, is highly socially triggering and strongly associated with the development of PSRs (Han & Yang, 2018). Further, the ability of modern technology to provide customised responses to users through natural language and speech facilitates the perception of them as a source of emotional communication and further solidifies the PSR or feelings of companionship (Louie et al., 2014).

Both the benefits of personable, social design and communicative capabilities for promoting PSRs are evidenced by the wealth of research documenting instances of PSRs with different types of technology. AI chatbots, such as Replika, are common targets of PSRs. These relationships typically begin with superficial interactions that arise from user curiosity (Skjuve et al., 2021). When users are motivated by loneliness and a desire for companionship (Pentina et al., 2023), repeated interaction with the AI chatbot can lead to an increase in trust and self-disclosure, ultimately resulting in a perceived PSR, attachment to the chatbot and associated social rewards (Skjuve et al., 2021). Similarly, smart speakers are also highly supportive of PSRs, likely owing to their speech-based interface and pro-social design (Pitardi & Marriott, 2021). As with other technology, forming a PSR with a smart speaker increases users' perception of satisfaction with the device (Jang, 2020). Interestingly, PSRs with smart speakers are noted as being common among children, who may be more susceptible to PSRs with digital agents and treat smart speakers as human-like entities (Calvert, 2021).

An understanding of the frequency of and ease with which PSRs develop in response to modern media leads to questions about the outcomes and implications of such

relationships. Predominantly, positive outcomes are discussed in the research, such as satisfaction with technology and affective benefits. PSRs have been shown to predict increased user satisfaction (Han & Yang, 2018; Jang, 2020; Lee & Kwon, 2013), and continuance (Lee & Kwon, 2013) and adoption intention (Yoo et al., 2016) of a range of parasocially capable technology. Further, PSRs have been shown to be associated with improvements in affect. An experimental study asking participants to spend time thinking about a PSR showed similar improvements in mood to those thinking about a reciprocal relationship, both of which were substantially greater than for those thinking about a non-social topic (Stein et al., 2022). Similarly, romantic PSRs are qualitatively similar to reciprocal romantic relationships, in that they are associated with increased happiness, decreased loneliness, and generally feeling better after an interaction (Adam & Sizemore, 2013). However, there are quantitative differences in that these effects are markedly smaller for romantic PSRs than for romantic reciprocal relationships (Adam & Sizemore, 2013). However, the research is not universally positive about the impact of PSRs and may contradict some of the suggested positive outcomes, namely reductions in loneliness. Baek et al. (2013) suggest that reliance and over-engagement with PSRs are associated with increased loneliness. Similarly, Wang et al. (2008) suggest that seeking PSRs or PSIs are associated with antecedent loneliness. This is further supported by Tukachinsky's (2021) meta-analysis finding about transient and acute loneliness, suggesting that PSIs and PSRs are insufficient to compensate for social or romantic loneliness. Overall, there is a lack of consensus about the impact of PSRs, particularly surrounding their relationship with loneliness.

1.3.2.4. Privacy, Trust, and Artificial Intelligence

Historically, privacy reflected the idea of restrict access to one's personal information by controlling what information is communicated and who it is communicated with (Westin, 1967). The desire to maintain privacy arises from the wish to limit the dissemination of personal information that may either be detrimental or embarrassing to us, or information that provides us with the potential to advance above our competition (Tavani & Moor, 2001). However, the desire to control and restrict access to our personal information becomes problematic when we consider the digitisation of information. The volume of information that is gleaned and stored about us every time

we go online is vast. One cannot practically have complete control over this. With advances in technology, data is being collected in previously inconceivable obscured ways, making enforcing one's privacy increasingly difficult (National Research Council, 2007). Therefore, when engaging with technology, there becomes the requirement for users to make privacy trade-offs. Privacy trade-offs are made when the user feels that the consequence of having their privacy violated is outweighed by the benefit of engaging with the system, service, or technology that requests their data. Conversely, individuals may believe the benefits do not outweigh the privacy violations, either due to the personal nature of the data being collected or the intended use of their collected data (National Research Council, 2007). This is exemplified by Beach et al. (2009) who showed that adults were generally resistant to intrusive health monitoring. However, adults with high levels of disability-related impairments were willing to forgo their privacy through health monitoring as they felt the benefits were great enough for them to outweigh the intrusion.

When considering the privacy issues associated with interacting with technology, there is the inherent requirement of trust. A substantial body of research investigates the influence of trust on technology use. While there is a lack of a universally agreed definition of trust, most definitions require 3 elements: the truster (e.g. the technology user), the trustee (e.g. the technology), and the context. Trust reflects the attitude that an agent will help an individual achieve their goals and not act in a way that is detrimental to the truster (Hancock et al., 2011; Lee & See, 2004). In addition to privacy concerns and perceived benefits, trust is essential for the acceptance of technology; people accept technology that they trust and reject technology that they do not (Hoff & Bashir, 2015; Lee & See, 2004). As trust is required to help individuals manage the mental load of interacting with complex technology, the importance of trust is likely to increase as technology continues to evolve (Lee & See, 2004). This reflects the role of trust as an affective influence on behaviour, particularly in circumstances where rational choices are difficult (i.e. due to a lack of comprehensive understanding of the technologies underlying processes) (Lee & See, 2004).

Humans trust of technology bares many resemblances to interpersonal trust. Both are influenced heavily by the situation or context, and only shape behaviour when a

cooperative relationship is formed in a situation that involves some uncertainty or risk (Hoff & Bashir, 2015). These similarities may be because human-technology trust is really reflecting trust in the creators of the technology (Parasuraman & Riley, 1997), however there is limited research relating to this suggestion. Human-technology and interpersonal trust differ in relation to the factors that influence trust; while interpersonal trust is shaped by ability, benevolence, and integrity of the trustee (Mayer et al., 1995), human-technology trust is based on performance, process, and purpose of the technology (Lee & Moray, 1992). Performance reflects how well a technology is able to execute the task requested by the user. Process is the understanding that the user has of the way the task has been performed, or the transparency of how the technology operates. Finally, purpose is users awareness of the technologies intended function. Suggestions to increase users trust in technology include increasing the anthropomorphism of the design (de Visser et al., 2012; Pak et al., 2012), simplifying the interface (Atoyan et al., 2006; Y.-M. Li & Yeh, 2010), and considering the politeness and gender of the communication style (Parasuraman & Miller, 2004; Spain & Madhavan, 2009).

As suggested previously, the role of trust becomes increasingly important as the complexity of technology advances. This is well exemplified by recent advances in artificial intelligence (AI), as it has been shown that people tend to be overly trusting of AI, even when it's making imperfect decisions (Dorneich et al., 2017). As with trust, there are varying definitions of AI. However, all reflect the notion of creating computer programmes or machines that can carry out functions that would be described as intelligent if they were performed by a human (McCarthy et al., 1955). When considering the functionality of AI, it is suggested that there are 4 categories (Stryker & Kavlakoglu, 2024). Reactive machine AI is designed for narrow tasks and has no memory, meaning it is limited to currently available data and cannot draw on previous data. IBMs Deep Blue chess computer was an early example of reactive machine AI. Slightly more advanced is limited memory AI, which is able to recall past data or monitor changes in objects or scenarios with time. Limited memory AI is able to use past and present data collectively when making predictions. While data cannot be stored indefinitely, limited memory systems show improvements in performance with training. Many of the examples of AI

in our daily lives that we may think of are limited memory systems, such as generative AI like ChatGPT, virtual assistants and chatbots like Alexa and Siri who use AI to understand user inputs, take appropriate actions, and produce responses. The two most complex functions of AI, theory of mind AI and self-aware AI, are currently only hypothetical. Theory of mind AI would be able to understand the feelings, thoughts, and emotions of others and adjust how it interacts accordingly, while self-aware AI would additionally possess its own feelings, thoughts, and emotions that would shape its performance. While these latter two are currently hypothetical, there is research working towards these goals. The social potential that emotionally-sensitive artificial intelligence could have raises many questions about its potential application and ethics, and it will be interesting to see how this emerging field develops.

1.3.3. Smart Speakers

1.3.3.1. *An Overview*

Smart speakers are a type of technology that exemplifies the areas of interests discussed thus far in this chapter: They are intuitively and accessibly designed so easy to control for individuals with low digital skills, they offer a means to easily contact friends and family and are anthropomorphically designed to present social possibilities. They have speech-controlled ‘virtual assistants’, such as ‘Alexa’ or ‘Siri’, that are examples of limited memory AI and can support the user to automate and streamline daily tasks (Han & Yang, 2018). Their basic functions include assistive services (e.g., setting alarms and reminders), access to multimedia (e.g., radio and audiobooks) and information through web access, and social assistance (Han & Yang, 2018). Further, their functional repertoire can be enhanced through add-on applications, sometimes called ‘Skills’ or ‘Actions’. Through this process, users can unlock a vast range of additional features, from remote calling to guided meditation (Amazon, 2025). The devices are reliant on voice recognition software and the use of natural language processing servers that are accessed via the internet and limited memory AI to allow the user to converse with the smart speaker (Han & Yang, 2018). When connected with additional smart technology, such as thermostats, light bulbs, plugs, etc., smart speakers allow users to create a smart home set up that is controllable through voice commands. Smart speakers are increasingly ubiquitous devices found in over 65% of US (Laricchia, 2022)

and 50% of UK homes (Laricchia, 2023), with over 87.4 millions units sold in 2024 alone (Sherif, 2025). Their widespread uptake is often attributed to their ease of operation and low price point, rendering them highly operationally and financially accessible, in addition to their anthropomorphic and social design.

The predominantly voice-controlled interface of smart speakers is, arguably, their most unique design feature and simultaneously the reason for their enhanced accessibility. The ability to command the device by speaking to it in a largely natural way offers operational accessibility that is valued by a range of groups. Those with visual impairments can fluidly navigate the device without the need for additional configuration and add-ons, as is the case with visual interface devices (Abdolrahmani et al., 2020). Similarly, those with mobility or dexterity issues benefit from controlling the device with their voice, without needing to move to be within reach of the device or use peripherals or touchscreens to control the device (Jamwal et al., 2020). Further individuals with low digital skills (Blocker et al., 2020), such as some older adults (Pradhan et al., 2020), benefit from an intuitive interface that is designed to trigger and draw on pre-existing social schema. From this, we see how the design features that distinguish smart speakers from other forms of modern technology also offer a high level of operational accessibility that is broadly appreciated but particularly beneficial for certain subgroups who may otherwise struggle to be digitally engaged.

Beyond operational accessibility, smart speakers are comparably an extremely affordable smart device and means to access the internet. At the time of writing, the most recent launches of the two market leaders were the Amazon Echo Dot 5th Generation and the Google Nest Mini Second Generation, respectively £54.99 (Echo Dot 5th Generation, 2024) and £49.99 (Google Nest Mini Second Generation, 2024). In comparison to the market leading smartphones, the Apple iPhone 14 and Samsung Galaxy S23, ranging in price from £849 to £1179 (iPhone 14, 2024) and £849 to £899 (Samsung Galaxy S23, 2024) respectively. Clearly, smart speakers are a fraction of the price of other smart devices, therefore making them a comparatively financially accessible means to enhance digital engagement.

1.3.3.2. Social Presence of Smart Speakers

The advent and increasingly ubiquitous presence of smart speakers reflects a new era of human-computer interactions: We no longer only use technology as a means to communicate with other people, rather, we aim to communicate with the technology itself. In this way, smart speakers can take on a flexible social role in the home, ranging from the more traditional role of mediating social interactions for the user to taking an active role in social interaction with the user (Voit et al., 2020). In light of this, the previous topics of anthropomorphism, CASA, and PSRs are discussed in application to explaining humans' interactions with and social perceptions of smart speakers.

Smart speakers are, perhaps surprisingly, designed to trigger anthropomorphic perceptions. While their diminutive design may not offer visual cues, their social potential is evident through interactions with them. Their gendered personae (e.g., a feminised voice and the name 'Alexa') and conversational capabilities are clear anthropomorphic design choices intended to trigger the social schema of users. Gao et al. (2018) and Chung et al. (2021) conclude that users' attribution of she/her pronouns to describe smart speakers reflects anthropomorphic activation. These findings underpin the linguistic theory of the ontological categorisation of smart speakers; mindlessly assigning human-like pronouns to smart speakers self-fulfils to deepen the perception that smart speakers are human-like, furthering the anthropomorphic attributions (Pradhan et al., 2019; Voit et al., 2020). From this, we see that the carefully considered design of smart speakers is conducive to activating user's social schema, leading to anthropomorphisation of and human-like attributions to the device.

Triggering social schema from gendered or conversational presentations of smart speakers can lead to the activation of related schema and broader human-like assumptions about the devices being made (i.e., something that can have a conversation is socially capable and therefore feels like a social presence). In this way, anthropomorphic activation and viewing smart speakers as human-like is a prerequisite to perceiving smart speakers as social entities. This is demonstrated through the mindless presentation of overlearned social behaviours despite conscious awareness that they are unnecessary or inappropriate, such as saying 'thank you' or 'good morning' to the smart speaker (Pradhan et al., 2019); users subconsciously perceive the smart

speaker as a social entity, and so mindlessly apply social scripts and adhere to social norms of politeness when interacting with them. Conversational/voice-based interaction as a design choice has shown to be strongly linked to triggering anthropomorphism and perceptions of smart speakers as socially capable entities (J. Li, 2015). Additionally, those who live alone are more likely to perceive their smart speaker as a social presence, likely arising from an increased sociality motivation (Voit et al., 2020). In this way, we see how anthropomorphism can lead to users perceiving their smart speaker to be a Social Actor(Reeves & Nass, 1996) paradigm (Reeves & Nass, 1996).

Developing a parasocial relationship, can arise naturally from repeated interactions with the smart speaker when it is socially perceived. It is the same design features that allow for human-like attributions to be made that are similarly conducive to forming PSRs and perceptions of friendship with the smart speakers (Wienrich et al., 2023). Additionally, evidence that humans converse similarly with their smart speakers as with other humans (e.g., with a sense of rapport) (Cerekovic et al., 2017) suggests that the design of smart speakers has been successful in creating a device that has true social capabilities and allows for parasocial relationships to form.

Smart speakers have been adopted by researchers and policy makers as social interventions as a result of the social potential discussed above. As an intervention, they are generally offered to groups thought to be at the greatest risk of digital and social exclusion, such as older adults in social or supported care housing. For example, Chung et al. (2024) found that smart speakers were an effective way for older adults living in social housing to proactively maintain their social networks. Additionally, Kim and Choudhury (2021) found that smart speakers could be effective for offering digital companionship, which resulted in decreased isolation and loneliness and feelings of emotional support for older adults living in a care home. Further, Yan et al. (2024) also found that smart speakers were effective for reducing loneliness amongst this group of interest, with the frequency of interactions positively correlating with the degree of loneliness reduction. Jones et al. (2021) expands on this finding by showing that high levels of baseline loneliness amongst this population are associated with more friendly interactions, increased anthropomorphic perception, and perceiving the smart speaker

as a companion. However, the research on smart speakers as a socio-digital intervention for older adults in social or care housing is not universally positive, with Chung et al. (2021) highlighting how frustrations may arise amongst this group of users and how this may limit engagement.

1.3.4. Summary

The literature reviewed highlights that the influence of the digital divide is permeating into all aspects of life. Due to the increasing digitisation of society and the assumption of universal digital ubiquity, the effects of the digital divide continue to grow more profound. While early interventions to reduce the digital divide focussed on providing access to technology, more contemporary approaches highlight the importance of digital skills. This approach is supported by literature showing that digital skills are the strongest predictor of digital engagement (Dogruel et al., 2015; Martins Van Jaarsveld, 2020). Within the range of impacts that digital engagement can have, this thesis focusses on the social outcomes. The social role of technology will be examined both as a method to communicate and maintain relationships with other humans and as a social presence through the lens of HCI literature and paradigms focussing on anthropomorphisation, the Computers are Social Actors paradigm, and parasociality. As a technological case study, the influence of smart speakers on digital and social engagement will be examined due to their increasing ubiquity, accessible design, and social potential.

Chapter 2. The Mediated Effect of Digital Skills on Psychosocial Outcomes: A Relationship with Age, Gender, and Education

2.1. Introduction

2.1.1. Background

Driven by a desire for efficiency and automation, the increasing digitisation of society highlights the requirement of digital inclusion. Digital inclusion, as discussed previously, is a highly nuanced concept and represents the culmination of many facets (Organisation for Economic Co-Operation and Development, 2000; van Dijk, 2006). Ultimately, it reflects an individual's capacity to access and engage effectively with digital technology (van Dijk, 2006). The societal assumption of ubiquitous digital access, engagement, and inclusion has led to technology becoming increasingly embedded in all aspects (Yelland & Neal, 2013)cational (Yelland & Neal, 2013), economic (Bradshaw, 2011), and social (Genoe et al., 2018; Hill et al., 2015).

Despite this assumption, ubiquitous digital inclusion is far from the reality. Digital inclusion is not equally achievable by all sectors of society, leading to many individuals being digitally excluded. This digital exclusion reflects a lack of access, or the skills required to engage efficiently with technology through circumstances beyond the individual's immediate control (Warren, 2007).Through an inability to access the benefits of digital inclusion, digital exclusion is viewed as a social determinant for various health and wellbeing outcomes (Warren, 2007). Because of this, digital exclusion is a key inequality at the heart of much research and policy interest (European Commission, 2010; van Dijk, 2006). Some suggest that this is because digital exclusion prevents individuals from accessing the resources necessary to proactively manage their conditions (Warren, 2007). However, this could be considered an oversimplification of an inequality that is as complex and has implications as far-reaching as digital exclusion.

Where an individual falls on the spectrum of digital inclusion is dependent on multiple factors and, therefore, highly variable. Societal factors influencing digital inclusion include access to opportunities to develop digital skills (e.g. in school or at home), internet access, or local infrastructure (Philip et al., 2017; Warren, 2007) which often disadvantages those in rural areas (Maude, 2014). Personal factors include attitudes towards digital technology and perception of its benefits (Mellor et al., 2008), self-efficacy relating to digital skills (Czaja et al., 2006), or fear of damaging expensive technology (Hill et al., 2015). Additionally, there is much research on the predictive power of demographic variables relating to digital inclusion. A short experience with formal education, followed by older age, have been shown to be the strongest predictors of digital exclusion (Helsper & Reisdorf, 2017). Similar research shows that education positively correlates with technological engagement, with each additional year of formal education conveying a 33% increase in the likelihood of having access to the internet (Czaja et al., 2006; Yu et al., 2016). Further, multiple findings suggest that older adults are still more likely to be digitally excluded than younger adults (Aston, 2023; Prescott, 2021; Yu et al., 2016), despite being the fastest growing group of technology users (Perrin & Duggan, 2015). Similarly, women are more likely to have access to the internet and use technology in a different way than men (Ihm & Hsieh, 2015; Yu et al., 2016). From this, we see that educational level, age, and gender are key demographic factors relating to an individual's digital inclusion. By viewing digital inclusion as a complex culmination of these factors, among others, we understand the digital divide better as a continuum rather than a binary. This continuous conceptualisation is better able to reflect the heterogeneity in digital engagement and access present in society (Organisation for Economic Co-Operation and Development, 2000) and supports the idea that incremental steps towards digital inclusion are possible and beneficial.

As discussed in the literature review in Chapter 1, historic interventions aiming to reduce the digital divide focussed on the barrier to accessing technology by providing internet access or low-cost technology internet (Edwards, 2021). However, recent research has shown that access alone is insufficient to explain the digital divide, and that digital skills are the strongest predictor of digital inclusion (Dogruel et al., 2015; Friemel, 2016; James, 2008; Martins Van Jaarsveld, 2020), leading contemporary

interventions to target this issue. These take one of two approaches in reflecting the importance of digital skills: digital skills training to support individuals in overcoming the barrier to engagement (Castilla et al., 2018; Miwa et al., 2017) or providing accessible technology that lowers the digital skills barrier that individuals need overcome (Gutierrez et al., 2017; Isaacson et al., 2019; Neves, Franz, et al., 2019).

As digital exclusion is a social determinant, such interventions are often employed with the hope of improving health and wellbeing outcomes (Gutierrez et al., 2017). Digital interventions for wellbeing are generally considered to be an attractive option as they have wide-reaching benefits. The efficiency of these interventions can be further enhanced by knowledge of who is likely to be digitally excluded; understanding the demographic factors that are associated with digital exclusion (age, gender, education level, etc.) allows for such interventions to be targeted at the societal groups who have the potential to make the greatest gains (Gutierrez et al., 2017; Isaacson et al., 2019).

For example, targeting digital interventions at older adults who are known to be at increased risk of digital exclusion is a popular strategy (Blažun et al., 2012; Cotten et al., 2013; Shapira et al., 2007). Despite these interventions being relatively common, the mechanism through which enhanced digital inclusion leads to improved wellbeing remains unclear. To try to understand this mechanism, the factors most commonly reported in relation to digital inclusion and wellbeing changes will be examined.

2.1.2. Examining the Relationship Between Digital Inclusion and Psychosocial Outcomes

2.1.2.1. *The Role of Isolation and Loneliness*

As discussed in Chapter 1, isolation is often reported as being comorbid with digital exclusion, and there is evidence that it can be reduced as wellbeing increases from digital inclusion interventions. Social Capital Theory suggests this is because social connections provide emotional and practical support such as access to information and resources (Coleman, 1990), 1990). It is theorised that the provision of such support underpins the relationship between strong social connections and the evidenced range of positive outcomes (Mulaney-Day et al., 2007). Conversely, then, being isolated or lacking social connections is a physically and psychologically stressful state that is a

risk factor for a range of negative wellbeing outcomes, including mental health issues such as PTSD (Brooks et al., 2020) and depression (Taylor et al., 2018) and physical health issues such as cardiovascular problems (Valtorta et al., 2016).

Despite isolation being a widespread issue, it is not equally experienced. Commonly, many of the same demographic factors that are implicated in digital exclusion are also associated with an increased risk of isolation. Many studies have found that older age is associated with an increased risk of isolation (Havens et al., 2004; Havens & Hall, 2001; Luggen & Rini, 1995) for a variety of reasons, including being increasingly homebound due to deteriorating health or the death of friends and family (Iredell et al., 2004; Wenger & Burholt, 2004). The impact of gender is less clear, with some finding men more likely to be isolated (Iliffe et al., 2007), while others find the same for women (Havens & Hall, 2001). However, a negative correlation between the length of education and isolation is consistently found (Balki et al., 2023; Fernández-Carro & Gumà Lao, 2022; Gul et al., 2019).

While isolation is an objective measure quantifying the frequency of social interactions, the experience of isolation varies between individuals based on their social needs (Perissinotto et al., 2012). Because of this variability in the experience of isolation, its impact may be better quantified by measuring loneliness. These two terms are often, but incorrectly, used interchangeably. Unlike isolation, which aims to objectively measure the number of social connections or interactions one experiences, loneliness is the subjective and troubling feelings that arise from one's social needs going unfulfilled (Perissinotto et al., 2012; Weiss, 1973). While isolation reflects a lack of relationship quantity, loneliness reflects a lack of relationship quality (Neves, Franz, et al., 2019). The two concepts are, however, linked; isolation influences feelings of loneliness, but the relationship is not perfectly direct due to individual differences in social motivation, desire, and needs (Cacioppo & Patrick, 2008; Shiovitz-Ezra & Ayalon, 2012). For this reason, the personal subjectivity of loneliness may be better able to encompass psychological distress than isolation, so may be a more relevant variable to examine in relation to digital inclusion and wellbeing.

As with isolation, there is an established relationship between loneliness and a variety of wellbeing outcomes. As humans have evolved to be innately social creatures (Coleman, 1990), the strength or quality, as well as the quantity, of social connections is

deeply important. Hypotheses such as the Stress-Buffering Effects model suggest that high-quality social connections are protective against physical and psychological stress, and therefore help to prevent associated negative health and wellbeing consequences (Wong & Waite, 2016). Similarly, the Social Productive Functions theory hypothesises that affection, behavioural confirmation, and social status are essential for wellbeing (Steverink & Lindenberg, 2006). These needs, and therefore wellbeing, can only be achieved through the maintenance of high-quality social connections, and so this drives our readiness to form social bonds (Baumeister & Leary, 1995). Conversely, then, those who are lonely are lacking protective, quality social connections and will struggle to meet the innate social needs that underpin wellbeing. This may explain why chronically lonely individuals show an elevated risk of physical (e.g. cardiovascular problems (Valtorta et al., 2016), cognitive (e.g. a 60% increased risk of dementia (Fratiglioni et al., 2000), and mental health issues (e.g. PTSD (Brooks et al., 2020) or depression (Taylor et al., 2018)).

As discussed in Chapter 1, loneliness is particularly common amongst certain subpopulations, such as older adults (Gardiner et al., 2020). Additionally, men are significantly more likely to experience loneliness than women (Barreto et al., 2021; Borys & Perlman, 1985) and there is a strong, inverse relationship between education and loneliness (Savikko et al., 2005; Wood, 1978). This highlights the substantial overlap in the demographic factors that can predict elevated risk of digital exclusion, isolation, and loneliness.

2.1.2.2. The Psychosocial Implications of Digital Inclusion

In addition to the findings previously discussed literature showing that digital exclusion is associated with isolation, loneliness, and wellbeing, further research shows that interventions to promote digital inclusion are also effective for reducing isolation and loneliness and increasing wellbeing. These interventions can include training courses to improve digital skills and the provision of accessibly designed technology. Computer training courses have been found to be effective in facilitating digital and social engagement, increasing life satisfaction, and decreasing depression and loneliness (Shapira et al., 2007). Particularly, training programmes focussing on online

communication, such as Skype or email, are highly effective for supporting social engagement, reducing isolation and loneliness, and improving wellbeing (Ballantyne et al., 2010; Blažun et al., 2012; Cotten et al., 2013). On the other hand, novel and accessible technology, such as simplified tablet devices, can also be effective for facilitating social communication and inclusion while also increasing general wellbeing (Neves, Franz, et al., 2019). The findings from such research support the idea that digital engagement and communication can fulfil social and psychological needs (Gabbiadini et al., 2020; McMellon & Schiffman, 2002).

As discussed, there are between-group differences in digital exclusion, isolation and loneliness. The same demographic factors, namely age, gender, and education level, which are associated with differences in these also seem to affect the relationship between these variables. For example, the use of technology to reduce isolation and loneliness appears to be particularly beneficial for older adults as it helps them to compensate for reduced mobility and geographical separation from loved ones (Genoe et al., 2018; Hill et al., 2015; Winstead et al., 2013). Using the internet for social communication has been shown to be particularly effective for strengthening the social networks, and combatting isolation and loneliness, of older adults (Hogeboom et al., 2010). Perhaps for these reasons, further findings show that loneliness is significantly lower amongst older adults who use the internet regularly (Şar et al., 2012). Much research shows that communicating through ICT is effective for older adults to maintain and enhance their social networks (Winstead et al., 2013), and there is a sense of wellbeing and empowerment that comes from being able to fulfil their social needs in this alternative way (Hill et al., 2015).

2.1.3. This Chapter

From the literature presented, we see that the increasing digitisation of society places increasing importance on digital inclusion to facilitate social inclusion and wellbeing. Further, the factors that are associated with an increased risk of digital exclusion overlap heavily with risk factors for isolation, loneliness, and wellbeing issues, such as older age, gender, and educational experience. However, there is a lack of research

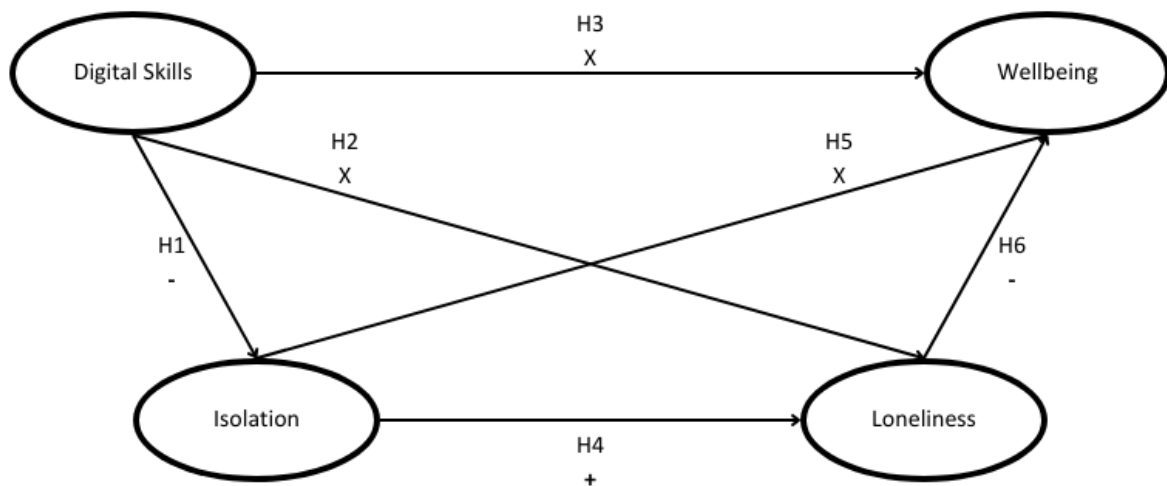
investigating the relationship between digital skills and these psychosocial factors concurrently, or how these relationships may collectively differ for different groups of interest.

Driven by this lack of research, this chapter has three aims. Firstly, it aims to examine the digital skills of a large, general population sample, as digital skills are the single, strongest predictor of digital inclusion/exclusion. From this sample, multiple subgroups of interest can be identified. These subgroups will relate to age, gender, and educational experience as these three factors that have been investigated as predictors to all factors of interest in this study (digital skills, isolation, loneliness, and wellbeing) in previous research. Additionally, these are easily quantifiable variables that are often used to target digital-skills related interventions. This will complement the existing literature that primarily focuses on the effects of digital interventions as opposed to baseline digital skills that better reflect an individual's position along the digital divide continuum and the culmination of factors that have led to this. Secondly, this study aims to map a pathway of the relationship between digital skills and wellbeing through the involvement of isolation and loneliness. This draws on the findings from many of the studies discussed previously which report the existence of individual pathways (e.g. digital skills influencing isolation, or loneliness influencing wellbeing) and brings them together into a holistic, hypothesised model. Through this, it is hoped that this will produce a pathway through which digital skills can better predict wellbeing, which may act as a foundation for future research and support the evaluation of digital skills interventions to target the outcomes of isolation, loneliness, and wellbeing, and narrow the digital divide. This is in preference to interventions focussing on providing technological or financial support with the hope of narrowing the digital divide, as these alone have been shown to be insufficient without the consideration of digital skills (Dogruel et al., 2015; James, 2008; Martins Van Jaarsveld, 2020). Both of these aims will be targeted by the first study in this chapter. The third aim, which will be addressed in Study 2 of this chapter, is to understand how the relationships represented in this model differ between the groups of interest (age, gender, and educational experience) as these groups have been shown to have different experiences of digital skills, isolation, loneliness, and wellbeing. Additionally, some differences in the proposed pathways

have been identified based on these demographic variables (e.g. digital inclusion being particularly important in combatting isolation for older adults (Genoe et al., 2018)).

Based on the literature presented and the stated aims, I propose the following model (see Figure 1) to represent the hypothesised relationships between the variables of interest. Broadly, I propose that digital skills are essential for combatting isolation, which in turn influences loneliness and wellbeing. To build upon this, propose the following eight hypotheses are proposed (see Table 2). Hypotheses 1-7 will be addressed in both studies, whereas Hypothesis 8 is specific to Study 2.

Figure 1. *Hypothesised model labelled with hypothesised pathways 1-6.*



Note: Pathway labels correspond to the hypothesis's numbers. '+' indicates a hypothesised significantly positive path coefficient, '-' indicates a hypothesised significantly negative path coefficient, 'x' indicates a hypothesised non-significant path coefficient.

Table 2. *The eight key hypotheses for this study.*

Label	Path	Hypothesis
H1	DS → ⁻ Isolation	A significant, negative path coefficient from digital skills to isolation.
H2	DS → ^x Loneliness	A non-significant path coefficient from digital skills to loneliness.
H3	DS → ^x Wellbeing	A non-significant path coefficient from digital skills to wellbeing.
H4	Isolation → ⁺ Loneliness	A significant, positive path coefficient from isolation to loneliness.
H5	Isolation → ^x Wellbeing	A non-significant path coefficient from isolation to wellbeing.
H6	Loneliness → ⁻ Wellbeing	A significant, negative path coefficient from loneliness to wellbeing.
H7	DS → Isolation → Loneliness → Wellbeing	A significant indirect effect from digital skills to wellbeing, via the mediators of isolation and loneliness.
H8	Not applicable	There will be significant between group differences in this model based on age, gender, and level of education.

Note: symbols above the hypothesis arrows indicate directional or non-significant pathways where appropriate: →⁺ represents a hypothesised significant, positive pathway, →⁻ represents a hypothesised significant, negative pathway, and →^x represents a hypothesised non-significant pathway.

2.2. Methods

2.2.1. Participants

Participants were recruited through the “HealthWise Wales” (*HealthWise Wales*, n.d.) mailing list of over 41,000 adult volunteers across Wales who had agreed to be contacted about health, wellbeing, and social care research projects. From this pool, 3512 participants self-selected to complete the survey. Participants were not given any incentive or compensation for their participation. The demographic information of these participants is presented in Table 3.

Table 3. *Demographic information of the 3512 participants involved in the study.*

	Description	Frequency
Gender	Man	1300
	Woman	2083
Age	18-24	20
	25-34	111
	35-44	203
	45-54	397
	55-64	850
	65+	1828
Education	No qualifications	153
	GCSE/O Level	520
	A level/BTEC	613
	Undergraduate Degree	1017
	Postgraduate Degree	812
Living Status	Alone	967
	With a partner/family	2429
	With friends/housemates	29
Sight Issues	Cannot see at all	0
	A lot of difficulty seeing	33
	Some difficulty seeing	656
	No difficulty seeing	2660
Hearing Issues	Cannot hear at all	1
	A lot of difficulty hearing	48
	Some difficulty hearing	605
	No difficulty hearing	2684
Walking Issues	Cannot walk at all	13
	A lot of difficulty walking	198
	Some difficulty walking	611
	No difficulty walking	2523
Remembering/ Concentrating Issues	Cannot remember/ concentrate at all	0
	A lot of difficulty concentrating/ remembering	56
	Some difficulty concentrating/ remembering	840
	No difficulty concentrating/ remembering	2448
Self-Care Issues	Cannot care for oneself at all	3
	A lot of difficulty with self-care	35
	Some difficulty with self-care	209
	No difficulty with self-care	3093
Communication Issues	Cannot communicate at all	4
	A lot of difficulty communicating	8
	Some difficulty communicating	128
	No difficulty communicating	3193

	Description	Frequency
Receipt of Help with Daily Tasks	No help with daily tasks	3001
	Yes, help from friends and/or family	258
	Yes, from paid carers or support staff	61
Reasons against buying new technology	Cost	945
	Not knowing how to use new technology	226
	Not seeing a reason to use new technology	706
	Privacy and security concerns	584
	There are no reasons not to use new technology	1667
	Other*	117

Note: Number of responses to each item may total less than 3512 where data was missing from the survey responses. Total responses to ‘reasons against buying new technology’ were greater than the total 3512 participants because responses were non-exclusive, and many participants selected multiple responses.

** Other responses included environmental/sustainability concerns over the production and purchase of new technology and the energy involved in running additional devices, designed obsolescence, and not wanting to replace current devices that still work.*

2.2.2. Measures

Within the survey, participants completed four key questionnaires.

1. The Essential Digital Skills Framework (EDSF) is a self-report measure used as the UK standard for assessing digital skills (Gov.UK, 2019). The EDSF is designed for use amongst adult populations and is used as a key element of “The Essential Digital Skills Report” conducted for the Department of Education annually (Lloyds Bank, 2021). Within this framework, there are 5 subscales; Communication (EDSF1-3), Handling Information and Content (EDSF4-6), Transactions (EDSF7-9), Problem Solving (EDSF10-12), and Being Safe and Legal Online (EDSF13-15) (see Table 4). These subscales were defined through consultation with leading charities, government departments, and academics to represent the essential skills needed to participate effectively in the modern, digital world. Responses to all items are limited to “yes” (scored as 1) or “no” (scored as 0) and summed to give a range of 0-3 for each subscale and 0-15 for the overall construct, with higher scores indicating greater digital skills.

2. The Lubben Social Network Scale (LSNS) is a self-report measure of the opposing concepts of social engagement and isolation (Lubben, 1988). It has been used in over 100 published studies and is assessed as having excellent validity and “good to excellent” reliability (Siette et al., 2021). It consists of two subscales that are represented by six items each: Friend isolation and family isolation. Responses are limited to a set of six options that are summed together. Scores range from 0-30 for each subscale and 0-60 for the overall construct. In this study, scores were reverse coded, so higher scores indicate greater isolation.
3. The DeJong Gierveld Loneliness Scale (DJGLS) is a self-report measure of loneliness (Gierveld, 2006). For this study, the shortened, six -item version was used. This has been extensively tested cross-culturally for reliability and validity (Gierveld & van Tilburg, 2010). The measure comprises two subscales containing three items each; emotional loneliness reflects the perceived lack of a close, partner relationship while social loneliness is the perceived lack of a broader network of social relationships. Responses are limited to “no”, “more or less”, or “yes”, and the scores are then summed. Scores range from 0-3 for the subscales and 0-6 for the overall construct. In all cases, higher scores indicate greater loneliness.
4. The Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) is a self-report measure of wellbeing designed for use in the general population (Warwick, 2021). It comprises 14 items, each with 5 response options ranging from “none of the time” to “all of the time” which would be scored as 0 and 5 respectively. Scores are summed to produce an overall construct score of 14-70, with higher scores indicating greater wellbeing.

Table 4. *Constructs involved in the SEM and their indicator variables, along with descriptions of each variable and scoring information.*

Construct	Construct Score	Variable	Variable Score	Label
Digital Skills	0-15	EDSF1	0 or 1	I can set up a group on messaging platforms, such as WhatsApp or Messenger, to talk to friends or family members.
		EDSF2	0 or 1	I can send photographs and other documents to friends and family as an email attachment.
		EDSF3	0 or 1	I can set up and use video-telephony products such as Facetime or Skype for video communications with friends and family.
		EDSF4	0 or 1	I can search for news using a browser such as Chrome, Internet Explorer or Safari.
		EDSF5	0 or 1	I can use a cloud storage account for a music or photo collection (from legal sources such as Apple iCloud, Instagram) and access the collections from different devices, such as a laptop or a smartphone.
		EDSF6	0 or 1	I can stream music from legal sites such as Spotify or Apple Music, or watch streamed movies from legal sources such as Netflix or Amazon Prime.
		EDSF7	0 or 1	I can set up online accounts with retailers to order and pay for goods online such as through Amazon or eBay.
		EDSF8	0 or 1	I can use travel websites and apps to book tickets and make reservations.
		EDSF9	0 or 1	I can set up and use online and telephone banking through websites or apps, keeping access information secure.
		EDSF10	0 or 1	I can use the internet to find specific information related to life tasks that need to be carried out, for example finding a recipe, or finding information that helps plan travel.
		EDSF11	0 or 1	I can use the help, FAQ section or chat facility of a manufacturer's website or other related content to work out how to fix an issue with a device.
		EDSF12	0 or 1	I can find out how to do something by using a tutorial video such as those found on YouTube.
		EDSF13	0 or 1	I can apply privacy settings to Facebook to ensure only friends can see posts and shared content.
		EDSF14	0 or 1	I can activate pop-up blockers on my web browser to reduce the threat from malicious sites.
		EDSF15	0 or 1	I can set automatic updates in the settings menu for the computer operating system and security software.
Isolation	0-60	LSNS1	0-5	How many relatives do you see or hear from at least once a month?
		LSNS2	0-5	How often do you see or hear from the relative with whom you have the most contact?
		LSNS3	0-5	How many relatives do you feel at ease with that you can talk about private matters?

Construct	Construct Score	Variable	Variable Score	Label
		LSNS4	0-5	How many relatives do you feel close to such that you could call on them for help?
		LSNS5	0-5	When one of your relatives has an important decision to make, how often do they talk to you about it?
		LSNS6	0-5	How often is one of your relatives available for you to talk to when you have an important decision to make?
		LSNS7	0-5	How many friends do you see or hear from at least once a month?
		LSNS8	0-5	How often do you see or hear from the friend with whom you have the most contact?
		LSNS9	0-5	How many friends do you feel at ease with that you can talk about private matters?
		LSNS10	0-5	How many friends do you feel close to such that you could call on them for help?
		LSNS11	0-5	When one of your friends has an important decision to make, how often do they talk to you about it?
		LSNS12	0-5	How often is one of your friends available for you to talk to when you have an important decision to make?
Loneliness	0-6	DJGLS1	0 or 1	I experience a general sense of emptiness.
		DJGLS2	0 or 1	There are plenty of people I rely on when I have problems.
		DJGLS3	0 or 1	There are many people I can trust completely.
		DJGLS4	0 or 1	I miss having people around me.
		DJGLS5	0 or 1	There are enough people I feel close to.
		DJGLS6	0 or 1	I often feel rejected.
Wellbeing	14-70	WEWMBS1	1-5	I've been feeling optimistic about the future.
		WEWMBS2	1-5	I've been feeling useful.
		WEWMBS3	1-5	I've been feeling relaxed.
		WEWMBS4	1-5	I've been feeling interested in other people.
		WEWMBS5	1-5	I've had energy to spare.
		WEWMBS6	1-5	I've been dealing with problems well.
		WEWMBS7	1-5	I've been thinking clearly.
		WEWMBS8	1-5	I've been feeling good about myself.
		WEWMBS9	1-5	I've been feeling close to other people.
		WEWMBS10	1-5	I've been feeling confident.

Construct	Construct Score	Variable	Variable Score	Label
		WEWMBS11	1-5	I've been able to make up my own mind about things.
		WEWMBS12	1-5	I've been feeling loved.
		WEWMBS13	1-5	I've been interested in new things.
		WEWMBS14	1-5	I've been feeling cheerful.

2.2.3. Design

All items within the four questionnaires administered yield quantitative data which will be used as indicator variables in the construction of the structural equation model (SEM). This will allow the predictive relationships reflecting the hypothesised model (see Figure 1) to be tested.

2.2.4. Procedure

Participants completed the survey using Qualtrics in either English or Welsh, taking a mean of 21 minutes. The survey was created by the author and disseminated by HealthWise Wales. Participants first read an information sheet stating the aims of the study and what types of questions they would face before providing their consent. After this, demographic information was collected (see Table 3), followed by the EDSF, LSNS, DJGLS, and the WEMWBS (see Table 4). Additional measures were gathered as part of a larger scale study that are not addressed in this chapter (EC.20.09.15.6072).

Throughout the survey, attention-check questions (e.g. “please check ‘more or less’ for this row”) were used to assess response quality. Additionally, two checkpoints reminded participants of their right to withdraw and asked them to confirm their ongoing consent. Full procedural detail can be seen in Appendix A: Information sheet, consent form, and survey tools administered to all HWW participants.

2.2.5. Structural Equation Modelling Procedure

Structural equation modelling was conducted using SmartPLS4 (Ringle, Christian et al., 2022). The indicator variables (i.e. individual items/variables taken from the four questionnaires) were standardised to a mean of 0 and a standard deviation of 1, before being automatically weighted and combined in a reflective model. This method was used because it assumes that the indicator variables reflect, rather than are caused by the underlying latent constructs. For example, this model suggests that items from the DeJong Gierveld Loneliness Scale reflect the underlying, latent construct of loneliness, rather than being caused by it. The SmartPLS algorithm then applies initial weights to the hypothesised pathways between the latent variables to maximise the *R*-squared

value. To maximise this value, and therefore the variance explained across the model, the weighting of the indicators and latent variables are iteratively adjusted until the changes to weights become insignificant. Best-practice for evaluating structural equation models will be followed to assess the validity of the inner (pathways between latent variables) and outer (latent to indicator variables) models in line with standardised thresholds (Chin, 1998; Garson, 2016). Chiefly, the average loading of indicator variables to latent variables should be >0.55 to be considered a “good” construction of the latent variable (Comrey & Lee, 1992). Following this satisfaction of these requirements, the results of the SEM can be interpreted.

2.3. Study 1 Results

2.3.1. Descriptive Statistics

The descriptive statistics of the four key measures used in the structural equation model were produced to understand the spread of the data (see Table 5 for a full report). Notably, the Essential Digital Skills Framework mean score was high ($M = 12.667$, out of a maximum of 15), indicating that the sample is highly digitally skilled. Additionally, the Warwick-Edinburgh Mental Wellbeing Scale mean is slightly lower than expected ($M = 49.900$, with UK general population means of 51.0 (Tennant et al., 2007)) with a higher standard deviation than expected ($SD = 10.406$, with UK general populations showing standard deviations of seven (Tennant et al., 2007)), indicating this variable has slightly lower but more varied scores than a general population sample.

Table 5. *Descriptive statistics of the constructs used in the SEM and their subscales.*

Construct	Possible Range of Values	Mean	Standard Deviation	Minimum Value Recorded	Maximum Value Recorded
EDSF	0-15	12.667	2.614	0	15
EDSF Communication Subscale	0-3	2.547	0.757	0	3
EDSF Information and Content Subscale	0-3	2.369	0.803	0	3
EDSF Transactions Subscale	0-3	2.802	0.524	0	3
EDSF Problem Solving Subscale	0-3	2.888	0.397	0	3
EDSF Being Safe and Legal Subscale	0-3	2.059	1.062	0	3
LSNS	0-60	28.960	10.368	1	60
LSNS Family Subscale	0-30	16.842	6.206	0	30
LSNS Friends Subscale	0-30	14.187	6.442	0	30
DJGLS	0-6	2.650	1.807	0	6
DJGLS Social Subscale	0-3	1.470	1.232	0	3
DJGLS Emotional Subscale	0-3	1.180	0.952	0	3
WEMWBS	14-70	49.900	10.406	14	70

Prior to creating the structural equation model and analysing it, potential correlations between the four key measures were assessed as an initial indication of potential relationships between variables and to be used for later comparisons to path coefficients (see Table 6). This identified a strong, negative correlation between WEMWBS and DJGLS scores, reflecting the concepts of loneliness and wellbeing. Additionally, there is a moderately positive correlation between LSNS and DJGLS scores, reflecting isolation and loneliness, and a moderately negative correlation between LSNS and WEMWBS scores, reflecting isolation and wellbeing. All of these are in line with the expected relationships based on the literature presented in the introduction of this chapter.

Table 6. Matrix of Spearman's Rho correlation coefficients amongst the four key variables represented in the SEM.

Correlations	EDSF (Digital Skills)	LSNS (Isolation)	DJGLS (Loneliness)
LSNS (Isolation)	-0.152 ($p < 0.001^*$)		
DJGLS (Loneliness)	-0.022 ($p = 0.238$)	0.528 ($p < 0.001^*$)	
WEMWBS (Wellbeing)	0.053 ($p = 0.004^*$)	-0.425 ($p < 0.001^*$)	-0.618 ($p < 0.001^*$)

Note: *correlation is statistically significant at the $p < 0.01$ threshold.

2.3.2. Model Development

In line with the stated hypotheses, the structural equation model (SEM) was created using all of the variables described in Table 4 (EDSF 1-15, LSNS 1-12, DJGLS 1-6, and WEMWBS 1-14). These observed variables were used as indicators to construct the latent variables of Digital Skills, Isolation, Loneliness, and Wellbeing (see Figure 2). The quality and fit of this model were then assessed using the PLS SEM Algorithm and Bootstrapping (Ringle, Christian et al., 2022) (see Table 7 for results and reference values).

Figure 2. The proposed SEM being assessed for fit, reliability, and validity.

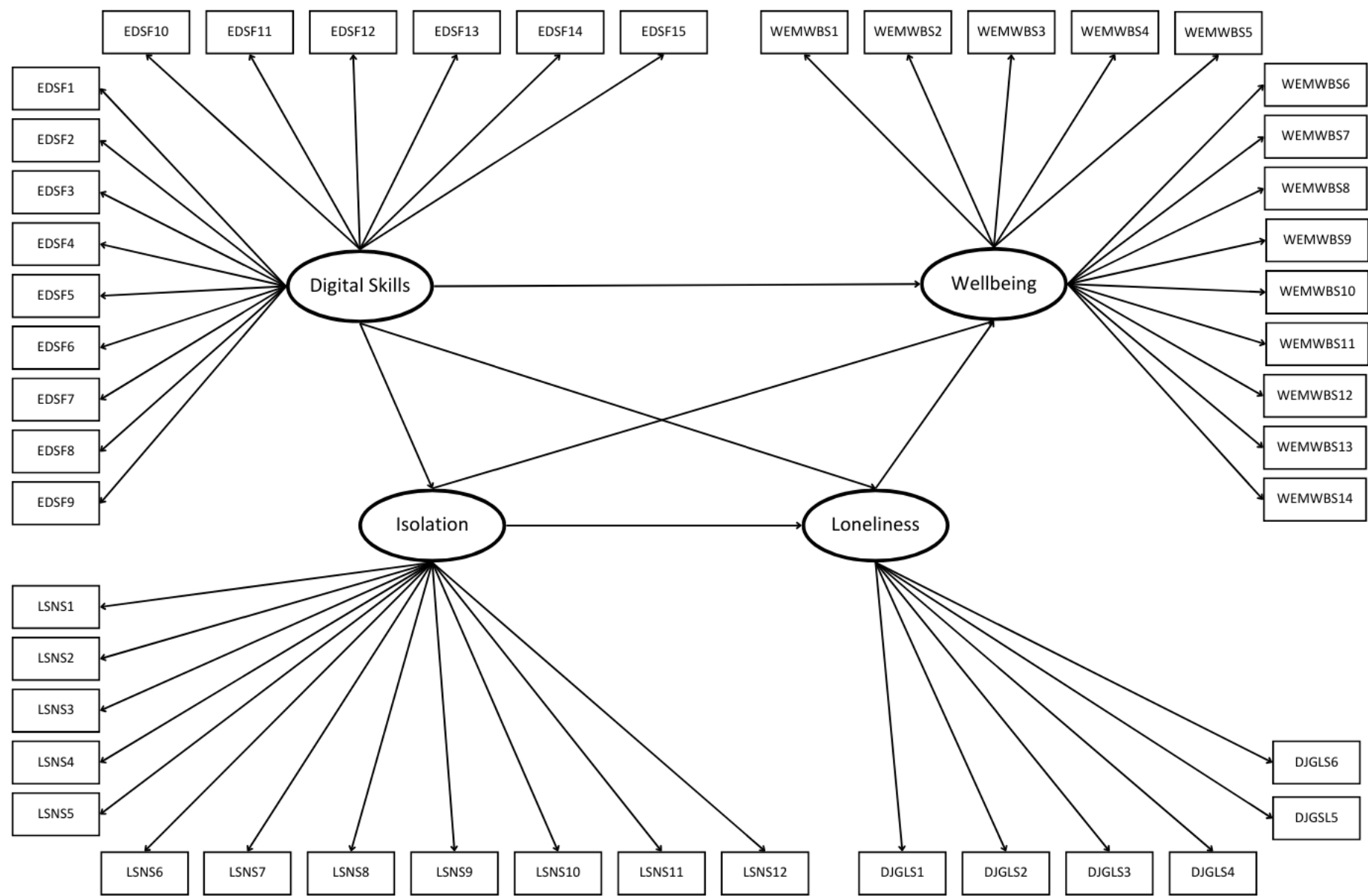


Table 7. Assessment of the created construct and variable reliability, validity, and unidimensionality, indicating appropriateness of the model.

Construct	Variables	Standard deviation	T	Collinearity	Standardized Loading	Average Standardised Loading	Internal Consistency	Composite Reliability	Convergent Validity	R ² adjusted
Reference Value				VIF < 5 (Hair et al., 2011)	Acceptable > 0.7 (Hair et al., 2006)	Fair > 0.45 Good > 0.55 Very Good > .63 Excellent > .71 (Comrey & Lee, 1992)	Cronbachs α > 0.7 (Taber, 2018)	Rho a > 0.6 / Rho c > 0.6 (Fornell & Larcker, 1981)	AVE > 0.5 (Fornell & Larcker, 1981)	
Digital Skills	EDSF1	0.021	35.905	1.522	0.752	0.484	0.813	0.810 / 0.825	0.256	
	EDSF2	0.030	14.148	1.156	0.423					
	EDSF3	0.021	34.426	1.413	0.728					
	EDSF4	0.039	6.272	1.176	0.246					
	EDSF5	0.029	22.478	1.535	0.652					
	EDSF6	0.029	21.641	1.457	0.624					
	EDSF7	0.039	8.210	1.272	0.323					
	EDSF8	0.030	17.856	1.229	0.532					
	EDSF9	0.033	13.943	1.329	0.463					
	EDSF10	0.041	6.162	1.194	0.253					
	EDSF11	0.035	12.839	1.338	0.446					
	EDSF12	0.033	11.910	1.272	0.395					
	EDSF13	0.039	12.391	1.324	0.487					
	EDSF14	0.048	9.950	1.631	0.482					
	EDSF15	0.050	8.976	1.608	0.451					
Isolation	LSNS1	0.013	50.059	2.313	0.646	0.639	0.870	0.880 / 0.893	0.414	0.046
	LSNS2	0.018	26.970	1.649	0.483					
	LSNS3	0.010	72.192	2.327	0.710					
	LSNS4	0.010	74.815	2.935	0.727					

Construct	Variables	Standard deviation	T	Collinearity	Standardized Loading	Average Standardised Loading	Internal Consistency	Composite Reliability	Convergent Validity	R ² adjusted
	LSNS5	0.014	42.642	1.908	0.604					
	LSNS6	0.011	59.203	2.107	0.678					
	LSNS7	0.013	50.466	2.436	0.652					
	LSNS8	0.017	30.360	1.862	0.520					
	LSNS9	0.012	54.712	2.408	0.667					
	LSNS10	0.010	70.648	3.007	0.727					
	LSNS11	0.015	40.046	2.221	0.591					
	LSNS12	0.013	51.161	2.507	0.662					
Loneliness	DJGLS1	0.012	58.210	1.448	0.674	0.613	0.704	0.766 / 0.799	0.431	0.353
	DJGLS2	0.008	92.207	1.841	0.772					
	DJGLS3	0.010	72.816	1.713	0.731					
	DJGLS4	0.024	3.900	1.072	0.095					
	DJGLS5	0.010	75.763	1.545	0.744					
	DJGLS6	0.013	51.578	1.471	0.665					
Wellbeing	WEMWBS1	0.011	69.052	2.135	0.736	0.776	0.950	0.955 / 0.955	0.606	0.424
	WEMWBS2	0.009	85.422	2.194	0.761					
	WEMWBS3	0.009	89.810	2.463	0.775					
	WEMWBS4	0.010	75.150	2.040	0.733					
	WEMWBS5	0.011	64.952	1.815	0.687					
	WEMWBS6	0.009	88.208	2.772	0.791					
	WEMWBS7	0.009	84.746	2.918	0.776					
	WEMWBS8	0.005	192.993	4.438	0.874					
	WEMWBS9	0.007	116.306	2.957	0.793					
	WEMWBS10	0.005	160.583	3.997	0.863					
	WEMWBS11	0.012	60.284	2.069	0.694					
	WEMWBS12	0.009	77.644	2.341	0.723					
	WEMWBS13	0.008	100.165	2.351	0.779					
	WEMWBS14	0.004	203.319	3.926	0.877					

The construction of the latent variables was examined, in part, by assessing the loading of the observed/indicator variables against established thresholds from the literature. Firstly, only 20 of the 47 indicator variables showed the suggested standardised loading of >0.7 (Hair et al., 2006) from the respective latent variable. However, the average loading for all four latent variables was sufficient to be considered at least “fair” (Comrey & Lee, 1992) (Digital Skills was “fair”, Isolation was “very good”, Loneliness was “good”, and Wellbeing was “excellent”). Further, collinearity of all indicator variables was acceptable ($VIF < 5$ (Hair et al., 2011)). Appropriate internal consistency (Cronbach’s $\alpha > 0.7$ (Taber, 2018)) was indicated for all latent variables. While convergent validity was not indicated for Digital Skills, Isolation, and Loneliness (Average Variance Extracted (AVE) < 0.5 (Fornell & Larcker, 1981)), all latent variables can be considered appropriately constructed as sufficient composite reliability was indicated (Rho a and Rho c > 0.6 (Fornell & Larcker, 1981)). Discriminant validity (HTMT > 0.85 (Hair et al., 2011)) and collinearity ($VIF < 5$ (Hair et al., 2011)) between the latent variables was acceptable (see Table 8). Collectively, these features would indicate that the construction of the latent variables was of sufficient quality to proceed.

Table 8. Matrix of collinearity (VIF) and discriminant validity (HTMT) between the constructs in the SEM.

VIF (lower triangle)/HTMT (upper triangle)	Digital Skills	Isolation	Loneliness	Wellbeing
Digital Skills		0.195	0.115	0.118
Isolation	1.000		0.704	0.491
Loneliness	1.048	1.048		0.740
Wellbeing	1.050	1.606	1.546	

Note: standard threshold of $VIF < 5$ to indicate acceptable collinearity, standard threshold of $HTMT > 0.85$ indicates acceptable discriminant validity.

However, upon examination of the indicator variables individually, it became apparent that there were a few outliers with substantially weak loading that were likely hindering the construction of their respective latent variables. Additionally, while a “Fair”

construction of Digital Skills as a latent variable is acceptable based on the literature (Comrey & Lee, 1992), this study aims for a “good” construction of latent variables at minimum. As there seemed to be opportunity for substantial improvement in the construction of Digital Skills as a latent variable this was pursued through removal of the weakest loading indicator variables.

After this, the model was reassessed using the same criteria (see Table 7) to ensure no other thresholds of model fit and quality were crossed. This process was iteratively repeated until the quality of all latent variables met the criteria to be considered “good” construction (average standardised loading > 0.55), at least. This process is summarised in Table 9.

Table 9. *Indicator variables iteratively removed.*

Variable Removed	Loading	Latent Variable	Average Standardised Loading Before Removal	Average Standardised Loading After Removal	Quality of Average Loading After Removal (Comrey & Lee, 1992)
DJGLS4	0.100	Loneliness	0.610	0.720	Excellent
EDSF4	0.246	Digital Skills	0.480	0.501	Fair
EDSF10	0.253	Digital Skills	0.501	0.520	Fair
EDSF7	0.310	Digital Skills	0.520	0.536	Fair
ESDF12	0.380	Digital Skills	0.530	0.547	Fair
EDSF2	0.417	Digital Skills	0.547	0.560	Good

2.3.3. Final Model

2.3.3.1. Assessing the Final Model

The Final Model is summarised in Table 10. Firstly, the construction of the latent variables in this model were examined, partially by assessing the loading of the indicator variables. Firstly, 20 of the 41 indicator variables showed the suggested standardised loading of >0.7 (Hair et al., 2006) with regards to their respective latent variable. However, the average loading for all four latent variables was now sufficient to be considered “good”, at least (Comrey & Lee, 1992) (Digital Skills was “good”, Isolation

was “very good”, and Loneliness and Wellbeing were both “excellent”). Further, collinearity of all indicator variables was acceptable ($VIF < 5$ (Hair et al., 2011)). Sufficient internal consistency was shown for all latent variables (Cronbach’s $\alpha > 0.7$ (Taber, 2018)). While sufficient convergent validity was not shown for Digital Skills or Isolation (Average Variance Extracted (AVE) < 0.5 (Fornell & Larcker, 1981)), all latent variables can be considered appropriately constructed as sufficient composite reliability was indicated ($Rho a$ and $Rho c > 0.6$ (Fornell & Larcker, 1981)). Finally, discriminant validity ($HTMT > 0.85$ (Hair et al., 2011)) and collinearity ($VIF < 5$ (Hair et al., 2011)) between the latent variables was acceptable (see Table 11).

Collectively, these features indicate that the indicator variables form an outer model that is sufficient to construct meaningful latent variables. Further, these latent variables and the inner model connecting them meet all the required criteria to indicate sufficient quality and fit, indicating appropriate construction and inter-relations. Further, this model meets the predetermined threshold of this study of “Good” latent variable construction as a minimum (Comrey & Lee, 1992). Because the quality and fit of the model has been evidenced, we are able to proceed with the interpretation of the modelled relationships.

Table 10. Assessment of the created construct and variable reliability, validity, and unidimensionality, indicating appropriateness of the final model.

Construct	Variables	Standard deviation	T	Collinearity	Standardized Loading	Average Standardised Loading	Internal Consistency	Composite Reliability	Convergent Validity	R ² adjusted
Reference Value				VIF < 5 (Hair et al., 2011)	Acceptable > 0.7 (Hair et al., 2006)	Fair > 0.45 Good > 0.55 Very Good > .63 Excellent > .71 (Comrey & Lee, 1992)	Cronbachs α > 0.7 (Taber, 2018)	Rho a > 0.6 / Rho c > 0.6 (Fornell & Larcker, 1981)	AVE > 0.5 (Fornell & Larcker, 1981)	
Digital Skills	EDSF1	0.021	37.176	1.502	0.767	0.560	0.800	0.794 / 0.824	0.329	
	EDSF3	0.021	35.542	1.401	0.740					
	EDSF5	0.031	21.551	1.530	0.660					
	EDSF6	0.029	21.659	1.444	0.634					
	EDSF8	0.030	17.319	1.184	0.525					
	EDSF9	0.032	13.827	1.220	0.449					
	EDSF11	0.033	12.673	1.201	0.417					
	EDSF13	0.041	12.050	1.322	0.494					
	EDSF14	0.052	9.194	1.628	0.477					
	EDSF15	0.054	8.216	1.605	0.442					
Isolation	LSNS1	0.013	50.086	2.313	0.646	0.639	0.870	0.880 / 0.893	0.414	0.046
	LSNS2	0.018	26.912	1.649	0.482					
	LSNS3	0.010	72.344	2.327	0.710					
	LSNS4	0.010	74.844	2.935	0.727					
	LSNS5	0.014	42.507	1.908	0.604					
	LSNS6	0.011	58.962	2.107	0.677					
	LSNS7	0.013	50.625	2.436	0.652					
	LSNS8	0.017	30.414	1.862	0.520					
	LSNS9	0.012	54.858	2.408	0.667					
	LSNS10	0.010	70.789	3.007	0.727					

Construct	Variables	Standard deviation	T	Collinearity	Standardized Loading	Average Standardised Loading	Internal Consistency	Composite Reliability	Convergent Validity	R ² adjusted
	LSNS11	0.015	40.092	2.221	0.592					
	LSNS12	0.013	51.225	2.507	0.662					
Loneliness	DJGLS1	0.012	58.538	1.439	0.674	0.717	0.765	0.765 / 0.842	0.516	0.354
	DJGLS2	0.008	93.445	1.835	0.772					
	DJGLS3	0.010	74.862	1.686	0.732					
	DJGLS5	0.010	76.221	1.501	0.743					
	DJGLS6	0.013	51.903	1.465	0.665					
Wellbeing	WEMWBS1	0.011	69.049	2.135	0.736	0.776	0.950	0.955 / 0.955	0.606	0.424
	WEMWBS2	0.009	85.321	2.194	0.761					
	WEMWBS3	0.009	89.863	2.463	0.775					
	WEMWBS4	0.010	75.346	2.040	0.733					
	WEMWBS5	0.011	64.897	1.815	0.687					
	WEMWBS6	0.009	88.191	2.772	0.791					
	WEMWBS7	0.009	84.765	2.918	0.776					
	WEMWBS8	0.005	192.992	4.438	0.874					
	WEMWBS9	0.007	116.452	2.957	0.793					
	WEMWBS10	0.005	160.639	3.997	0.863					
	WEMWBS11	0.012	60.303	2.069	0.694					
	WEMWBS12	0.009	77.674	2.341	0.723					
	WEMWBS13	0.008	100.099	2.351	0.779					
	WEMWBS14	0.004	203.380	3.926	0.877					

Table 11. Matrix of collinearity (VIF) and discriminant validity (HTMT) between the constructs in the SEM.

VIF (lower triangle)/HTMT (upper triangle)	Digital Skills	Isolation	Loneliness	Wellbeing
Digital Skills		0.194	0.100	0.103
Isolation	1.000		0.709	0.491
Loneliness	1.049	1.049		0.739
Wellbeing	1.050	1.609	1.548	

Note: standard threshold of VIF < 5 indicates acceptable collinearity, standard threshold of HTMT > 0.85 indicates acceptable discriminant validity.

2.3.3.2. Interpretation of the Final Model

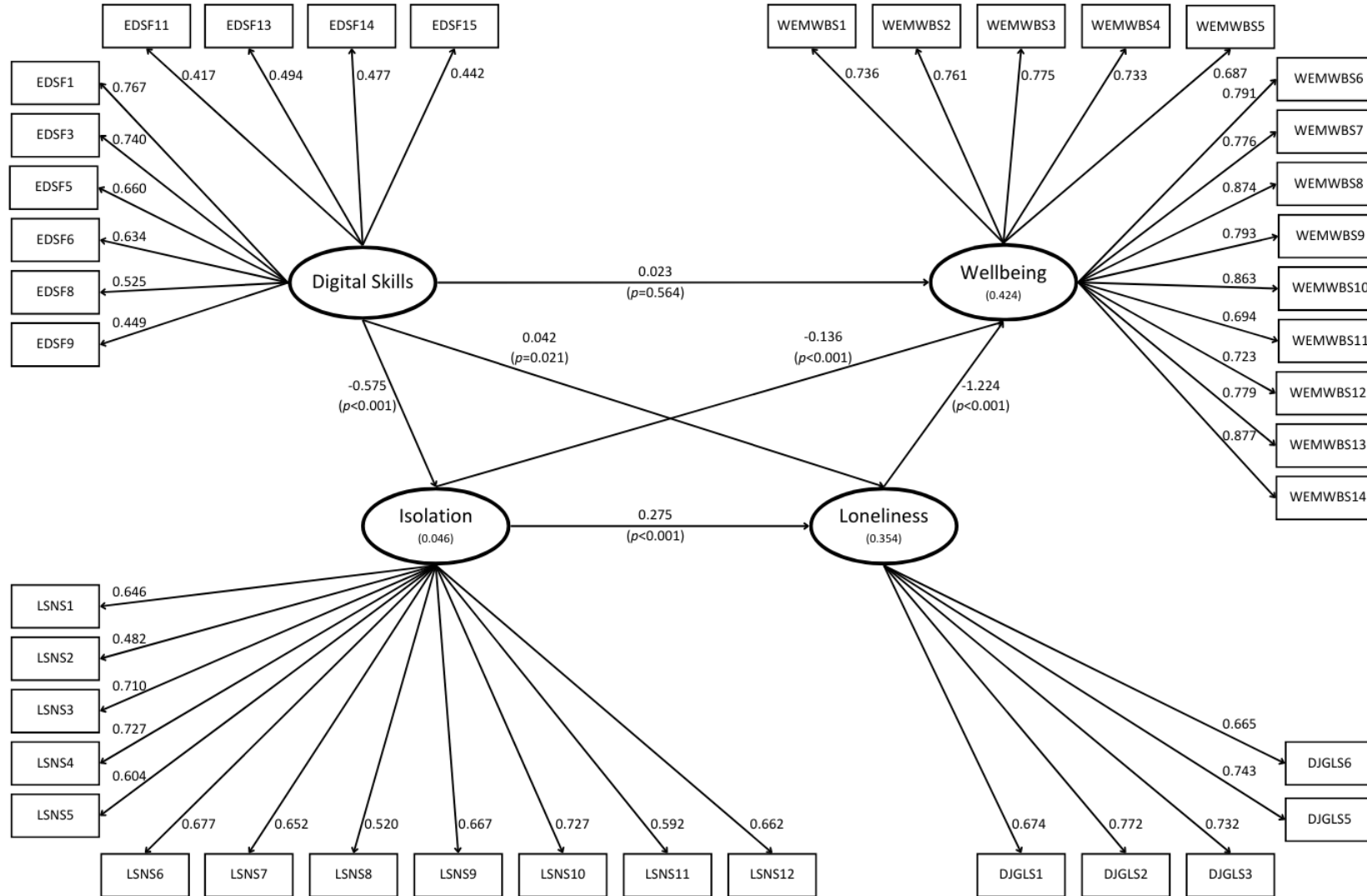
Following confirmation of appropriate model fit and quality, the path coefficients and indirect effects of the inner model (i.e. between latent variables) were examined in line with the stated hypotheses (See Table 2Table 12, and Figure 3).

Table 12. A summary of the outcomes of the structural equation model and their relationship to the key hypotheses.

	Path Coefficient/ Specific Indirect Effect	Standard Deviation	T	P	Results
H1: Digital Skills → Isolation	-0.575	0.041	14.098	<0.001*	Supported
H2: Digital Skills → ^x Loneliness	0.042	0.018	2.303	0.021	Supported
H3: Digital Skills → ^x Wellbeing	0.023	0.040	0.577	0.564	Supported
H4: Isolation → ⁺ Loneliness	0.275	0.005	51.280	<0.001*	Supported
H5: Isolation → ^x Wellbeing	-0.136	0.017	7.768	<0.001*	Not supported
H6: Loneliness → ⁻ Wellbeing	-1.224	0.031	40.086	<0.001*	Supported
H7: Digital Skills → Isolation → Loneliness → Wellbeing	0.194	0.015	12.585	<0.001*	Supported

Note: * significant at the $p < 0.05$ level.

Figure 3. The pathways and loadings of the final structural equation model.



Note: Variables in rectangles are observed/indicator variables. Variables in ovals are constructed latent variables. The values on arrows from latent variables to indicator variables are the outer loadings, all of which were statistically significant AT the $p < 0.001$ level. The values on arrows between the latent variables are the path coefficients and associated p values. The values in brackets within the latent variable ovals are the R^2 adjusted values.

Notably, Hypotheses 1-4, 6, and 7 were supported for the findings from this SEM (see Table 12). Hypothesis 1 confirmed a significant, negative pathway between the latent variables of Digital Skills and Isolation ($-0.575, p < 0.001$). Hypothesis 2 confirmed a non-significant pathway between Digital Skills and Loneliness ($0.042, p = 0.021$). Hypothesis 3 confirmed a non-significant pathway between Digital Skills and Wellbeing ($0.023, p = 0.564$). Hypothesis 4 confirmed a significant, positive pathway between Isolation and Loneliness ($0.275, p < 0.001$). Hypothesis 6 showed a significant, negative pathway between Loneliness and Wellbeing ($-1.224, p < 0.001$). These pathways are represented in Figure 3. Finally, the indirect pathway from Digital Skills to Wellbeing, via the mediators of Isolation and Loneliness was statistically significant ($0.194, p < 0.001$). However, Hypothesis 5 was not supported. This hypothesis predicted a non-significant relationship between Isolation and Wellbeing however, a significant, negative pathway from Isolation to Wellbeing was found ($-0.136, p < 0.001$).

2.4. Study 1 Discussion

2.4.1. Overview

This study aimed to investigate the digital skills of a large, general population sample as digital skills have been previously shown to be the single strongest predictor of digital inclusion/exclusion (Dogruel et al., 2015; James, 2008; Martins Van Jaarsveld, 2020). It then aimed to meaningfully connect digital skills to outcomes of isolation, loneliness, and wellbeing, incorporating pathways suggested by previous research in this area. Through these efforts, we hoped to gain a greater understanding of the relationship between digital skills and wellbeing to act as a foundation for future research and evidence informed interventions that may help to narrow the digital divide and its effects. In doing so, this study provided support for the majority of the first seven hypotheses in this chapter.

2.4.2. Evaluation of Findings

When testing the final model, support was found for six of the seven tested hypotheses in this study. Firstly, it was hypothesised that the pathway from Digital Skills to Isolation

would be a statistically significant and negative. Support was found for this, which is in keeping with previous research suggesting a relationship between these two factors. Research shows that effective use of digital technologies allows for opportunities to connect and meet new people with similar interests and/or strengthen existing social connections (European Commission, 2010; Nimrod, 2011). Further, online socialising may lead to an increase in social capital through increased opportunities for forming new social connections or joining communities (Sum, Mathews, Pourghasem, et al., 2008). Therefore, finding a significant, negative pathway between Digital Skills and Isolation supports the literature base and reflects the increasing digitisation of society and consensus that digital engagement is essential for maintaining social connections.

Hypothesis 4 posited that there would be a significant, positive pathway from Isolation to Loneliness. This hypothesis was supported by findings from the model. This concurs with previous research which shows that isolation can influence one's feelings of loneliness (Cacioppo & Patrick, 2008); social quantity can predict social quality. However, despite being significant, the coefficient of this pathway was not as high as may have been predicted from the previous research into this relationship. Further stratification of isolation as a concept may explain this; a distinction between voluntary and enforced isolation may be valuable. Voluntary isolation, often thought of as solitude or selective privacy, is not generally associated with loneliness and decreased wellbeing, instead tending to be viewed positively (Biordi & Nicholson, 2013). Conversely, enforced isolation arises from an inability to engage in social interactions and is more strongly associated with one's social needs going unmet and a sense of loneliness (Biordi & Nicholson, 2013). Additionally, as loneliness is a subjective state relating to social needs, individual differences in social needs could lead to a weaker relationship between Isolation and Loneliness for some, reflected by the path coefficient (Perissinotto et al., 2012; Weiss, 1973). Therefore, Hypothesis 4 is supported, and the weak strength of the coefficient may be explained by different aspects of isolation or individual differences in loneliness.

Hypothesis 6 was supported by finding a significant, negative path coefficient from Loneliness to Wellbeing. This is in line with a substantial body of previous work that documents and aims to explain the relationship between loneliness and wellbeing. For

example, the Belongingness Hypothesis suggests that, as we are social animals, the need for social belongingness is innate and intensely motivating and has evolved to underpin wellbeing (Baumeister & Leary, 1995). Similarly, the Social Productive Functions Theory suggests that humans innate social motivation manifests as a series of social needs that must be fulfilled for wellbeing to be achieved (Steverink & Lindenberg, 2006). Further, Social Capital Theory aims to reflect the benefits of successful social integration, primarily suggesting that social networks offer access to resources that are not available to the outgroup, such as jobs, information, and positive influences on health and social behaviours (Berkman & Glass, 2000; Bourdieu, 1985; Coleman, 1990). Conversely, the Stress Buffering Hypothesis focusses on the absence of social integration, stating that loneliness is a physically and psychologically stressful state (Cohen & Wills, 1985). We are therefore driven to reduce that stress by forming and maintaining quality social connections, in turn protecting us from the associated wellbeing consequences (Lubben & Gironda, 1996; Wong & Waite, 2016). Overall, the strong, negative pathway found in this study between Loneliness and Wellbeing could be explained by any of these hypotheses and the associated evidence from previous literature.

Finally, Hypothesis 7 reflecting the overall indirect pathway was supported in this study. This suggests that the mediators of Isolation and Loneliness are important when considering the effect of Digital Skills on Wellbeing. This relates to findings from previous research showing that a combination of isolation, loneliness, and wellbeing are often associated with digital skills. For example, computer training courses to increase digital skills and facilitate digital engagement have been shown to be effective for increasing aspects of wellbeing (reducing depression and increasing life satisfaction) and decreasing loneliness (Shapira et al., 2007). Similarly, having sufficient digital skills to play video games was associated with social inclusion (reduced isolation) and increased wellbeing (Allaire et al., 2013). Interestingly, offering accessibly designed technology can sometimes be an effective alternative to overcoming the barrier to digital inclusion often caused by low digital skills. For example, offering an accessibly designed tablet, associated with a low digital skills threshold for access, has

been shown to be effective for increasing social communication and inclusion while increasing general wellbeing (Neves, Franz, et al., 2019).

2.4.3. Summary

In summary, this study was effective in meeting its aims of sampling the digital skills of the general population and then meaningfully connecting this measure to isolation, loneliness and wellbeing in a structural equation model. In doing so, this model was found to achieve all required fit and quality criteria, and support was found for the hypothesised direction and significance of most pathways in the model (Hypotheses 1-4 and 6) and the overall indirect pathway (H7).

2.5. Study 2 Results

To build upon this model further, the following study will focus on the third aim of this chapter; to investigate differences along demographic factors that have previously been shown to influence some or all of the factors and pathways in the model. It will do so by investigating differences in the model developed in Study 1 based on demographic variables of age, gender, and education. It will test the differences in these three variables as single variable comparisons and intersectional analyses to thoroughly address Hypothesis 8: there will be significant between group differences in the model based on age, gender, and level of education.

2.5.1. Single Variable Comparisons

2.5.1.1. Data Analysis

2.5.1.1.1. Group Creation

To test Hypothesis 8, that there will be significant differences in the model based on differences in age, gender, and education, the overall sample from Study 1 was subdivided into relevant groups. In line with the standard in the literature, 65 years was taken as the cut-off point when creating the “Younger” (aged <65, $n = 1581$) and “Older” (aged ≤ 65 , $n = 1828$) groups. Self-reported gender was used to create the groups of “Men” ($n = 1300$) and “Women” ($n = 2083$). 129 individuals gave other responses when asked about their gender, however this group lacked the sample size required to sufficiently power the analyses and so were not included. Two further groups were created in response to participants educational experience. Those who had no qualifications, O levels, GCSEs, A levels, or BTECs were all grouped together as having experienced “School” level education ($n = 1286$). Those who had an undergraduate or postgraduate degree were grouped as having experienced “University” level education ($n = 1829$). The data belonging to these three pairs of groups were then analysed using the PLS SEM Algorithm and Bootstrapping, and the differences between the models were compared through Permutation Multigroup Analyses.

2.5.1.1.2. Model Construction Validity

Firstly, the fit and quality of the models for all six created groups were assessed. Based on the criteria described in Section 2.3.2. Model Development and 2.3.3. Final Model, all models met the required criteria. This is reported fully in Appendix B: Single Variable Comparison of Age for the Younger and Older groups comparison, Appendix C: Single Variable Comparison of Gender for the Men and Women groups comparison, and Appendix D: Single Variable Comparison of Education with Automatic Weighting for All Latent Variables for the School and University level education groups comparison. These confirmations of model fit and quality indicate that further analysis was appropriate.

2.5.1.1.3. Validation and Planning of further Comparisons

The second stage involved conducting MICOM analyses as part the Permutation Multigroup Analyses. Step 2 of the MICOM indicated composite invariance in the construction of the latent variables between the Younger and Older groups (see Appendix B: Single Variable Comparison of Age), and Men and Women groups (see Appendix C: Single Variable Comparison of Gender); there were no significant differences in the construction of Digital Skills, Isolation, Loneliness, and Wellbeing between these two pairs of groups. However, Step 3a and 3b of the MICOM analyses revealed some significant differences in the means and variances of the latent variables between these two pairs of groups. Collectively, these findings suggest that further interpretation of the Permutation Multigroup Analyses for Age and Gender would be meaningful.

However, when conducting the MICOM analysis to validate the comparison between the School and University education groups, Step 2 indicated there was significant differences in the construction of Wellbeing as a latent variable between these groups. This suggests that further comparisons or analysis would be inappropriate and lack meaning as the concept of Wellbeing is significantly different, and therefore incomparable, between the two groups (see Appendix D: Single Variable Comparison of Education with Automatic Weighting for All Latent Variables). To overcome this issue, the weighting mode used to construct the latent variable of Wellbeing was changed

from automatic (as with all previous analyses and models) to equal weights. The PLS SEM Algorithms, Bootstrapping, and Permutation Multigroup Analyses were then rerun. Firstly, the fit and quality of these two new models met the required criteria (see Appendix E: Single Variable Comparison of Education with an Equal Weighting of Wellbeing). This indicates that further analysis was appropriate. Secondly, step 2 of the MICOM analysis indicates that the latent variables now have compositional invariance; all four latent variables were comparably constructed by the School and University groups (see Appendix E: Single Variable Comparison of Education with an Equal Weighting of Wellbeing). This indicates that further interpretation of the MICOM analysis is valid. From this, significant differences in the means and variances of the latent variables between the School and University groups were indicated by Step 3a and 3b (see Appendix E: Single Variable Comparison of Education with an Equal Weighting of Wellbeing). Collectively, this MICOM analysis suggests that further interpretation of the Permutation Multigroup Analysis could now be meaningful.

Before interpreting the Permutation Multigroup Analysis, the issue of multiple comparisons needed to be corrected for. To do this, a Bonferroni Correction was applied conservatively adjusting the p value to account for the increased risk of a type one error associated with multiple comparisons. Each hypothesis (1-7) was tested 18 times within Study 2; six times for the two groups in each of the three Single Variable Comparisons (Age, Gender, and Education) and 12 times for the four groups in the three Intersectional Analyses. This produced a Bonferroni Corrected significance threshold of $p < 0.00294$ which will be used for Hypotheses 1-7 throughout Study 2.

2.5.1.2. Age Differences

2.5.1.2.1. Differences in Model Construction

All 41 indicator variables showed significant loadings from their respective latent variables for both groups. Of these, seven indicator variables showed significantly stronger loadings from the latent variable for the Younger group compared to the Older group, even with a Bonferroni correction for multiple comparisons of the 41 indicator variables ($p < 0.00122$). These were DJGLS1 (“I experience a general sense of emptiness”), DJGLS6 (“I often feel rejected”), WEMWBS4 (“I’ve been feeling interested

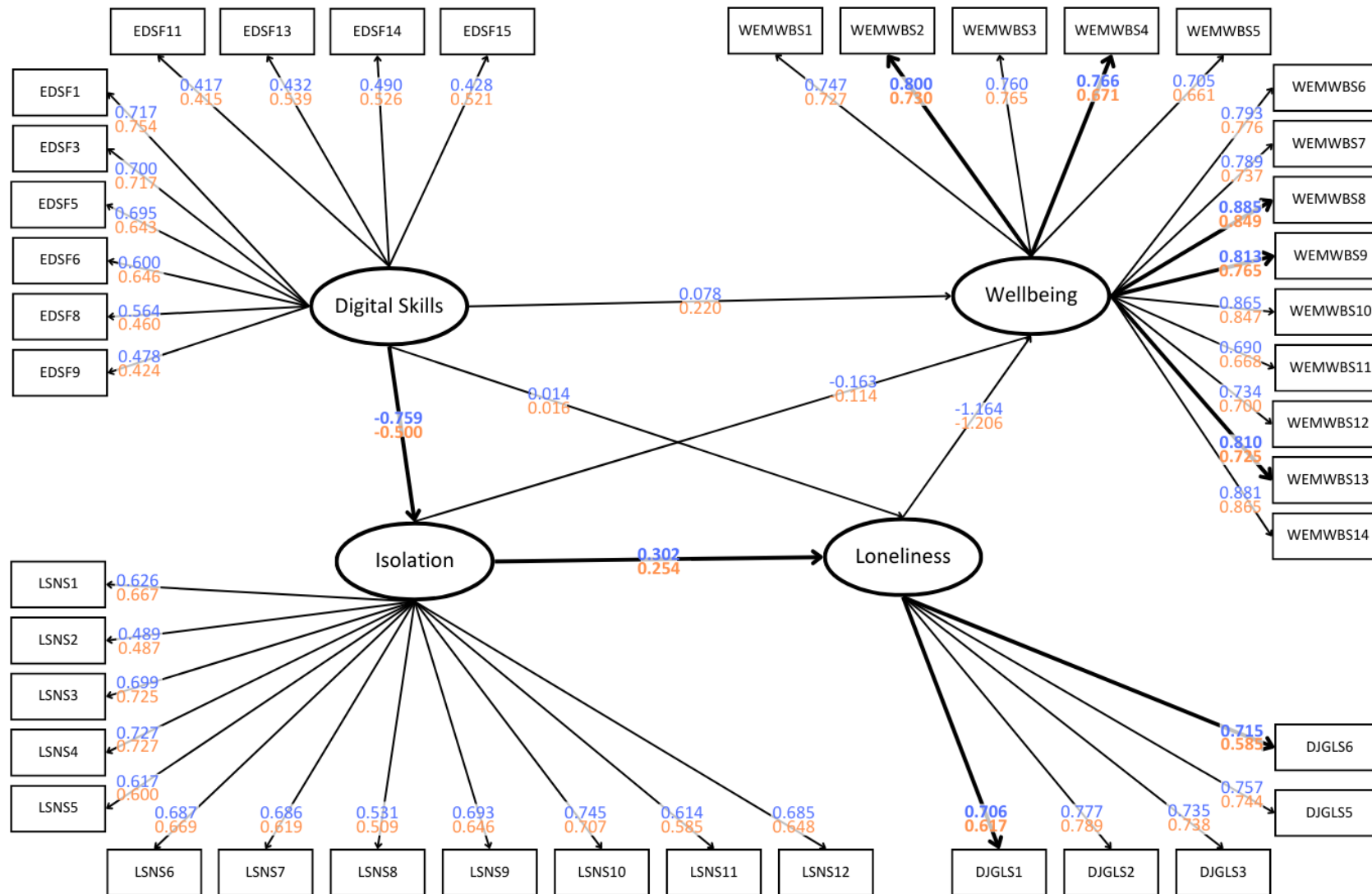
in other people”), WEMWBS8 (“I’ve been feeling good about myself”), WEMWBS9 (“I’ve been feeling close to other people”), and WEMWBS13 (“I’ve been interested in new things”). However, the other 34 indicator variables did not show a significant difference between the two groups. This is reported in full in Table 8 of Appendix B: Single Variable Comparison of Age.

2.5.1.2.2. Differences in the Pathways of the Model

For both groups, the majority of hypotheses 1-6 were met (see Table 13 and Figure 4). The pathways between Digital Skills and Isolation (H1), and Loneliness and Wellbeing (H6), were both significantly negative for both groups, as predicted. The pathways between Digital Skills and Loneliness (H2) were nonsignificant for both groups, as predicted. The pathway between Isolation and Loneliness (H4) was significantly positive, as predictive. While the pathway directly between Digital Skills and Wellbeing (H3) was weak and non-significant, as predicted, for the Younger group (0.078, $p=0.265$), this pathway was much stronger and statistically significant for the Older group (0.220, $p<0.001$). Additionally, the pathway between Isolation and Wellbeing (H5) was negative and significant for both groups, despite hypothesising a non-significant pathway, as was found in Study 1.

Further, Hypothesis 7, predicting a significant indirect effect from digital skills to wellbeing, via the mediators of isolation and loneliness, was supported by the findings from both groups (see Table 13). Interestingly, there is a significant difference in the overall specific indirect effect between the Younger (0.267, $p < 0.001$) and Older (0.153, $p<0.001$) groups, with this effect being significantly stronger for the Younger group (difference in specific indirect effect=0.114, $p < 0.001$).

Figure 4. Differences in the loadings and pathways of the structural equation model between the Younger and Older groups.



Note: Blue numbers represent the outer loadings and path coefficients from the Younger Group, orange represents the Older Group. Bold arrows and text indicate statistically significant differences in pathways or loadings at a Bonferroni corrected threshold of $p < 0.00294$.

Table 13. A summary of the differences between the path coefficients and specific indirect effect of the structural equation model in relation to the first seven hypotheses for the Younger and Older groups.

Pathways / Specific Indirect Effects	Younger		Older		Original Difference	Permutation Mean Difference	Permutation <i>P</i> Value
	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value			
(H1) Digital Skills → Isolation	-0.759	<0.001*	-0.500	<0.001*	-0.259	0.001	<0.001*
(H2) Digital Skills → Loneliness	0.014	0.657	0.016	0.482	-0.002	-0.001	0.971
(H3) Digital Skills → Wellbeing	0.078	0.265	0.220	<0.001*	-0.142	-0.001	0.069
(H4) Isolation → Loneliness	0.302	<0.001*	0.254	<0.001*	0.049	<0.001	<0.001*
(H5) Isolation → Wellbeing	-0.163	<0.001*	-0.114	<0.001*	-0.048	-0.003	0.174
(H6) Loneliness → Wellbeing	-1.164	<0.001*	-1.206	<0.001*	0.043	0.004	0.497
(H7) Digital Skills → Isolation → Loneliness → Wellbeing	0.267	<0.001*	0.153	<0.001*	0.114	-0.001	<0.001*

Note: * Indicates statistical significance at the Bonferroni corrected $p < 0.00294$ level.

2.5.1.3. Gender and Educational Differences

2.5.1.3.1. Differences in Model Construction

For both the Gender and Education comparisons, all 41 indicator variables showed significant loadings from their respective latent variables for both groups. However, there were no significant differences in the loading of any indicator variables between the Men and Women's models or the School and University models. This is reported in full in Table 8 of Appendix C: Single Variable Comparison of Gender for Gender and Table 8 of Appendix E: Single Variable Comparison of Education with an Equal Weighting of Wellbeing for Education.

2.5.1.3.2. Differences in the Pathways of the Models

For both the Gender (see Table 14) and Education (see Table 15) comparisons, the majority of hypotheses 1-6 were met. The pathways between Digital Skills and Isolation (H1), and Loneliness and Wellbeing (H6), were both significantly negative for all groups, as predicted. The pathways between Digital Skills and Wellbeing (H3) were nonsignificant for all groups, as predicted. The pathways between Isolation and Loneliness (H4) were significantly positive for all groups, as predicted. However, the pathway between Isolation and Wellbeing (H5) was negative and significant for all groups, despite hypothesising a non-significant pathway. The pathways from Digital Skills to Loneliness (H2) were non-significant for both gender groups and the School group, as predicted. However, for the University group this pathway was significant, although very weak. There were no significant differences in the strength of these pathways between Men and Women or between the School and University education groups.

Further, Hypothesis 7, predicting a significant indirect effect from digital skills to wellbeing, via the mediators of isolation and loneliness, was supported by the findings from all four groups (see Table 14 and Table 15). However, there was no significant difference in the overall specific indirect effect between the Men (0.190, $p < 0.001$) and Women's (0.190, $p < 0.001$) models (difference in specific indirect effect < 0.001 , $p = 0.991$) or School (0.178, $p < 0.001$) and University (0.224, $p < 0.001$) models (difference in specific indirect effect = -0.046, $p = 0.148$).

Table 14. A summary of the differences between the path coefficients and specific indirect effect of the structural equation model in relation to the first seven hypotheses for the Men and Women groups.

Pathways / Specific Indirect Effect	Men		Women		Original Difference	Permutation Mean Difference	Permutation <i>P</i> Value
	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value			
(H1) Digital Skills → Isolation	-0.574	<0.001*	-0.567	<0.001*	-0.006	-0.006	0.928
(H2) Digital Skills → Loneliness	0.053	0.074	0.040	0.089	0.014	-0.001	0.710
(H3) Digital Skills → Wellbeing	0.060	0.306	-0.015	0.767	0.075	-0.003	0.362
(H4) Isolation → Loneliness	0.271	<0.001*	0.286	<0.001*	-0.015	-0.001	0.192
(H5) Isolation → Wellbeing	-0.169	<0.001*	-0.150	<0.001*	-0.019	-0.001	0.590
(H6) Loneliness → Wellbeing	-1.224	<0.001*	-1.174	<0.001*	-0.050	0.000	0.446
(H7) Digital Skills → Isolation → Loneliness → Wellbeing	0.190	<0.001*	0.190	<0.001*	0.000	0.002	0.991

Note: * Indicates statistical significance at the Bonferroni corrected $p < 0.00294$ level.

Table 15. A summary of the differences between the path coefficients and specific indirect effect of the structural equation model in relation to the first seven hypotheses for the School and University education groups.

Pathways / Specific Indirect Effect	School		University		Original Difference	Permutation Mean Difference	Permutation <i>P</i> Value
	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value			
(H1) Digital Skills → Isolation	-0.514	<0.001*	-0.663	<0.001*	0.150	-0.013	0.080
(H2) Digital Skills → Loneliness	0.049	0.188	0.062	0.018	-0.013	<0.001	0.737
(H3) Digital Skills → Wellbeing	-0.029	0.695	0.052	0.395	-0.081	-0.004	0.353
(H4) Isolation → Loneliness	0.285	<0.001*	0.276	<0.001*	0.009	0.001	0.482
(H5) Isolation → Wellbeing	-0.119	<0.001*	-0.110	<0.001*	-0.009	<0.001	0.790
(H6) Loneliness → Wellbeing	-1.217	<0.001*	-1.222	<0.001*	0.006	-0.001	0.933
(H7) Digital Skills → Isolation → Loneliness → Wellbeing	0.178	<0.001*	0.224	<0.001*	-0.046	0.005	0.148

Note: * Indicates statistical significance at the Bonferroni corrected $p < 0.00294$ level.

2.5.2. Intersectional Analyses

2.5.2.1. Data Analyses

2.5.2.1.1. Group Creation

To further test Hypothesis 8, the overall sample from Study 1 was alternatively subdivided further into 12 groups that represented the intersection of two demographic variables. In line with the parameters set out in Section 5.1.1., four groups were created to represent the intersection of Age and Gender (Younger Men ($n=443$), Older Men ($n=844$), Younger Women ($n=1124$), and Older Women ($n=950$)), four for Age and Education (Younger School Experience ($n=556$), Older School Experience ($n=723$), Younger University Experience ($n=911$), and Older University Experience ($n=903$)), and four for Gender and Education (Men with School Experience ($n=487$), Women with School Experience ($n=780$), Men with University Experience ($n=691$), and Women with University Experience ($n=1113$)).

2.5.2.1.2. Model Construction Validity

Bootstrapping was then conducted on each of these 12 groups, confirming that all 12 models showed sufficient fit and quality to proceed, in line with the parameters stated in Section 3.2. and 3.3. This suggests that further analysis of these groups is appropriate.

2.5.2.1.3. Validation and Planning of Further Comparisons

Following this, six iterations of Permutation Multigroup Analyses per intersection were conducted to allow for comparisons between all possible combinations of the four groups (i.e., 18 iterations total). 16 paired comparisons passed the criteria of the MICOM analyses, allowing for meaningful interpretation of the comparisons. However, two comparisons failed the MICOM analysis: Younger Women against Older Women, and Women with School Education against Women with University Education. Both comparisons showed significantly different constructions of Wellbeing. Therefore, differences between these two pairings were not interpreted further. Additionally, the Bonferroni Corrected significance threshold of $p < 0.00294$ is used for all following analyses.

2.5.2.2. Age and Gender

Each of the four groups largely confirmed the same hypotheses as the model using the whole samples data described in Study 1 (see Table 16); all groups found significant, negative pathways between Digital Skills and Isolation (H1) and Loneliness and Wellbeing (H6), a non-significant pathway from Digital Skills to Loneliness (H2), and a significant, positive pathway between Isolation and Loneliness (H4). As with the overall model in Study 1, the findings from all four groups contradicted H5 by finding significant, negative pathways between Isolation and Wellbeing. While the Younger Men, Younger Women, and Older Men showed the predicted, non-significant pathway between Digital Skills and Wellbeing (H3), this pathway was significantly positive for Older Women. Further, the findings from all four groups supported H7 by showing significant specific indirect effects for the overall pathway (Digital Skills to Isolation to Loneliness to Wellbeing) (see Table 16).

Between-groups differences were seen in the strength of the pathways from Digital Skills to Isolation, and Isolation to Loneliness only (see Table 16). The pathway between Digital Skills and Isolation was strongest for the Younger Men (-0.970 , $p < 0.001$), with the path coefficient being significantly stronger than the other three groups. Conversely the pathway between Isolation and Loneliness was weakest for the Older Men (0.240 , $p < 0.001$), being significantly weaker from the other three groups. Differences in the specific indirect effects were seen for the overall pathway (Digital Skills to Isolation to Loneliness to Wellbeing). This effect was strongest for the Younger Men (0.342 , $p < 0.001$) and was significantly stronger than for the other three groups. Overall, these findings support H8 as there are some significant differences in the pathways of the model and the strength of the overall model between different groups when considering the intersection of age and gender.

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Table 16. A summary of the differences between the path coefficients and specific indirect effect of the structural equation model in relation to the first seven hypotheses for the four groups representing the intersection of age and gender.

Pathways / Specific Indirect Effect	Younger Men		Older Men		Younger Women		Older Women	
	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value
(H1) Digital Skills → Isolation	-0.970 ^{□○○△}	<0.001*	-0.554 [◇]	<0.001*	-0.682 [◇]	<0.001*	-0.530 [◇]	<0.001*
(H2) Digital Skills → Loneliness	-0.003	0.952	0.040	0.239	0.028	0.484	0.019	0.529
(H3) Digital Skills → Wellbeing	0.094	0.433	0.208	0.002	0.042	0.600	0.189	0.006
(H4) Isolation → Loneliness	0.307 [□]	<0.001*	0.240 ^{◇○○△}	<0.001*	0.296 [□]	<0.001*	0.273 [□]	<0.001*
(H5) Isolation → Wellbeing	-0.196	<0.001*	-0.133	<0.001*	-0.173	<0.001*	-0.127	<0.001*
(H6) Loneliness → Wellbeing	-1.149	<0.001*	-1.242	<0.001*	-1.156	<0.001*	-1.152	<0.001*
(H7) Digital Skills → Isolation → Loneliness → Wellbeing	0.342 ^{□○○△}	<0.001*	0.165 [◇]	<0.001*	0.233 [◇]	<0.001*	0.167 [◇]	<0.001*

Note: No comparisons were made directly between Younger Women and Older Women as this comparison failed Step 2 of the MICOM analysis by indicating the Wellbeing was constructed differently by each group. * Indicates statistical significance at the Bonferroni corrected $p < 0.00294$ level. ◇ = significantly different from Younger Men; □ = significantly different from Older Men; ○ = Significantly different from Younger Women; △ = Significantly different from Older Women.

2.5.2.3. Age and Education

Findings from each of the four groups in these intersectional analyses were found to largely support the same hypotheses as in Study 1 (see Table 17); all groups showed significant, negative pathways from Digital Skills to Isolation (H1) and Loneliness to Wellbeing (H6), non-significant pathways from Digital Skills to Loneliness (H2), and significant, positive pathways from Isolation to Loneliness (H4). As with the model representing the overall sample (i.e. Study 1) and the intersectional analyses of age and gender, all four groups here contradicted H5 by showing a significant, negative pathway from Isolation to Wellbeing. Additionally, as with the intersectional analysis of age and gender, three of the four groups here showed the hypothesised non-significant pathway from Digital Skills to Wellbeing (H3). However, this pathway was significant and positive for the Older University Experience group. Further, the findings from all four groups supported H7 by showing significant specific indirect effects for the overall pathway (Digital Skills to Isolation to Loneliness to Wellbeing) (see Table 17).

Between group differences were seen for the pathway from Digital Skills to Isolation. This path coefficient was weakest for the Older School Experience group ($-0.388, p < 0.001$), which was significantly weaker than the other three groups. Further, there were significant differences for the pathway from Isolation to Loneliness. This path coefficient was weakest for the Older University Experience group ($0.249, p < 0.001$), which was significantly weaker than the Younger University Experience and Younger School Experience group, possibly suggesting that this effect is driven largely by age. Additionally, this path was strongest for the Younger University Experience group ($0.302, p < 0.001$), being significantly different from both the Older School Experience and Older University Experience groups, again suggesting that this may be heavily influenced by the effect of age. The specific indirect effects of the overall pathway were strongest for the Younger University Experience group ($0.285, p < 0.001$), however this was only significantly different to the Older School Experienced group who had the weakest specific indirect effect ($0.131, p < 0.001$). Overall, these findings support H8 as there are some significant differences in the pathways of the model and the strength of the overall model between different groups when considering the intersection of age and education..

Table 17. A summary of the differences between the path coefficients and specific indirect effect of the structural equation model in relation to the first seven hypotheses for the four groups representing the intersection of age and education.

Pathways / Specific Indirect Effect	Younger School		Younger University		Older School		Older University	
	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value
(H1) Digital Skills → Isolation	-0.696 [○]	<0.001*	-0.774 [○]	<0.001*	-0.696 [○]	<0.001*	-0.774 [○]	<0.001*
(H2) Digital Skills → Loneliness	0.005	0.935	0.012	0.804	0.005	0.935	0.012	0.804
(H3) Digital Skills → Wellbeing	0.142	0.200	-0.042 [△]	0.719	0.142	0.200	-0.042 [△]	0.719
(H4) Isolation → Loneliness	0.290 [△]	<0.001*	0.302 ^{△○}	<0.001*	0.290 [△]	<0.001*	0.302 ^{△○}	<0.001*
(H5) Isolation → Wellbeing	-0.159	0.001*	-0.143	<0.001*	-0.159	0.001*	-0.143	<0.001*
(H6) Loneliness → Wellbeing	-1.165	<0.001*	-1.222	<0.001*	-1.165	<0.001*	-1.222	<0.001*
(H7) Digital Skills → Isolation → Loneliness → Wellbeing	0.235	<0.001*	0.285 [○]	<0.001*	0.235	<0.001*	0.285 [○]	<0.001*

Note: * Indicates statistical significance at the Bonferroni corrected $p < 0.00294$ level. [△] = significantly different from Younger School; [□] = significantly different from Younger University; [○] = Significantly different from Older School; [△] = Significantly different from Older University

2.5.2.4. Gender and Education

The findings from the permutation multigroup analyses of the intersection of gender and education were found to support the same hypotheses as in Study 1 (see Table 18); all four groups showed significant, negative pathways from Digital Skills to Isolation (H1) and from Loneliness to Wellbeing (H6), non-significant pathways from Digital Skills to Loneliness (H2) and from Digital Skills to Wellbeing (H3), and a significant, positive pathway from Isolation to Loneliness (H4) as expected. Additionally, all four groups supported H7 by showing significant specific indirect effects for the overall pathway (see Table 18). However, as with the findings from Study 1 and the previous intersectional analyses, all four groups supported the rejection of H5 by showing significant, negative pathways from Isolation to Wellbeing (H5).

Only one pathway showed significant between group differences; the pathway from Isolation to Loneliness was the weakest for Men with University Education (0.248, $p < 0.001$), being significantly weaker than all other groups. No other pathways or specific indirect effects showed significant between group differences amongst the intersection groups of gender and education. Overall, these findings somewhat support H8 as there is one significant difference in the pathway of the model, representing an intersectional effect of gender and education.

Table 18. A summary of the differences between the path coefficients and specific indirect effect of the structural equation model in relation to the first seven hypotheses for the four groups representing the intersection of gender and education.

Pathways / Specific Indirect Effect	Men School		Men University		Women School		Women University	
	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value	Path Coefficient / Specific Indirect Effect	Path / Effect <i>P</i> Value
(H1) Digital Skills → Isolation	-0.535	0.012	-0.665	<0.001*	-0.535	0.012	-0.665	<0.001*
(H2) Digital Skills → Loneliness	0.045	0.503	0.050	0.290	0.045	0.503	0.050	0.290
(H3) Digital Skills → Wellbeing	-0.005	0.964	0.089	0.305	-0.005	0.964	0.089	0.305
(H4) Isolation → Loneliness	0.295 [□]	<0.001*	0.248 ^{♦○○△}	<0.001*	0.295 [□]	<0.001*	0.248 ^{♦○○△}	<0.001*
(H5) Isolation → Wellbeing	-0.150	0.002*	-0.162	<0.001*	-0.150	0.002*	-0.162	<0.001*
(H6) Loneliness → Wellbeing	-1.225	<0.001*	-1.267	<0.001*	-1.225	<0.001*	-1.267	<0.001*
(H7) Digital Skills → Isolation → Loneliness → Wellbeing	0.194	0.013	0.209	<0.001*	0.194	0.013	0.209	<0.001*

Note: No comparisons were made directly between Women School and Women University as this comparison failed Step 2 of the MICOM analysis by indicating the Wellbeing was constructed differently by each group. * Indicates statistical significance at the Bonferroni corrected $p < 0.00294$ level. ♦ = significantly different from Men School; □ = significantly different from Men University; ○ = Significantly different from Women School; △ = Significantly different from Women University.

2.6. Study 2 Discussion

2.6.1. Overview

This second study aimed further investigate the model developed and tested in Study 1 by examining potential differences in subgroups of the overall sample. The demographic factors of age, gender, and education have been shown through previous research to influence some or all of the variables and/or pathways of the model developed.

Therefore, this study tested Hypothesis 8 by investigating these differences using single variable and intersectional comparisons. Support was somewhat found for Hypothesis 8, with significant differences being present between the Younger and Older age groups, but not between genders or educational experience groups. Similarly, the intersectional analyses provided some support for Hypothesis 8, as substantial differences were seen at the intersection of Age and Gender, but limited differences were seen at the intersections of Age and Education, or Gender and Education.

2.6.2. Evaluation of Findings

Firstly, significant differences were found between the Younger and Older groups when conducting the single variable comparison for age; the overall indirect pathway was significantly stronger for Younger Adults than Older adults, offering support for Hypothesis 8. This contradicts previous research suggesting that the use of technology to reduce isolation and loneliness, and promote wellbeing, may be most beneficial for older adults of any age groups, and instead highlights the importance of this for younger adults. This body of research suggested that digital skills are particularly useful for older adults to compensate for reduced mobility and geographical separation, from which they are disproportionately affected, to maintain good social connections and underpin wellbeing (Genoe et al., 2018; Hill et al., 2015; Winstead et al., 2013). Within this overall indirect pathway, the direct pathway between Digital Skills and Isolation is significantly stronger for the Younger group than the Older group. This, again, contrasts with previous research which has found that the use of the internet and social communication is particularly effective for strengthening the social networks, thereby combatting isolation, of older adults (Hogeboom et al., 2010). Despite this previous research, this

study suggests that digital skills are more strongly connected to positive psychosocial outcomes for younger adults than older adults.

Despite this contradiction with the previously examined literature, this difference between younger adults and older adults may be explained by a small pocket of research that focusses on the negative opinions of digital technology from older adults. Within this research, it is suggested that some older adults find that technology disrupts and hinders social connections, exacerbating isolation and loneliness by weakening social interactions rather than facilitating or strengthening them (Mitzner et al., 2010). Therefore, the sample investigated in this chapter may include a portion of older adults that hold such views about the lack of usefulness of technology, which underpins the digital skills they have developed, and weakens the explanatory power of the model for older adults overall. Conversely, there is a wealth of research to suggest that internet use, and the digital skills required for this, are strongly correlated with reduced isolation and loneliness among younger adults (Broady et al., 2010; Esen et al., 2013). Therefore, it may alternatively or additionally be the case that the relationship between digital skills and isolation is exceptionally strong for younger adults, and this drives the significant difference identified.

Contradictory to Hypothesis 8, no significant differences were found between Men and Women, or between School and University level education groups. This may be because previous research focusses primarily on differences in individual variables within the model based on gender or education, rather than differences in the relationships between these variables. For example, previous research finds that women are more likely to have access to the internet than men (Ihm & Hsieh, 2015; Yu et al., 2016), while men are more likely to experience loneliness than women (Barreto et al., 2021; Borys & Perlman, 1985). Similarly, previous research finds that education positively correlates with digital engagement (Czaja et al., 2006; Yu et al., 2016) and negatively correlates with isolation (Balki et al., 2023; Fernández-Carro & Gumà Lao, 2022; Gul et al., 2019). However, differences in the variables involved in the SEM does not necessarily lead to differences in the pathways between variables, as is indicated here.

Further, this lack of difference between school and university education groups particularly may be explained by the age of the research suggesting there should be a

difference. Education was once suggested to be the strongest factor for predicting digital engagement (Cruz-Jesus et al., 2016), however more recent statistics suggest that, in the UK, 93% of those who have a school-level education have access to the internet at home, compared to 98% of those with a university-level education (Eurostat, 2021). While access to the internet is not the only factor influencing digital engagement, it is perhaps indicative of digital inequalities related to educational experience narrowing in recent years.

Interestingly, when the two age groups in the single variable comparison were further subdivided to represent the intersection of age and gender, significant differences were identified between some of the groups. Notably, the overall indirect pathway, explaining the influence of digital skills on wellbeing via the mediators of isolation and loneliness, is significantly stronger for Younger Men than the other three groups. The strength of this indirect effect may be underpinned by the pathway from Digital Skills to Isolation, which is significantly stronger for the Younger Men than the other three groups. This suggests that the ability to be digitally engaged and active is particularly important for socialising to prevent isolation for younger men and, conversely, an inability to digitally engage is related to social isolation.

2.6.3. Summary

In summary, Study 2 was effective in meeting its aim of further exploring the applications of the structural equation model developed in Study 1 by investigating between group differences related to age, gender, or education. This related to Hypothesis 8, which suggested that between group differences would be found for all three of these demographic factors. The findings of Study 2 partially support Hypothesis 8, with significant differences being found between the Younger and Older groups when investigating age in isolation. Additionally, unique features were identified with the Younger Men group when investigating the intersection of age and gender. However, no substantial differences were found when investigating gender or education as single variables, or when investigating the intersection of age and education or gender and education.

2.7. General Discussion

2.7.1. Overview

Overall, this chapter had three aims. Firstly, to examine the digital skills of a large, general population sample. Secondly, to create a structural equation model to link this measure of digital skills to isolation, loneliness, and wellbeing in a way that is consistent with the suggestions from the literature. Finally, to understand how the pathways of the structural equation model differ based on differences in age, gender, and educational experience. Linked to these aims, this chapter put forth eight hypotheses. Hypotheses 1-6 related to specific pathways of the structural equation model, while Hypothesis 7 reflected the importance of the overall, indirect pathway of the model (i.e. the influence of digital skills on wellbeing via the mediators of isolation and loneliness). Hypothesis 8 reflected the hypothesised differences in the model based on age, gender and education.

The findings from Study 1 and 2 offered support for the majority of these hypotheses. Study 1 successfully produced a structural equation model using the data from the full sample that met standardised fit and quality criteria to support further analysis. From this, the model was able to offer support for the six of the seven relevant hypotheses (not supporting Hypothesis 5 in its prediction of a non-significant pathway from Isolation to Wellbeing). Most saliently, the overall indirect pathway was found to be significant and positive, suggesting that high levels of digital skills can predict high levels of wellbeing, via the mediation of reduced isolation and loneliness.

Building upon this, Study 2 replicated this support for the majority of hypotheses 1-7 (again, excluding Hypothesis 5) while also offering partial support for Hypothesis 8; significant differences were found for age, with the overall indirect effect of the model being significantly stronger for younger adults, and some differences in specific pathways. Investigating this further, the model was found to be strongest for younger men than the other three groups compared in the intersectional analysis of age and gender. However, no substantial differences were found for gender or education as individual variables, or for the intersection of age and education or gender and education. Therefore, Hypothesis 8 is only partially support, specifically in relation to its prediction that grouping the sample by age will show significant differences.

2.7.2. Evaluation of the Research

A substantial strength of the structural equation model developed in this chapter is the replicability and consistency shown through repeated analysis. The overall sample was subdivided into 18 different groups across the single variable comparisons and intersectional analyses collectively. Each of these 18 subgroups directly tested the first seven hypotheses. Despite the many ways of parsing the data, the same overall trends were largely seen for every subgroup as were shown in the original model (that involved data from the full sample); only 5 of the 126 hypotheses collectively tested by the subgroups differed from the overall model. This suggests that the model is highly consistent and may be applicable to different subgroups within the general population. Further work should be done with other general population samples, or to examine other subgroups of interest, to further support this.

Additionally, this study focussed on how an individuals' digital skills at any level can predict their psychosocial outcomes. This differs from most previous literature, which tends to focus on the effect of digital skills interventions for improving psychosocial outcomes. For example, a quasi-experimental study found that a computer training course was effective for reducing levels of loneliness among older adults (Blažun et al., 2012). Similarly, a systematic review found that a range of interventions to support e-mailing, internet, Skype and broad computer skills were effective for reducing loneliness (Ibarra et al., 2020). However, such studies are confounded by the effect of training on loneliness and isolation. Studies that trained participants to improve their digital skills involved opportunities to interact with trainers and/or the researchers, and often other participants. This leads to a confound as we cannot clearly say that the reduction in loneliness or isolation comes from the new engagement with technology and not from training-related interaction (Dickinson & Gregor, 2006). Therefore, this study has the benefit of removing this confound when attempting to clarify the relationship between digital skills and psychosocial outcomes.

An alternative interpretation of the relationship between digital skills and psychosocial outcomes is present in the research and should be considered. As referenced in Chapter 1, there is likely a degree of bidirectionality in the relationship between digital skills and psychosocial outcomes. For example, there is evidence that digital inclusion

can support socialising resulting in reduced isolation and loneliness (Neves, Franz, et al., 2019; Nimrod & Adoni, 2012). Alternatively, preexisting reliable social connections, particularly with family members, are shown to be very important for promoting the initial uptake of technology and to support new users during the initial difficulties of essential skill acquisition that underpins sustained engagement (Chang et al., 2015; Chopik, 2016; Fischl et al., 2017; Wang et al., 2011). Despite this potential bidirectionality, this chapter focusses on digital skills as the root of the theorised model. This is for two main reasons. Firstly, focussing on digital skills influencing psychosocial outcomes is in keeping with much of the research and policy; digital interventions are frequently implemented with the hope of this improving broader outcomes (Castilla et al., 2018; Miwa et al., 2017). Secondly, digital skills are an easier target for interventions with the hope of improving psychosocial outcomes (than the alternative of direct psychosocial interventions to improve digital interventions) because they are more concrete and easier to measure when assessing the interventions efficacy. For these reasons, while it is worth acknowledging the potential of bidirectionality, this chapter focussed on digital skills as the root of the model rather than the outcome.

2.7.3. Limitations and Future Directions

A limitation of this research is the sampling method used. As participants were contacted from a digital mailing list, HealthWise Wales (*HealthWise Wales*, n.d.), to participate in the study, this introduces a potentially substantial bias. This sampling method required all participants to be at least somewhat digitally engaged, having access to the internet and sufficient digital skills and confidence to engage with online surveys. This was reflected by the large proportion of participants who scored the maximum possible on the EDSF (35%), reflecting high levels of digital skills. As such, individuals who are digitally excluded and/or lack confidence when using technology may be artificially underrepresented in this sample. While this is a general issue relating to online sampling methods, it is of particular importance to consider when researching internet and technology use (Sum, Mathews, Pourghasem, et al., 2008). However, the use of online sampling methods for this exploratory and novel study were justified as

priority was given to gathering a large sample to be sufficiently powered to detect small effect sizes and to subdivide the overall sample to investigate the effects of age, gender, and education. Future research should focus on using additional analogue sampling methods, such as postal or telephone surveying, to engage and target digitally excluded individuals and gain a more representative range of digital skills abilities. This would allow for replication of the model amongst a digitally representative, or even digitally excluded, population to expand its applications. For these reasons, Chapter 3 will aim to replicate this model amongst a digitally excluded sample of older adults living in social housing.

Furthermore, while the use of quantitative data allowed for statistical prediction of wellbeing and an understanding of how strongly the variables in the model are connected, purely quantitative data does not offer an explanation as to why digital skills predict isolation, isolation predicts loneliness, etc. This may be better explained with a mixed methods approach; using quantitative data to replicate the model developed in this chapter and open-ended interviews to understand, for example, why older adults are likely to show lower digital skills and why digital skills can decrease isolation and loneliness. Particularly as digital skills are being targeted as interventions to decrease isolation and loneliness, among other wellbeing factors, the use of quantitative data would offer support for these interventions, and qualitative data would allow for specific interventions to be designed, such as fear of damaging the technology being overcome by the option to practice in a supported environment (Hill et al., 2015).

2.7.4. Conclusion

This chapter aimed to develop a structural equation model using digital skills to predict the psychosocial outcomes of a large, general population sample, and to investigate the influence of age, gender and education on this model. The produced model is able to use digital skills to significantly predict variation in wellbeing via the mediators of isolation and loneliness, as hypothesised. Additionally, this indirect pathway from digital skills to wellbeing is supported by the overall sample of this study, but also for

every stratified subgroup within sample. This indicates that the model is highly replicable and applicable to many different demographic groups.

Some between group differences were present when the overall population was stratified, for example, the model had greater predictive power for the under 65's than the over 65's. However, a limitation of this chapter was the sampling method used. An online survey was thought to be the only feasible methods to gather a sample large enough to sufficiently power this structural equation modelling and to provide sufficient group sizes when the overall sample was stratified. However, this method introduced a digital skills bias; those with the lowest digital skills are excluded from participation due to the use of an online survey for data collection. By excluding individuals with the lowest digital skills, the generalisability of this model to digitally excluded populations of interest is hindered. To overcome this, the following chapter will aim to replicate this model in a population who are at risk of having low digital skills/digital exclusion.

Chapter 3. Replicating the Mediated Effect of Digital Skills on Psychosocial Outcomes: A Digitally Excluded Sample of Older Adults in Social Housing

3.1. Introduction

3.1.1. Background

The previous chapter hypothesised and tested a novel model linking digital skills to wellbeing via the mediators of isolation and loneliness. Simultaneously a strength and a limitation of Chapter 2 was the sample. As a significant strength, Chapter 2 recruited a large, general population sample of over 3000 adults from across South Wales, providing sufficient power to facilitate structural equation modelling and subsequent stratification of the sample to investigate the effects of common demographic variables on the relationships identified by the model. However, the need to recruit a sample of this size was accompanied by the concession of the recruitment method and the subsequent bias this introduced. The previous chapter used an online survey as this was the only reasonable method to gather a large enough sample for structural equation modelling and testing for between groups difference. However, a digital recruitment method naturally leads to a positive bias in terms of the digital skills represented by the sample as those with insufficient digital skills to complete the survey would be excluded. This was indeed reflected by the high mean digital skills score with a third of the sample showing the ceiling score of digital skills, reflecting a highly digitally skilled and engaged sample. To overcome this issue, this chapter aimed to apply the structural equation model developed in Chapter 2 to a sample with lower digital skills who were recruited through non-digital methods to minimise bias. This provides an understanding of whether the model is applicable and replicable in this key group of interest.

In addition to aiming to recruit a sample with low digital skills to overcome the previous chapters sampling bias, the previous chapter also highlighted the effect of age on the model. Study 2 of Chapter 2 evidenced significant distinctions in the strength of relationships and effect sizes in the model between younger (under 65) and older (65 and over) adults. This is in keeping with previous research which suggests meaningful

differences in older adults' digital engagement compared to younger adults, and the differential effects of this digital engagement. For example, there are substantial differences in the digital engagement rates between older adults (69%) and younger adults in the UK (94%) (Ofcom, 2023). There is much additional evidence to suggest that older adults are less likely to be digitally engaged than other age groups (Aston, 2023; Prescott, 2021) and that this can have negative effects on wellbeing by compounding any existing inequalities (Yu et al., 2016). For example, there are stark inequalities in rates of social issues such as loneliness that may be compounded by digital inequalities; 7% of UK adults from a general population study report chronic loneliness (Payne, 2021) compared to 61% of older adults living in an aged care setting (Gardiner et al., 2020). Winstead et al. (2013) suggest that digital technology may be particularly important for combatting loneliness amongst older adults living in social housing, by finding that digital communication can be highly effective for maintaining and enhancing their social connections. Collectively, previous literature and the previous chapter suggests that older adults in social housing are at elevated risk of both digital and social exclusion. Therefore, this population should be treated as distinct a sample to reflect this difference.

1.1.2. This Chapter

Based on the literature presented above, the relationship between digital skills and loneliness seems to be particularly salient to older adults living in social housing as they represent a group at increased risk of both digital exclusion and loneliness. These issues can be mutually compounding. This chapter aims to test the replicability of the structural equation model from the previous chapter in a sample of older adults in social housing who are likely to show low digital skills. As discussed in Chapter 1 and Chapter 2, this interaction is likely to be bidirectional in nature; digital skills may support socialising to reduce isolation (Neves, Sanders, et al., 2019; Nimrod & Adoni, 2012), but lower levels of isolation can also reflect the social support, particularly from family members, needed to develop digital skills (Chang et al., 2015; Chopik, 2016; Fischl et al., 2017). However, as with the previous chapter, this chapter will focus on digital skills as a predictor and psychosocial factors as the outcomes. This is done for

two main reasons. Firstly, it reflects the trend within research and policy to view digital upskilling as a target for interventions with the aims to improve psychosocial outcomes and is therefore more in keeping with this field of work. Secondly, interventions to improve digital skills, with the hope of improving other outcomes, are easier to achieve and measure the success of as digital skills are a more tangible outcome compared to the volatile and complex concepts of loneliness or wellbeing. Therefore, focussing the model in the proposed direction allows it to align with and offer a theoretical underpinning to the related research.

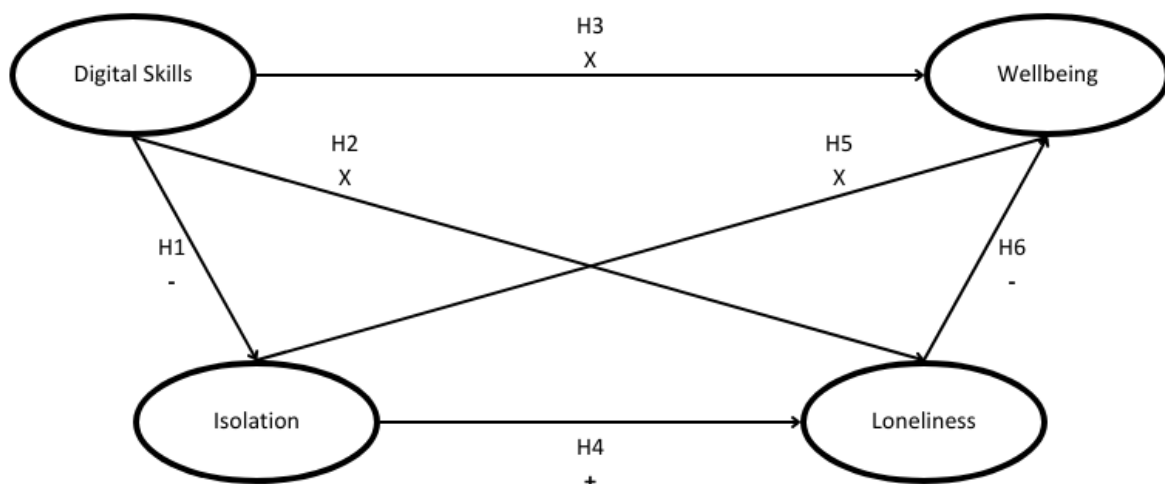
Further, targeting this unique population of interest will offer three novel contributions to the literature. Firstly, it overcomes the sampling bias from the previous chapter by conducting non-digital recruitment and removing the previously present digital barrier. Secondly, it adds a focus on digitally excluded individuals to the body of research on older adults. Thirdly, if the model is successfully replicated, it will offer an entirely novel insight into the relationship between digital skills and wellbeing, via the mediators of isolation and loneliness, to a group that are a common target for digital skills interventions. To do this, this chapter proposes the same seven hypotheses (see Table 19) and structural equation model (see Figure 5. *Hypothesised model labelled with hypothesised pathways 1-6.*) as the previous chapter that will be tested in a sample of older adults living in social housing.

Table 19. *The seven key hypotheses for Chapter 3.*

Label	Path	Hypothesis
H1	Digital Skills → ⁻ Isolation	A significant, negative path coefficient from digital skills to isolation.
H2	Digital Skills → ^x Loneliness	A non-significant path coefficient from digital skills to loneliness.
H3	Digital Skills → ^x Wellbeing	A non-significant path coefficient from digital skills to wellbeing.
H4	Isolation → ⁺ Loneliness	A significant, positive path coefficient from isolation to loneliness.
H5	Isolation → ⁻ Wellbeing	A non-significant path coefficient from isolation to wellbeing.
H6	Loneliness → ⁻ Wellbeing	A significant, negative path coefficient from loneliness to wellbeing.
H7	Digital Skills → Isolation → Loneliness → Wellbeing	A significant indirect effect from digital skills to wellbeing, via the mediators of isolation and loneliness.

Note: '→⁺' indicates a hypothesised significantly positive path coefficient, '→⁻' indicates a hypothesised significantly negative path coefficient, '→^x' indicates a hypothesised non-significant path coefficient.

Figure 5. *Hypothesised model labelled with hypothesised pathways 1-6.*



Note: Pathway labels correspond to the hypothesis's numbers. '+' indicates a hypothesised significantly positive path coefficient, '-' indicates a hypothesised significantly negative path coefficient, 'x' indicates a hypothesised non-significant path coefficient.

3.2. Methods

3.2.1. Participants

100 participants living in housing associations across South Wales were recruited as part of a larger study testing smart speakers as an intervention for independence. There were substantial difficulties in recruiting, engaging with, and maintaining the targeted 100 participants, leading to a lengthy recruitment and testing process. Early stages of recruitment and testing were made difficult due to COVID-19-related restrictions; researchers were unable to visit housing associations to recruit and interview participants. During this period of restrictions, the study relied heavily on the involvement of housing association staff to disseminate information about the study to residents and facilitate Zoom calls with those who agreed to participate. As staff capacity was already stretched due to COVID-19 requirements, recruitment and testing was initially slow. When restrictions lifted and the researchers were able to visit the housing associations in person, recruitment and testing rate improved. However, in line with previous research relating to this sample, attracting and maintaining the interest of older adults proved to be difficult (e.g. Edwards et al., 2021), slowing the progress of the study.

This study was advertised within common areas of the housing associations by staff or through coffee-morning/drop in sessions hosted by the researchers, who recorded interest expressed to them by residents. Interested residents who were over 65, did not have a diagnosis of dementia, and did not already own a smart speaker were given an information sheet and a consent form to read at their leisure before baseline testing. All participants were given an Amazon Dot as compensation for their participation. Participants ranged in age from 65 to 93 years ($M_{age} = 75.6$ years). Other demographic information is presented in Table 20.

Table 20. *Demographic information of the 100 participants involved in the study.*

	Description	Percentage (%)
Gender	Man	37
	Woman	63
Living Status	Alone	81
	With a partner	14
	With family	1
	With friends/ housemates	4
Sight Issues	Cannot see at all	1
	A lot of difficulty seeing	7
	Some difficulty seeing	32
	No difficulty seeing	60
Hearing Issues	Cannot hear at all	0
	A lot of difficulty hearing	10
	Some difficulty hearing	30
	No difficulty hearing	60
Walking Issues	Cannot walk at all	5
	A lot of difficulty walking	33
	Some difficulty walking	31
	No difficulty walking	31
Remembering/ Concentrating Issues	Cannot remember/ concentrate at all	0
	A lot of difficulty concentrating/ remembering	11
	Some difficulty concentrating/ remembering	33
	No difficulty concentrating/ remembering	56
Self-Care Issues	Cannot care for oneself at all	1
	A lot of difficulty with self-care	7
	Some difficulty with self-care	14
	No difficulty with self-care	78
Communication Issues	Cannot communicate at all	0
	A lot of difficulty communicating	2
	Some difficulty communicating	12
	No difficulty communicating	86
Receipt of Help with Daily Tasks	No help with daily tasks	60
	Yes, help from friends and/or family	18
	Yes, from paid carers or support staff	22
Technology Ownership	Smart Phone	62
	Tablet	46
	Wi-fi Internet Access	86
	Smart TV	58
	Laptop/ Computer	34
	Other*	7
	Cost	29

	Description	Percentage (%)
Reasons against buying new technology	Not knowing how to use new technology	51
	Not seeing a reason to use new technology	29
	Privacy and security concerns	24
	There are no reasons not to use new technology	16
	Other**	9

* Other types of technology owned included music players (e.g. iPods), Bluetooth enabled hearing aids, Amazon Firesticks, and smart watches.

** Other reasons participants were against buying new technology included feeling that they couldn't engage with novel technologies due to vision issues. Others felt that they would struggle to learn how to use them and would be frustrated by updates that required additional learning or would be confused by having multiple devices.

3.2.2. Measures

In addition to the demographic variables summarised above, participants completed four key questionnaires as part of their baseline interview. The Personal Wellbeing ONS (PWONS) (Office for National Statistics, 2018) is a 4-item self-report measure of subjective wellbeing (see Table 21). It is a key component of the Office for National Statistics Measuring National Well-being programme and has been part of the annual population survey since 2011 (Office for National Statistics, 2018). It captures three aspects of wellbeing (evaluative, eudemonic, and affective experience) by asking users to rate their life satisfaction, sense of worth, happiness, and anxiety on a scale from 0-10. The values relating to anxiety were flipped before being used as an indicator variable in the SEM so that the sum of all four items from the PWONS reflected greater wellbeing. The other three questionnaires (the Essential Digital Skills Framework (EDSF; Gov.UK, 2019), Lubben Social Network Scale (LSNS; Lubben, 1988), and the De Jong Gierveld Loneliness Scale (DJGLS; Gierveld, 2006) were the same as for Chapter 2.

Additional data was gathered as part of these interviews, but quantitative responses to additional questionnaires and responses to open-ended, semi-structured prompts relating to technology use and opinions. This was gathered as part of a larger project aiming to understand the social and wellbeing impact of introducing smart speakers to older adults in social housing. However, this data was not addressed within this chapter

as it does not pertain directly to this chapter's aim of replicating the model from Chapter 2.

Table 21. *Constructs involved in the SEM and their indicator variables, along with descriptions of each variable and scoring information.*

Construct	Construct Score	Variable	Variable Score	Description
Digital Skills	0-15	EDSF1	0 or 1	I can set up a group on messaging platforms, such as WhatsApp or Messenger, to talk to friends or family members.
		EDSF2	0 or 1	I can send photographs and other documents to friends and family as an email attachment.
		EDSF3	0 or 1	I can set up and use video-telephony products such as Facetime or Skype for video communications with friends and family.
		EDSF4	0 or 1	I can search for news using a browser such as Chrome, Internet Explorer or Safari.
		EDSF5	0 or 1	I can use a cloud storage account for a music or photo collection (from legal sources such as Apple iCloud, Instagram) and access the collections from different devices, such as a laptop or a smartphone.
		EDSF6	0 or 1	I can stream music from legal sites such as Spotify or Apple Music, or watch streamed movies from legal sources such as Netflix or Amazon Prime.
		EDSF7	0 or 1	I can set up online accounts with retailers to order and pay for goods online such as through Amazon or eBay.
		EDSF8	0 or 1	I can use travel websites and apps to book tickets and make reservations.
		EDSF9	0 or 1	I can set up and use online and telephone banking through websites or apps, keeping access information secure.
		EDSF10	0 or 1	I can use the internet to find specific information related to life tasks that need to be carried out, for example finding a recipe, or finding information that helps plan travel.
		EDSF11	0 or 1	I can use the help, FAQ section or chat facility of a manufacturer's website or other related content to work out how to fix an issue with a device.
		EDSF12	0 or 1	I can find out how to do something by using a tutorial video such as those found on YouTube.
		EDSF13	0 or 1	I can apply privacy settings to Facebook to ensure only friends can see posts and shared content.
		EDSF14	0 or 1	I can activate pop-up blockers on my web browser to reduce the threat from malicious sites.
		EDSF15	0 or 1	I can set automatic updates in the settings menu for the computer operating system and security software.
Isolation	0-60	LSNS1	0-5	How many relatives do you see or hear from at least once a month?
		LSNS2	0-5	How often do you see or hear from the relative with whom you have the most contact?

Construct	Construct Score	Variable	Variable Score	Description
		LSNS3	0-5	How many relatives do you feel at ease with that you can talk about private matters?
		LSNS4	0-5	How many relatives do you feel close to such that you could call on them for help?
		LSNS5	0-5	When one of your relatives has an important decision to make, how often do they talk to you about it?
		LSNS6	0-5	How often is one of your relatives available for you to talk to when you have an important decision to make?
		LSNS7	0-5	How many friends do you see or hear from at least once a month?
		LSNS8	0-5	How often do you see or hear from the friend with whom you have the most contact?
		LSNS9	0-5	How many friends do you feel at ease with that you can talk about private matters?
		LSNS10	0-5	How many friends do you feel close to such that you could call on them for help?
		LSNS11	0-5	When one of your friends has an important decision to make, how often do they talk to you about it?
		LSNS12	0-5	How often is one of your friends available for you to talk to when you have an important decision to make?
Loneliness	0-6	DJGLS1	0 or 1	I experience a general sense of emptiness.
		DJGLS2	0 or 1	There are plenty of people I rely on when I have problems.
		DJGLS3	0 or 1	There are many people I can trust completely.
		DJGLS4	0 or 1	I miss having people around me.
		DJGLS5	0 or 1	There are enough people I feel close to.
		DJGLS6	0 or 1	I often feel rejected.
Wellbeing	0-40	PWONS1	0-10	Overall, how satisfied are you with your life nowadays?
		PWONS2	0-10	Overall, to what extent do you think the things you do in your life are worthwhile?
		PWONS3	0-10	Overall, how happy did you feel yesterday?
		PWPWONS*	0-10	Overall, how anxious did you feel yesterday?

Note: * The values of PWPWONS have been flipped here in comparison to the scoring criteria, so low scores indicate high anxiety. Therefore, a high construct score for wellbeing indicates high overall wellbeing.

3.2.3. Design

The measures above yielded quantitative data that were used as indicator variables in the structural equation model (SEM) to plot predictive relationships that reflect the stated hypotheses and hypothesised model previously presented. The model produced was reviewed for goodness of fit and iteratively reviewed to assess whether fit and explanatory power can be improved.

3.2.4. Procedure

Interested housing association residents were given a consent form and information sheet to read before the baseline interview was scheduled (see Appendix F: Information and Consent Form for the Housing Association Study). Guest et al. (2020) suggest there is no meaningful difference in the data quality gathered from online surveys in comparison to interviews, so this methodological difference from Chapter 2 should not cause a meaningful difference in the data collected.

The early participants (January 2022 – October 2022) were interviewed over Zoom, facilitated by the housing association staff, due to COVID restrictions. These interviews were conducted by the author or by a research associate working on the wider project.

The later participants were interviewed in person in their homes by the author or a research assistant working on the wider project. When comparing video call to in-person interviews, Lobe et al. (2022) suggest that there are 5 factors to consider: logistics and budget, ethics, recruitment, research design, and interviewing.

Logistically, in-person interviews are preferential as they do not require a member of housing association staff to facilitate the interview by setting up the Zoom call.

Therefore, in-person interviews also only involve two parties (the interviewer and interviewee), making them easier to schedule. Additionally, in-person interviews could be considered more ethical as privacy is easier to ensure in participants own homes than in the housing association offices where staff interruptions and distractions are possible. Further, when designing the research, it is generally considered to be easier to build rapport when interviewing in person as participants are less reserved and not put off by technological glitches. In-person interviewing may also be better suited for older

adults with hearing impairments. However, recruitment is more time-consuming for in-person work as many of the partner associations are in remote and difficult to reach areas of South Wales. Generally, in-person interviews were considered to be preferable. However, these were unfeasible for the early stages of the study due to COVID-19 restrictions. Despite these apparent differences, previous research suggests that, while there may be a lower word count for online interviews, there is no meaningful difference in terms of data richness when comparing online to in person interviews (Guest et al., 2020). Further, Jenner & Myers (2019) suggest that there is no difference in self-disclosure between online and in-person interviews, limiting concerns about possible differences in data accuracy for those interviewed via Zoom compared to those interviewed in person.

Interviews took an average of 20-30 minutes and gathered data on the four measures detailed above, as well as a quantitative measure of resilience and open-ended, semi-structured questions about hobbies, technology use, and knowledge of smart speakers as part of a larger-scale study (EC.21.07.13.6369). Risks were assessed relating to in-person testing and COVID-19 and were mitigated by informing housing association staff of the time and location of testing, carrying a personal alarm, wearing face masks and taking lateral flow tests (Risk Assessment Form: 1682514314_3740).s

Participants were randomly assigned to either control or intervention conditions at baseline testing, with intervention participants having an Amazon Echo Dot installed by the researcher or housing association staff the end of the baseline interview. All participants were then interviewed again at 8-12 weeks, whereupon control participants had their Amazon Echo Dot installed. All participants were given an exit interview 6-12 months after the initial interview (see Appendix G. Interview Schedule for the Housing Association Study). However, only data gathered from the initial, baseline interview (prior to the introduction of the smart speakers) is analysed in this chapter.

3.2.5. Structural Equation Modelling Analysis

Structural equation modelling was conducted using Smart PLS4 (Ringle, Christian et al., 2022) following the same procedure as stated in Chapter 2. Similarly, the validity of the

internal and external models was assessed in line with the standard thresholds stated in Chapter 2 before the results of the SEM were interpreted, as suggested by Garson (2016) and Chin (1998). A sample of 100 participants was appropriate for this method based on the “10-times rule”, which suggests that the minimum sample for PLS-SEM is 10 times the highest number of paths terminating a latent variable (Kock & Hadaya, 2018). In this case, three paths terminate at Wellbeing, making 30 a reasonable estimate for minimum sample size. While increasing the sample size beyond 100 would have been ideal to increase the power of the PLS-SEM, this was deemed unfeasible due to difficulties with recruitment discussed previously.

3.3. Results

3.3.1. Descriptive Statistics

First, descriptive statistics of the scales used in the structural equation model were produced to understand the spread of the data (see Table 22 for a full report). Notably, PWONS mean score, representing overall wellbeing, was high ($M=30.87$), reflecting an average “high” wellbeing amongst the sample based on the surveys scoring guidelines (Office for National Statistics, 2018). However, the standard deviation of PWONS was high ($SD=7.29$), indicating high variability in wellbeing scores within the sample. Additionally, EDSF mean score was low ($M=4.91$), showing that the average participant could only complete one out of every three digital skills surveyed. The weakest subscales reflected skills about safe and legal use of the internet ($M=0.78$), and communication ($M=0.93$). The standard deviation was high ($SD=5.39$), suggesting there was high variability in the digital skills of this sample.

Table 22. *Descriptive statistics of the constructs used in the SEM and their subscales.*

Construct	Possible Range of Values	Mean	Standard Deviation	Minimum Value Recorded	Maximum Value Recorded
EDSF	0-15	4.91	5.39	0	15
EDSF Communication Subscale	0-3	0.93	1.15	0	3
EDSF Information and Content Subscale	0-3	1.05	1.16	0	3
EDSF Transaction Subscale	0-3	1.09	1.28	0	3
EDSF Problem Solving Subscale	0-3	1.07	1.28	0	3
EDSF Safe and Legal Subscale	0-3	0.78	1.17	0	3
LSNS	0-60	27.67	11.94	4	60
LSNS Family Subscale	0-30	12.45	6.74	0	30
LSNS Friends Subscale	0-30	15.33	7.82	3	30
DJGLS	0-6	1.61	1.68	0	6
DJGLS Emotional Subscale	0-3	0.91	0.97	0	3
DJGLS Social Subscale	0-3	1.01	0.71	0	3
PWONS	0-40	30.87	7.29	5	40
PWONS1	0-10	7.70	2.10	0	10
PWONS2	0-10	7.85	2.02	0	10
PWONS3	0-10	7.92	1.97	2	10
PWONS4	0-10	7.01	3.12	0	10

*Note: *Low scores of Anxious4 indicate high anxiety, high scores indicate low anxiety.*

Prior to creating the structural equation model, potential correlations between the four key constructs were assessed as an initial indication of potential relationships between variables and to be used for later comparison to path coefficients (see Table 23 for the correlation matrix).

Table 23. Matrix of Spearman's Rho correlation coefficients amongst the four key variables represented in the SEM.

Correlations	EDSF (Digital Skills)	LSNS (Isolation)	DJGLS (Loneliness)
LSNS (Isolation)	-0.265 ($p=0.010^*$)		
DJGLS (Loneliness)	-0.119 ($p=0.249$)	0.389 ($p<0.001^{**}$)	
PWONS (Wellbeing)	0.249 ($p=0.019^*$)	-0.270 ($p=0.011^*$)	-0.333 ($p=0.002^{**}$)

Note: $^*p < 0.05$; $^{**}p < 0.01$.

3.3.2. Model Fit Assessment

In line with the stated hypotheses, the below structural model was created using all of the variables from Table 21 (EDSF1-15, LSNS1-12, DJGLS1-6, and PWONS1-4) as indicators of the latent variable(s) of Digital Skills, Isolation, Loneliness, and Wellbeing respectively (see

Figure 6). The quality and fit of this model was assessed using the PLS4 SEM Algorithm and Bootstrapping (Ringle, Christian et al., 2022) (see Table 24 for results and reference values).

Figure 6. *The proposed SEM being assessed for fit, reliability, and validity.*

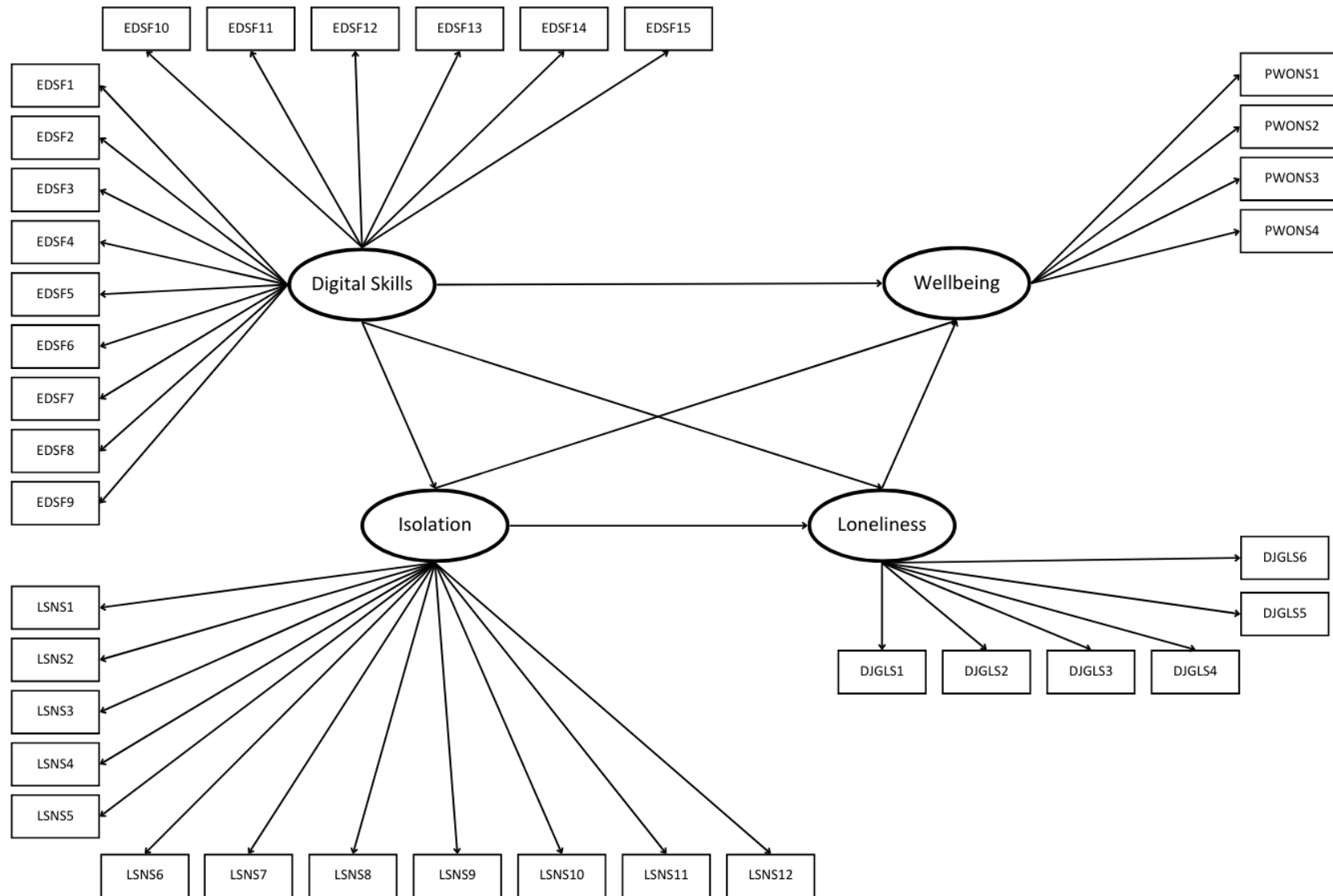


Table 24. Assessment of created construct and variable reliability, validity, and unidimensionality, indicating appropriateness of the SEM.

Construct	Variables	Standard deviation	T	Collinearity	Standardized Loading	Average Standardised Loading	Internal Consistency	Composite Reliability	Convergent Validity	R ² adjusted
Reference Value				VIF < 5 (Hair et al., 2011)	Acceptable > 0.7 (Hair et al., 2006)	Fair > 0.45 Good > 0.55 Very Good > .63 Excellent > .71 (Comrey & Lee, 1992)	Cronbachs α > 0.7 (Taber, 2018)	Rho a > 0.6 / Rho c > 0.6 (Fornell & Larcker, 1981)	AVE > 0.5 (Fornell & Larcker, 1981)	
Digital Skills	EDSF1	0.074	9.713	2.199	0.717	0.774	0.952	0.958/ 0.957	0.601	
	EDSF2	0.070	10.900	2.161	0.758					
	EDSF3	0.085	7.853	2.224	0.664					
	EDSF4	0.066	11.944	2.893	0.782					
	EDSF5	0.084	8.381	2.646	0.700					
	EDSF6	0.074	9.771	2.238	0.728					
	EDSF7	0.062	13.670	4.251	0.847					
	EDSF8	0.073	10.799	3.158	0.784					
	EDSF9	0.068	11.733	3.229	0.793					
	EDSF10	0.064	12.648	3.624	0.805					
	EDSF11	0.063	13.356	4.147	0.837					
	EDSF12	0.064	13.230	4.077	0.845					
	EDSF13	0.071	11.285	4.114	0.797					
	EDSF14	0.076	9.798	2.909	0.742					
	EDSF15	0.067	12.003	3.205	0.804					
Isolation	LSNS1	0.094	6.973	3.230	0.656	0.616	0.860	0.881/ 0.883	0.395	0.077
	LSNS2	0.128	3.178	2.033	0.408					
	LSNS3	0.092	7.177	2.074	0.658					
	LSNS4	0.068	11.214	3.262	0.759					
	LSNS5	0.106	4.872	1.711	0.515					

Construct	Variables	Standard deviation	T	Collinearity	Standardized Loading	Average Standardised Loading	Internal Consistency	Composite Reliability	Convergent Validity	R ² adjusted
	LSNS6	0.101	5.442	1.783	0.550					
	LSNS7	0.092	7.527	3.050	0.696					
	LSNS8	0.129	3.771	2.245	0.488					
	LSNS9	0.078	9.853	3.987	0.771					
	LSNS10	0.085	8.682	3.545	0.735					
	LSNS11	0.135	3.310	1.797	0.447					
	LSNS12	0.099	7.176	2.537	0.712					
Loneliness	DJGLS1	0.076	9.695	1.362	0.737	0.638	0.726	0.781/ 0.810	0.428	0.277
	DJGLS2	0.095	7.592	1.973	0.723					
	DJGLS3	0.162	2.499	1.291	0.406					
	DJGLS4	0.112	5.079	1.291	0.568					
	DJGLS5	0.056	15.221	2.249	0.845					
	DJGLS6	0.125	4.401	1.252	0.550					
Wellbeing	PWONS1	0.050	16.900	1.924	0.848	0.789	0.799	0.819/ 0.870	0.628	0.165
	PWONS2	0.060	13.413	2.078	0.804					
	PWONS3	0.050	16.589	1.973	0.837					
	PWONS4	0.092	7.267	1.316	0.666					

The construction of the latent variables was primarily assessed by examining the loading of the observed variables in line with established thresholds from the literature. Firstly, only 23 of the 37 indicators had the required standardised loading of >0.7 (Hair et al., 2006) from the relevant latent variable. However, the average standardised loading for all latent variable was sufficient to be considered at least “good” (Comrey & Lee, 1992) (Digital Skills and Wellbeing were “excellent”, Loneliness was “very good”, and Isolation was “good”), so this indicated the construction of the latent variables was sufficient. Further, collinearity of all indicator variables was acceptable ($VIF < 5$ (Hair et al., 2011)).

Internal consistency of all the latent variables met the required thresholds to indicate appropriate construction (Cronbach’s $\alpha > 0.7$ (Taber, 2018)). While convergent validity of Isolation and Loneliness was not indicated (Average Variance Extracted (AVE) < 0.5 (Fornell & Larcker, 1981), these latent variables can still be considered appropriately constructed as composite reliability (Rho a and Rho c > 0.6 (Fornell & Larcker, 1981) was indicated. Additionally, Digital Skills and Wellbeing met the required thresholds to assume sufficient convergent validity and composite reliability. Further, discriminant validity (HTMT > 0.85 (Kline, 2011) and collinearity ($VIF < 5$ (Hair et al., 2011) between latent variables was acceptable (see Table 25).

Table 25. *Matrix of collinearity (VIF) and discriminant validity (HTMT) between the constructs in the SEM.*

VIF (lower triangle)/HTMT (upper triangle)	Digital Skills	Isolation	Loneliness	Wellbeing
Digital Skills		0.359	0.205	0.277
Isolation	1.000		0.606	0.331
Loneliness	1.094	1.094		0.449
Wellbeing	1.094	1.513	1.412	

Note: standard threshold of $VIF < 5$ to indicate acceptable collinearity, standard threshold of $HTMT > 0.85$ to indicate acceptable discriminant validity.

Overall, this suggests that the indicator variables form an outer model that is sufficient to construct meaningful latent variables. Further, these latent variables meet all required quality and fit criteria, indicating appropriate construction and inter-relations. This suggests the model overall is appropriate to continue with further interpretation of the SEM analysis.

3.3.3. Interpretation of the Structural Equation Model

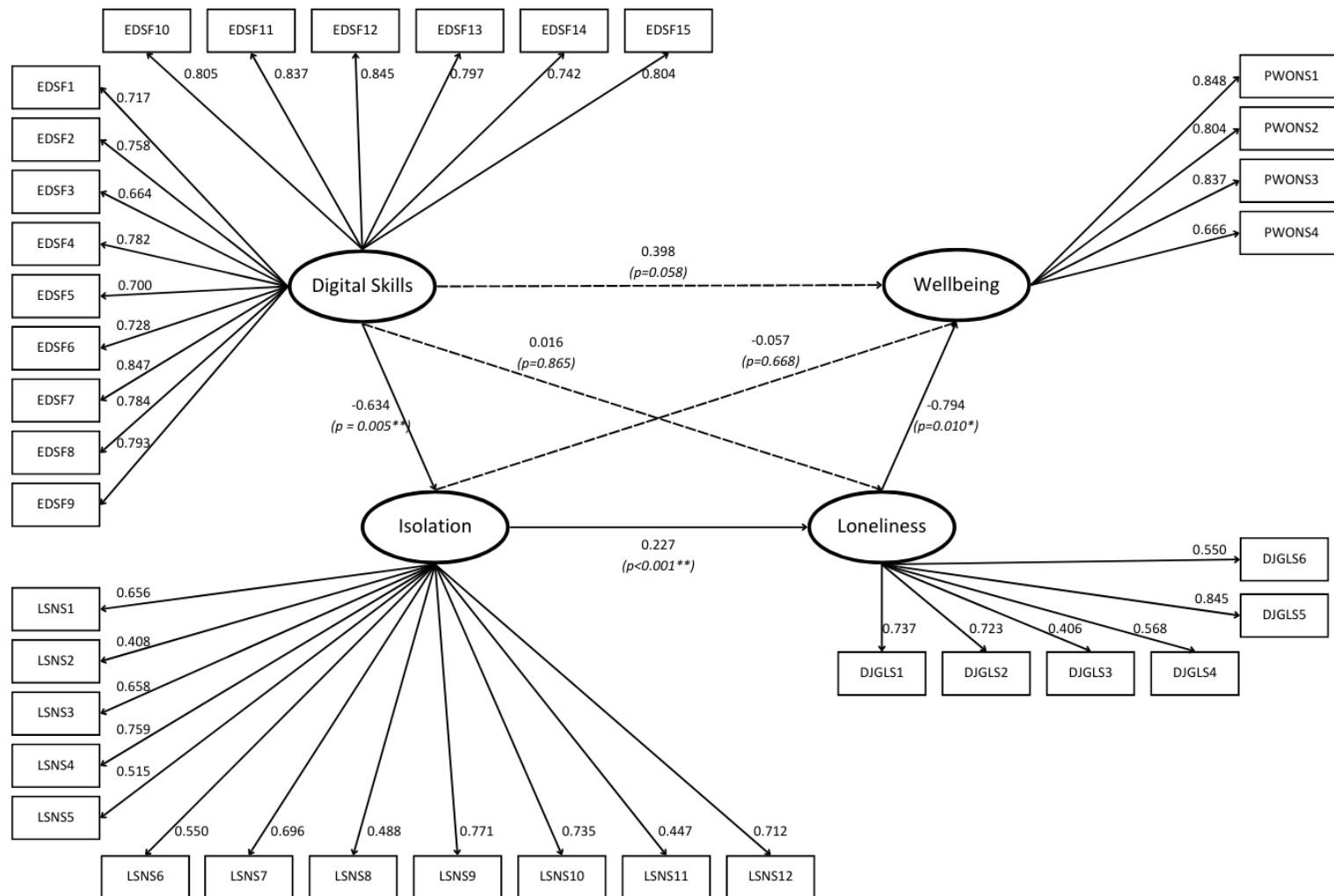
Following confirmation of appropriate model fit and quality, the path coefficients and indirect effects of the inner model (i.e. between latent variables) were examined in line with the stated hypotheses (see Figure 7 and Table 26).

Table 26. A summary of the outcomes of the structural equation model and their relationship to the key hypotheses.

	Path Coefficients/ Specific Indirect Effects	Standard Deviation	T	P	Results
H1: Digital Skills → Isolation	-0.634	0.227	2.796	0.005**	Supported
H2: Digital Skills → ^x Loneliness	0.016	0.097	0.170	0.865	Supported
H3: Digital Skills → ^x Wellbeing	0.398	0.210	1.894	0.058	Supported
H4: Isolation → ⁺ Loneliness	0.227	0.033	6.835	<0.001**	Supported
H5: Isolation → ^x Wellbeing	-0.057	0.132	0.429	0.668	Supported
H6: Loneliness → ⁻ Wellbeing	-0.794	0.306	2.591	0.010*	Supported
H7: Digital Skills → Isolation → Loneliness → Wellbeing	0.114	0.069	1.645	0.100	Not Supported
Digital Skills → Isolation → Loneliness	-0.144	0.061	2.357	0.018*	N/A
Isolation → Loneliness → Wellbeing	-0.180	0.082	2.207	0.027*	N/A

Note: * $p < 0.05$; ** $p < 0.01$.

Figure 7. A structural equation model reflecting the key hypotheses, linking digital skills to isolation, loneliness and wellbeing.



Note: Path labels represent indicate path coefficients for the inner model and outer loadings for the outer model. All outer loadings are statistically significant to the $p < 0.005$ threshold. Dashed lines indicate a non-significant path coefficient. $^{*}p < 0.05$; $^{**}p < 0.001$.

Notably, the first six hypotheses reflecting individual paths in the inner model were all strongly supported (H1-6), in terms of positive/negative path coefficients for H1 (-0.634, $p = 0.005$), H4 (0.227, $p < 0.001$) and H6 (-0.794, $p = 0.010$) and lack of significance for H2 (0.016, $p = 0.865$), H3 (0.398, $p = 0.058$), and H5 (-0.057, $p = 0.668$). This indicates validity of the direct inner model; Digital Skills was able to predict Isolation, Isolation was able to predict Loneliness, and Loneliness was able to predict Wellbeing (see Figure 7 and Table 26). Additionally, the pathways show stronger path coefficients than correlation coefficients (see Table 23), likely due to a suppression effect on the correlations.

However, H7, hypothesising that the overall indirect pathway would be significant, was not supported (0.114, $p = 0.100$). This suggests that the relationship between Digital Skills and Wellbeing was not significantly mediated by Isolation and Loneliness (see Table 26). However, there were some significant mediations present. Digital Skills significantly predicted Loneliness via the mediator of Isolation (-0.144, $p = 0.018$), and Isolation significantly predicted Wellbeing via the mediator of Loneliness (-0.180, $p = 0.027$) (see Table 26).

3.4. Discussion

3.4.1. Overview

This chapter aimed to test the replicability of the structural equation model developed in the previous chapter amongst a sample of older adults in social housing who showed low digital skills. In doing so, this chapter makes novel contributions to the digital skills and gerontology literature by applying the model to a subgroup of interest who are at heightened risk of digital and social exclusion and overcoming the sampling bias of the previous chapter. This would offer additional information about the relationship between digital skills and wellbeing amongst this group. Associated with this aim were seven hypotheses, six of which related to specific pathways in the model while the 7th represented the indirect effect (see Table 19).

3.4.2. Evaluation of Findings

The first six hypotheses were all supported by the SEM analyses: each individual pathway showed the expected directionality (i.e. positive or negative) and significance. This suggests the model has been reasonably replicated from the original general population sample to this sample of older adults with lower digital skills. This adds reliability and robustness to the findings from the previous chapter by replicating it in an additional sample.

H1 was supported in its prediction of a low digital skills predicting higher levels of isolation. This is in keeping with previous research on digital skills amongst older adults which highlight the importance of digital skills to access online communication and stay in touch with relations (Genoe et al., 2018; Hill et al., 2015). Further, a systematic review on interventions to support digital skills amongst older adults found that these are effective for supporting online communication and increasing social engagement, thereby suggesting a reduction in isolation (Ibarra et al., 2020). Additionally, Winstead et al. (2013) found that older adults in residential care are disproportionately impacted by social and spatial separation, leading to isolation. However, the use of ICT can allow for geographical and temporal barriers to communication to be overcome, facilitating the maintenance of their social networks to prevention of isolation. This evidences the importance of digital skills for facilitating social engagement to prevent isolation and relates to the negative path coefficient seen between skills and isolation in this model.

H4 predicted that high levels of isolation will be associated with high levels of loneliness, and this hypothesis was supported by the model. This is strongly supported by the literature, suggesting that infrequency of social contact (isolation) can impact perceived quality of social contact (loneliness) (Cacioppo & Patrick, 2008). However, the relationship between isolation and loneliness is not directly proportional, as reflected by the pathway coefficient (0.227), due to individual differences in social desire; while voluntary isolation is suggested to lead to positive outcomes from achieving desired privacy, enforced isolation can lead to loneliness and negative wellbeing outcomes (Biordi & Nicholson, 2013). This may suggest that the concept of isolation being reflected in this model more closely aligns to enforced isolation as there is a positive relationship with loneliness.

H6, suggesting that high loneliness will predict lower wellbeing, is supported by the findings from this sample. This is consistent with both a social evolutionary perspective (Coleman, 1990) and the Stress-Buffering Model (Wong & Waite, 2016). The social evolutionary perspective views fulfilment of humans innate social needs as essential for psychological wellbeing (Brooks et al., 2020; Coleman, 1990; Taylor et al., 2018), reflecting the findings of this chapter, as well as physiological wellbeing (Valtorta et al., 2016). Similarly, this relationship between loneliness and wellbeing is expanded upon by the Stress-Buffering model which suggests that high quality social relationships can offer protection from stressors and associated negative consequences (Wong & Waite, 2016) thereby promoting wellbeing. The inverse of both theories suggests that loneliness would be associated with increased stress and reduced wellbeing, supporting the findings from this model. Additionally, the lack of significance for H2, H3 and H5, as hypothesised, confirm that any direct relationships between these variables is minimal or better explained by another, significant mediated pathway in the model.

Further, H7 suggested that the total indirect pathway would be significant, based on findings from the previous chapter. However, this hypothesis was not supported by the findings from this sample. Despite this, isolation was found to mediate the relationship between digital skills and loneliness, and loneliness was found to mediate the relationship between isolation and wellbeing. The non-significance of the total indirect pathway may be due to differences in the measure of wellbeing used in this chapter compared to the previous chapter; the difference in measure may be representing a different construct of wellbeing, leading to a difference in whether this outcome can be predicted by the model or not.

3.4.3. Implications

These findings offer a pathway to potentially explain the evidenced effects of digital inclusion interventions. Many interventions aiming to increase digital inclusion focus on either improving digital skills through training to provide individuals with the skills needed to overcome the barriers to inclusion. For example, a computer training course was found to be effective for increasing older adults' digital skills and decreasing

feelings of loneliness (Blažun et al., 2012). Similarly, a systematic review showed that a wide range of interventions to support digital use (such as emailing, engaging with the web browsers, Skype, and general computer skills) were also effective for reducing loneliness (Ibarra et al., 2020). These findings that digital skills can underpin digital communication that reduces loneliness relate to this chapter's demonstration of the mediated effect of digital skills on loneliness, via isolation. This chapter adds strength to the relationship between digital skills and loneliness discussed in the literature, while suggesting that isolation is a key mediator for this relationship. It is particularly pertinent to understand the factors influencing loneliness in this population, as chronic loneliness is a widespread social issue for this group, impacting an estimated 60% of older adults in social housing (Gardiner et al., 2020).

The replication of the structural equation model in this chapter overcomes the main limitation of the previous chapter; the use of an online survey preventing digitally excluded individuals from participating. This prevented reliable inferences from being made about the relationship between digital skills and wellbeing for those with the lowest digital skills. Therefore, largely replicating this structural equation model amongst a population with substantially lower digital skills supported hypotheses 1-6 and offered reliability to the model proposed by Chapter 2.

3.4.4. Limitations and Future Research

As previously mentioned, this chapter is limited in the comparison that can be drawn directly to the previous chapter due to the difference in the measure of wellbeing used. The previous chapter administered the Warwick-Edinburgh Mental Wellbeing Scale, consisting of 14 items, as part of an online survey. However, this chapter used an interview technique to gather data from digitally excluded older adults in social housing. As such, the time demands placed upon the participants, in terms of maintaining attention and ensuring quality of responses, and the researchers, in terms of feasibility of interviewing a sample of this size, were primary considerations. As such, the shorter PWONS measure was chosen to assess wellbeing as it is appropriate to use in this

sample, consists of only four items, and has better accessibility (Benson, 2022), thereby saving both participants and researchers' time.

A further limitation of this chapter was the sample size recruited. For this chapter, the priority was recruiting a digitally excluded sample of older adults in social housing to theoretically investigate a population that is frequently the target of digital interventions and to overcome the previous chapters sampling issue. As many other studies have found, this is a traditionally hard-to-reach sample that is time intensive to recruit and test, with consistent retention issues (Edwards et al., 2021). As such, 100 participants were the largest sample that could be feasibly recruited based on these issues and practical constraints. While this is a large sample size of older adults in social housing relative to other studies of this population (e.g. Jones et al. (2021) had a sample of 16 and Kim & Choudhury (2021) had a sample of only nine), this was still substantially smaller than the sample from the previous chapter ($n = 3845$). As such this sample size was insufficient for between group comparisons such as those conducted amongst the larger sample from the previous chapter. This limits the knowledge that can be gained about the effect of demographic variables, such as gender or education level, on the relationships in the model. The absence of this information prevents further stratification of which subgroups, within the older adult population, show the strongest relationship between digital skills and loneliness, and therefore who may benefit most from digital skills interventions to improve loneliness. Further research may wish to examine intersectional effects among this population on this model.

Additionally, future research may wish to employ this proposed model when assessing the outcomes of digital skills interventions. Older adults living in social housing should have their baseline levels of digital skills, isolation, loneliness, and wellbeing assessed prior to any intervention. At regular intervals during and following the intervention period, these measures should be repeated. This would allow for changes in these variables to be tracked over time and to experimentally test this proposed pathway. This would then contribute to more theoretically driven research in the field.

3.4.5. Conclusion

This chapter aimed to replicate the model proposed and tested in Chapter 2 in a sample of digitally excluded older adults living in social housing, as an example of a population at high risk of digital and social exclusion. To do this, data from 100 participants was gathered, largely through face-to-face and facilitated Zoom interviews to avoid digital skills acting as a barrier to participation. From these data, a structural equation model produced using digital skills to predict wellbeing via the mediators of isolation and loneliness. While digital skills were unable to predict wellbeing through the indirect mediated pathway, two partial mediations of interest were present; isolation mediated the prediction of digital skills to loneliness, and loneliness mediated the prediction of isolation to wellbeing. These findings, combined with those from Chapter 2, reflect a perspective of the digital divide that emphasises the role of digital skills as a determinant of inclusion and the associated, in this case psychosocial, benefits. The following two chapters of this thesis comprise Section 2 and will reflect the perspective that the design of technology underpins the digital divide by focusing on smart speakers as an example of accessibly designed, socially capable mainstream technology.

Chapter 4. “Alexa, What Do You Mean to Me?”: A Scoping Review and Model of Parasocial Relationship Formation with Smart Speakers

4.1. Introduction

4.1.1. Background

As discussed in Section 1.3.3., smart speakers are accessibly designed devices that rely on intuitive, speech-controls. They host socially capable, virtual agents, such as Amazon’s Alexa for Echo devices or the Google Assistant for the Google Home. These agents are designed to automate and streamline everyday tasks with assistive services (e.g., setting alarms and reminders), access to multimedia and information through web services, and social assistance (Han & Yang, 2018). Smart speakers are reliant on voice-recognition software and the use of natural language processing servers that are accessed via the internet to allow the user to conversationally control the device (Han & Yang, 2018). Alongside their low price point, this contributes to their accessibility, particularly for groups that may struggle to navigate alternative, visual-interface devices (e.g. those with low digital skills (Blocker et al., 2020), or physical (Jamwal et al., 2020), cognitive (Smith et al., 2020), and sensory impairments (Abdolrahmani et al., 2020)). For many, the purchase of a smart speaker represents the first introduction of ‘human-like’ artificial intelligence into the home environment.

The presence of smart speakers reflects the emergence of a new era in human-computer interactions (HCI); we no longer use technology simply as a method to communicate with other people, rather, we aim to communicate with the technology itself (Voit et al., 2020). Further, the increasing success and ubiquity of smart speakers incites a need to understand this shift from a psychosocial perspective, considering why social interactions with virtual agents are becoming so common and what the outcomes of these interactions are.

4.1.2. Anthropomorphism

Anthropomorphic design is pivotal to the success of smart speakers (Cao et al., 2022; Wu et al., 2019). As discussed in Chapter 1, anthropomorphism is the tendency to assign human traits and characteristics to non-humans, for example, ascribing motivations, emotions, or intentions to non-human animals or objects (Epley et al., 2007; Nass & Moon, 2000). Anthropomorphic principles are frequently harnessed in design to promote user engagement. The goal of anthropomorphic design is to create an object that triggers widely held schemata about positive social traits, leading to the attribution of these traits to the designed object (Aggarwal & McGill, 2007; Schweitzer et al., 2019). This becomes more relevant and complex, however, when considering socially capable technology such as artificially intelligent agents or robots. When anthropomorphic design is successfully achieved and social schemata are triggered, users can begin to perceive these devices as possessing some human-like qualities.

This is exemplified by the design of smart speakers; possessing a name, a human-like voice, and a gendered persona supports the illusion of an anthropomorphic entity. Gao et al. (2018) and Chung et al. (2020) both conclude that users' frequent attribution of human she/her pronouns to their smart speakers constitutes anthropomorphic activations and underpins the linguistic theory of ontological categorisation; mindlessly assigning human-like pronouns to smart speakers self-fulfils to deepen the perception of smart speakers as human-like, furthering the anthropomorphic attributions (Pradhan et al., 2019; Voit et al., 2020).

4.1.3. Computers are Social Actors (CASA) Paradigm

Perception of technology as human-like can indicate social potential (Gambino et al., 2020). As technology ceaselessly progresses, we see an increase in the social cues and affordances that can be demonstrated to users, leading to a heightened perception of social potential (Fox & McEwan, 2017). Representing this, the Computers are Social Actors (CASA) paradigm suggests that humans mindlessly produce social behaviour in response to computers that activate our social schemata (Reeves & Nass, 1996).

Perception of a computer as a social actor commonly leads to users adhering to social

norms, such as politeness, when interacting with the computer (Jones et al., 2021; Nass et al., 1994)), and preferring socially capable computers over non-social computers (Baxter et al., 2017; Fogg & Nass, 1997; Gong, 2008; Lee et al., 2012).

Smart speakers meet both criteria required to be viewed as socially capable actors: they present sufficient social cues and are an independent social source (rather than only transmitting social information from other sources) (Voit et al., 2020). This perception of smart speakers as social actors is evidenced by users' presentation of mindless, overlearned social behaviours, such as saying 'thank you' or 'good morning', despite conscious awareness that they are unnecessary or inappropriate (Pradhan et al., 2019); users subconsciously perceive the smart speaker to be a social actor and so mindlessly apply social scripts and norms and when interacting with them. Individuals who live alone or are isolated are more likely to perceive their smart speaker as a social actor, likely arising from the increased sociality motivation (Voit et al., 2020).

4.1.4. Parasocial Relationships

Repeated interactions with a social agent can lead to a parasocial relationship.

Parasocial relationships originally described the phenomenon of perceived social relationships and an illusion of intimacy with television personalities (Horton & Wohl, 1956) among some viewers. Parasocial relationships have similarities with human-human interactions in that they can be deeply socially gratifying but are distinct in that they are unidirectional and non-reciprocal.

Parasocial relationships have been documented with smart speakers, underpinned by their pro-social design features (Wienrich et al., 2023). Users report feeling a sense of friendship with and even love for their smart speaker (Cho et al., 2019; Oh et al., 2020), reflecting a parasocial illusion of intimacy (Horton & Wohl, 1956). Further, despite evidence that users converse similarly with their smart speaker as with other humans (e.g. in the way that rapport develops (Cerekovic et al., 2017)), the interactions are non-reciprocal as the virtual agent cannot incite conversations or express human-like features such as emotions, wants or thoughts. For these reasons, users' relationships with smart speakers can be classified as parasocial.

4.1.5. This Chapter

To date, there exists a large body of HCI research focussing on understanding why people interact with socially capable technology, and what the implications of these interactions are. This has led to findings that humans can form relationships with digital agents that resemble human-human relationships in terms of self-disclosure, feelings of warmth, and shared ideas (Loveys et al., 2022). Further, the emotional expressions of socially capable technology, such as empathy and emotional understanding, are particularly important for encouraging users to engage socially (Ling et al., 2021). Often this research has been conducted with devices whose main purpose is to mimic human-like relationships or to provide some kind of social value.

Compared to other, socially capable technology, less research has focused directly on the parasocial potential of smart speakers, possibly because they are primarily designed as virtual assistants rather than social agents. However, for many people, they represent the first introduction of human-like artificial intelligence into their homes and are now extremely common (present in over 65% of US homes (Laricchia, 2022) and 50% of UK homes (Laricchia, 2023)). Therefore, even if only a small percentage of people form parasocial relationships with their smart speakers, the absolute numbers may be substantial because the user base is so vast.

Research that does investigate smart speakers tends to focus on functional interactions, such as mapping feature use (Furini et al., 2020), barriers to adoption (Wallace & Morris, 2018), and privacy concerns (Cha et al., 2019). Despite their clear social capabilities, far less research has considered the psychosocial implications of repeated interactions with these socially capable digital agents. Of the research that does consider this, there is a lack of consensus regarding the methods and measures used to understand this topic and a lack of synthesis of the resultant findings.

For these reasons, this chapter aims to systematically review the current literature on social aspects of smart speaker use. A particular focus is placed on the outcomes and implications of relationships formed with their smart speakers, the factors influencing

these relationships, and the methods used to gather these findings. As such, this chapter will address three research questions:

- RQ1:** What outcomes arise from forming a relationship with a smart speaker?
- RQ2:** What user attributes have been reported in association with forming relationships with smart speakers?
- RQ3:** What methodological approaches have been used to research relationship development with smart speakers? What are the merits and drawbacks of these approaches?

4.2. Methods

4.2.1. Protocol

A scoping review method was used to produce a systematic and comprehensive overview of this unmapped research topic (Arksey & O'Malley, 2005). This method was the most appropriate due to the exploratory research questions, lack of prior synthesis on the topic, and active research in this area (Colquhoun et al., 2014). The protocol for this scoping review was established prior to commencement and followed the PRISMA guidelines for scoping reviews (Page et al., 2021) and detailed 20-item, PRISMA extension checklist for scoping reviews (PRISMA-ScR) (Tricco et al., 2018). Additionally, the five-stage process for conducting scoping reviews, outlined by Arksey and O'Malley (2005) was followed.

4.2.2. Sources of Information

A search was conducted on the 2nd of February 2024 to identify literature relating to relationships with smart speakers. The following databases were searched due to their coverage of technology and social science topics: Association of Computing Machinery (ACM), Association for Information Systems (AIS), Institute of Electrical and Electronics Engineers (IEEE), Science Direct, Scopus, and Web of Science. (See Appendix F: Information and Consent Form for the Housing Association Study

Information and Consent **Form**

What is the study about?



We are researchers from Cardiff University, and we want to find out what people think about new ‘smart speaker’ devices (like the Amazon Alexa or Google Home). These are small devices that you have in your home, which you can control by speaking to them and asking questions and making requests. The smart speaker has lots of functions. For example, you can ask it to play music, and it can remind you to do things, tell you about the weather, news, and other information. We want to find out what people think about using smart speakers and how they might impact their day-to-day life.

What does the study involve?

As part of the study, you will receive a free smart speaker. Staff at your housing association will set up a [insert model name] smart speaker for you in your home. They will then set up a meeting with a researcher from Cardiff University called [researcher name], who will explain to you how to use the device. The researcher will also ask you to take part in an interview, which will take about an hour, and will ask you questions about your daily life, your thoughts and feelings, the things you find challenging or easy to do, and your technology use.

You will then be given the smart speaker to use at home for four months. If you have any problems using the smart speaker, you can call [researcher name] on [researcher number] or ask one of the staff at your housing association.

At the end of the four months, you’ll have another interview with [researcher name], which will take about an hour. They will ask you questions about your experience of using the devices and also repeat some of the questions about your daily life and thoughts and feelings.

The researcher will meet with you once more after 12 months, to interview you again for about an hour and see if anything has changed and what your experience with the devices has been.

Smart speaker information

It is possible to make purchases with smart speakers, but this function will be turned off.

Smart speakers will constantly listen for the wake word [alexa/hey google], but it will not record this information and send it to Amazon/Google. If you say the wake word, the device will start recording any sounds in the room and send these to your amazon/google account.

Good/amazon are able to use the recording to improve their services. If you don't want the device to monitor for the wake word you can switch it off at the plug socket.

We are collecting two types of information from the devices: 1. Activity log and 2. Audio recordings. These recordings will be stored confidentially, only seen/heard by the small research team and recordings will be deleted after the research is completed. If you would prefer not to share this information with us, then you can still participate in the study. If you would like us to delete any or all of the recordings at any point, just get in touch and we will delete them permanently.

1. Activity log: This is a log in your smart speaker app that shows what questions have been asked to the smart speaker and when. It is in text format.

2. Audio recordings: This is the recordings of the verbal interactions with your smart speaker that are stored in your account. The smart speaker only records when it is activated by the wake word. You can see when the smart speaker is recording as the light will be on/flashing when it is activated and recording. There is the potential for the smart speaker to record the voices of people who are visiting you and have not agreed to take part in the research study, therefore we would advise you to ask visitors not to use the smart speaker. The small team of researchers who can access the recordings will also delete any that include unknown voices. All recordings will be stored confidentially and will not be shared or distributed. The only exception to this is if the recordings contain disclosures of certain types of illegal activities (physical or sexual abuse of minors, the physical abuse of vulnerable adults, money laundering, and terrorism), were there is a legal obligation to report them to the local authority or police.

Why do we want to look at this information?

The reason we are collecting this information is so that we can assess what features are used and the amount and type of errors.



What are the benefits and risks of taking part?

The results of this study will help us to find out what people think about using smart speakers, and if they are useful in day-to-day life. One of the benefits of the study is that you get to keep a free smart speaker.

There are no major risks to taking part. All data will be securely stored and confidential, meaning that it will only be accessible to the researchers in this study. It will not be shared or sold to any third parties. Any presentation or publication of the data will be completely anonymous, which means it will not be possible to personally identify you. The data will be retained for 10 years and then destroyed.

Can I change my mind about taking part?

You can withdraw from the study at any point without giving a reason, even once the study has started. To withdraw, simply tell a member of staff at your housing association to call [researcher name] on [researcher phone number].

If you have any questions or worries about the study, please contact [researcher name] on [research number].

If you have any ethical concerns about the research, please contact:

School of Psychology Research Ethics Committee

Cardiff University, 70 Park Place, Cardiff, CF10 3AT

psychethics@cardiff.ac.uk

029 2087 6707

Please tick the box

if you agree



I am happy to take part in this study	
I am happy to share the activity log from my smart speaker	
I am happy to share the audio recordings from my smart speaker	

Signed.....

Date.....

Appendix G. Interview Schedule for the Housing Association Study

Baseline interview

- Could you tell me about some of your interests and hobbies? What do you like to do in your spare time?
- How has the COVID-19 pandemic affected your life?
- Can you tell me about the devices you use in your daily life? For example, how often do you use them and for what sort of things?
- Do you use any assistive technologies to help you do things in day-to-day life?
- Did you use technology more or less during the pandemic?
- Do you face any barriers to using technology?
 - If you do face barriers, do you receive any help and support to use them?
- If you had a smart speaker, what do you think you would use it for?

T1 and T2 Interviews

- Do you like using the smart speaker?
- What do you like about it?
- What do you use the smart speaker for?
 - Do you use it for making phone calls or video calls?
 - Do you use it like a virtual companion?
 - Do you use it to control the home environment?
- How often do you use smart speaker?
- Do you tend to use the smart speaker when you're alone or when other people are around?
 - Do you find that you use it differently when other people are around?
- Did someone help you to learn to use it?
- Did you have enough training to understand how to use the device?
- Did the smart speaker change how well you could do things for yourself?
- Did the smart speaker ever frustrate you?
- Do you have any concerns about using the device?
- Do you ever worry about privacy or security?
- In what way did you find Alexa similar or different to a real person?
- Does Alexa provide company? E.g. when you're alone?
- Do you ever see the smart speaker as a friend or companion?

4.2.3. Study Identification

Inclusion of literature in this review was limited to those that met the following criteria:

1. Studies published between the 1st of November 2014 (the date when the first smart speaker was released to the open market (Mutchler, 2017) and the 2nd of February 2024 (the date the literature search was conducted).
2. Studies that report empirical data reflecting users' relationships with their smart speaker or describing the social value derived from their smart speaker. This excludes papers that are exclusively theoretical or methodological, do not relate to smart speakers, or , do not discuss users' relationships or social interactions with a smart speaker.
3. Studies with an abstract and published in English.

The initial search yielded 4841 records, which were reduced to a sample of 151 following title and abstract screening, and a final sample of 30 following full-text screening using the above criteria (see Figure 8. *Study selection process based on PRISMA guidelines for scoping reviews (Page et al., 2021).* for full details).

In line with stage 10 and 11 of the PRISMA-ScR (Tricco et al., 2018), a data-charting form was developed to determine what variables to extract. The following variables were determined to be relevant to the research questions and were therefore extracted from all 30 records (where possible). Data was extracted for extrinsic characteristics (e.g., authors), methodology (e.g., samples, measures), and findings relating to social value. The characteristics of the sources of evidence (stage 15 of the PRISMA-ScR; Tricco et al., 2018) are presented in

Table 27. *Summary of the 30 papers included in this scoping review (step 17 of the PRISMA-ScR: Results of individual sources of evidence (Tricco et al., 2018)., alongside a description of the variables of interest.*

Figure 8. Study selection process based on PRISMA guidelines for scoping reviews (Page et al., 2021). This constitutes stage 14 (selection of sources of evidence) from the PRISMA-ScR (Tricco et al., 2018).

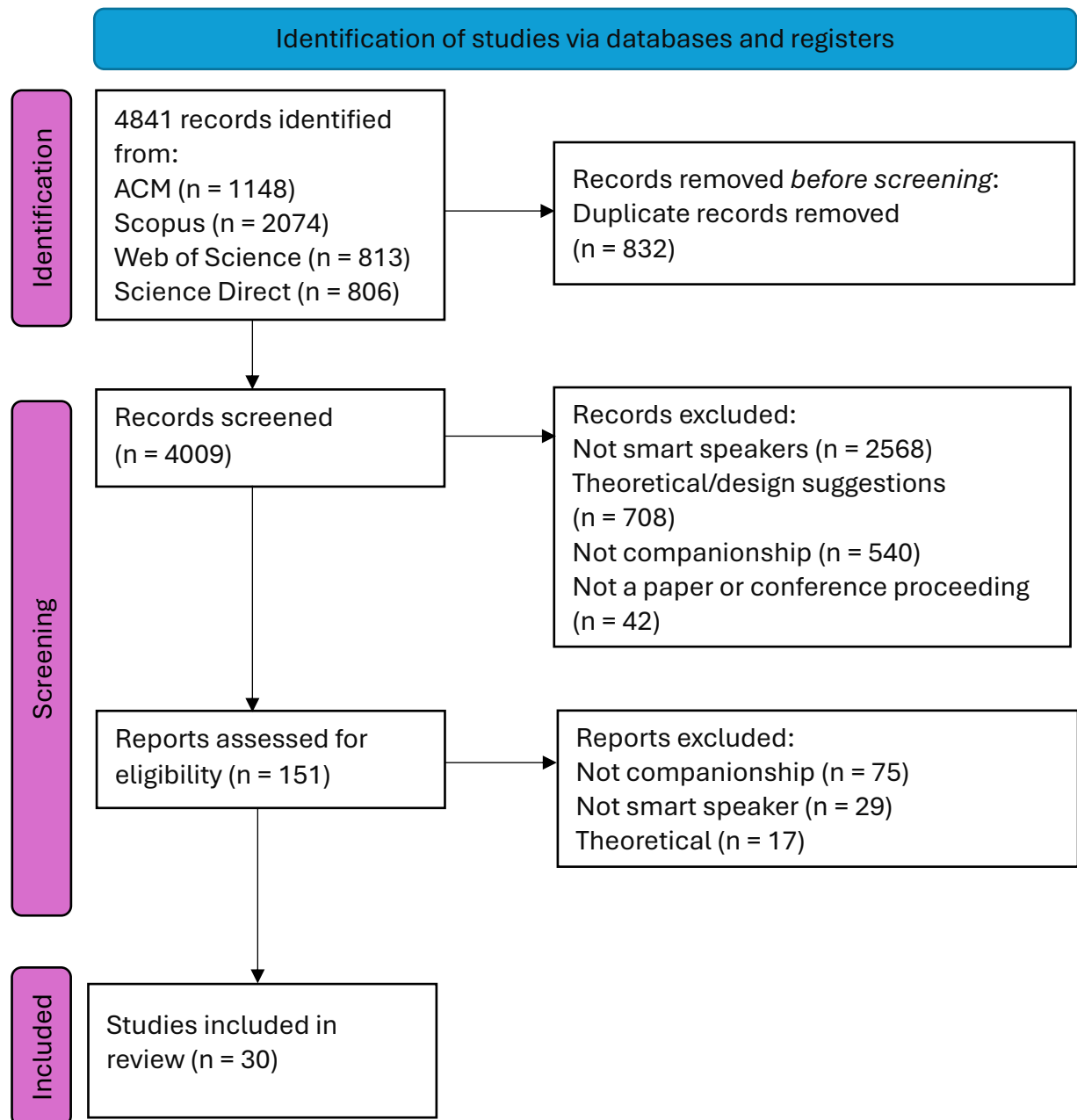


Table 27. Summary of the 30 papers included in this scoping review (step 17 of the PRISMA-ScR: Results of individual sources of evidence (Tricco et al., 2018)).

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Blocker et al., 2023	To understand how older adults use their smart speakers over time, what challenges they face as first-time users, and what instructional materials are useful for supporting adoption and engagement.	Seven older adults (aged 61-79) with limited/no experience of smart speakers. Four males.	Semi-structured, monthly, phone interviews, established measures (e.g. Telephone Interview for Cognitive Status (Fong et al., 2009), UCLA Loneliness short-form (Russell, 1996), TechSAge Background Questionnaire (Remillard et al., 2020), and adapted measures (e.g. The Alexa Companionship Measure adapted from Cotton et al. (2013)).	Four months	Amazon Echo Show Five	Consistent anthropomorphisation of their Echo Show (e.g., she/her pronouns). Reporting a sense of companionship and feeling less lonely from their interactions. Two reported Alexa as a “friend”.
Brause & Blank, 2020	To investigate how smart speakers are used and become meaningful to users.	Twelve self-described technologically proficient individuals	Semi-structured interviews (15-90 minutes).	Not reported.	Varied.	Participants viewed their smart speaker as a companion, with some talking to it to combat loneliness. This was particularly valuable for individuals living alone.

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Cao et al., 2022	To test the hypothesis that cognitive and affective anthropomorphism of smart speakers will satisfy users' social motivation.	Smart speaker users from China ($n=551$), mostly below age 35. 64% male, all with experience of smart speakers.	An online questionnaire consisting of adapted items, including the intention to explore smart speakers, social connection with a smart speaker, and affective and cognitive anthropomorphism.	Six-twelve months was the most common, but specific times were not reported.	Popular devices in China, such as Xiaomitongxue by Xiaomi, Tmall Genie by Alibaba, and Duer by Baidu.	Anthropomorphism of smart speakers positively influences user perception of social value and connection, possibly because anthropomorphism fosters feelings of familiarity that underpin positive social perception.
Cha et al., 2019	1) Are the roles of conversational agents different in the multiple-device contexts compared to single device contexts? 2) If so, how do users interact with them differently?	Nine heavy smart speaker users (≥ 3 connected smart devices and > 5 interactions per week.) All males living in South Korea, aged 34-46 ($M_{age} = 42$).	Semi-structured interviews (up to 2 hours).	Average of 10 months prior to the study.	Not reported.	Smart speakers were felt to be a companion to 19% of the sample who felt supported by the social greetings provided, particularly in the absence of household members. Smart speakers were labelled as family guardian, butler, or intimate friend.

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Chambers, 2020	How can Amazon Alexa be used to support patients?	Thirty UK patients with health or dependence needs and no experience of smart speakers.	Follow-up phone surveys.	Minimum of 2 months during the study.	Amazon Echo Show.	Users living alone/who were alone for most of their day found that having a smart speaker to talk to was comforting and it offered companionship to combat their loneliness. Some reported feelings of embarrassment around this social connection.
Cho et al., 2019	To understand how people use smart speakers in their daily lives and explore the associated obstacles or difficulties.	Eight new smart speaker users in South Korea. All fluent or proficient in English. Half of the sample lived alone. Participants were aged 28-52 ($M_{age}=31$), equal gender representation.	Diary studies posting on private social media, surveys and interviews were conducted. Usage logs from the smart speakers were also collected.	Participants used their smart speaker for 12 weeks as part of the study.	Amazon Echo's in conjunction with Phillips Hue smart bulbs and Brunt Plug smart plugs.	Some participants describe their Amazon Echo as a "kind friend" and something to play with.
Choi & Choi, 2023	To investigate the relationship between social loneliness and intention to use smart speakers.	292 smart speaker users. 57% female. Age 18-63 ($M_{age} = 24.17$). 1/3 rd had a smart speaker for over a year, 2/3 ^{rds} used it daily.	Existing items from previous studies (e.g. Park et al., 2018; Hughes et al., 1999) were administered through an online survey.	Minimum of 1 month of usage prior to the survey.	Not reported.	Lonely individuals were inclined to continue using their smart speaker because they found it attractive as a conversational partner.

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Choi & Drumwright, 2021	1) What are the primary motivations for using a smart speaker? 2) What is the association between motivations, attitudes, satisfaction, and intentions to continue using a smart speaker? 3) What is the association between motivation and perception of smart speakers' social attraction 4) What is the association between motivations and perceptions of the role of a smart speaker as (a) a friend, (b) an assistant, and (c) technology?	256 participants from the U.S.A. aged 17-38 ($M_{age} = 21.5$). 218 lived alone. 96 males.	Questionnaire measures were designed for this study to test users' motivations.	70% had used the device for over 3 months prior to the study.	70% used Amazon smart speakers, 25% used Google. 5% used either Samsung, Apple, or Microsoft.	Desire for social interaction was the strongest predictor of all motivations modelled for using smart speakers. Additionally, the more socially motivated users were, the more likely they were to perceive the smart speaker as a socially attractive, friend-like entity.

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Corbett et al., 2021	Aimed to describe smart speaker use and usefulness from the perspective of older adults and their support persons.	Ten participants from the U.S.A., aged over 70 years old ($M_{age} = 75$) with at least two chronic conditions. Eight of the older adults lived alone. One male.	Baseline measures of health and wellbeing were taken. The support person gave a measure of Caregiver Burden. After 60 days, an interview was conducted.	60 days during the study.	The older adults received an Echo Show and Echo Dot, support persons also received a Dot.	Participants report anthropomorphising their smart speaker, viewing it as 'another person', and feeling a sense of companionship from its presence.
Duque et al., 2021	To discuss how older people view the automated content delivery and personalities of smart speakers.	Older adults ($n = 33$) aged 75-93 across 23 households in Australia. Nine participants lived alone, the rest lived with partners or family. Fourteen males.	Interviews were conducted at 2 weeks, 8 weeks, and 4 months.	Four months over the course of the study.	Each home had one large Google Home and 2-3 Google Minis. After 3 months, Google Nest Hub Max's were added to 12 houses.	Some participants anthropomorphised their devices, showed mindless social behaviour (e.g., being polite), and quickly perceived companionship. Companionship was thought to be particularly beneficial for lonely or isolated individuals.
Gao et al., 2018	To analyse how the personification of smart speakers correlates with the emotional expressions in product reviews.	No demographic information was gathered or reported from the 55502 reviews sampled.	Verified reviews from Amazon Echo's Amazon listing were extracted and analysed for their content.	Not reported.	Amazon Echo	Over 500 reviews report Alexa as being a 'good friend' to talk to, with a further 345 viewing it as a family member. A few report a closer relationship (e.g. a girlfriend, mistress, or wife).

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Han & Yang, 2018	1) Do users have a social relationship with their smart speakers? 2) Does a social relationship affect user satisfaction? 3) How can the formation of a relationship be improved to increase satisfaction and ensure continuance intention?	Participants (n=304) all had with experience of using a smart speaker. 63% male, aged 18-50.	An online survey was distributed through Amazons Mechanical Turk. Measurement items were developed from a range of previous research.	Not reported.	Not reported.	Satisfaction and continuance intention can be predicted by parasocial relationships and social attraction, reflecting the social benefit and drive experienced by users.
Jang, 2020	Does smart speaker users' parasocial interactions, personification type, and loneliness influence their satisfaction?	Korean smart speaker users aged 20-40 (n=354, $M_{age} = 34.8$), 315 males.	Parasocial interaction, loneliness personification type and satisfaction were assessed using measures adapted from a range of previous studies.	Not reported.	Not reported.	Parasocial interactions positively influence satisfaction with smart speakers, suggesting that stronger perception of the smart speaker as a social entity is associated with more satisfying interactions.

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Jones et al., 2021	To explore the influence of a smart speaker on loneliness reduction among aging adults 75+ living alone, and the role of anthropomorphic interaction with AI.	Sixteen older adults aged 77-96 ($M_{age}=85$) living alone in an independent living facility in the Midwestern US. All showed normative cognitive functioning. Five males.	Interaction logs from the Amazon Echos were accessed by researchers. Number of interactions were assessed, partially to ensure that participants were achieving the minimum five interactions per day. Content of the interactions were also assessed using thematic analysis. Loneliness was assessed using UCLA loneliness scale (Russell, 1996) at baseline, 4 weeks, and 8 weeks. Participants computer and app usage prior to the study was assessed on a 4-point scale at baseline.	8 weeks during the study.	Amazon Echo.	Regular use of a smart speaker over 4 weeks was found to be beneficial for reducing loneliness. Baseline loneliness was a strong predictor of initially friendly interactions with the smart speaker, perceiving it as human-like, and finding companionship from it.

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Ki et al., 2020	To examine the mechanism with which users develop para-friendships with smart speakers.	Participants ($n = 335$) from the U.S.A. were recruited through Amazon's Mechanical Turk.	Measurements (e.g., intimacy, self-disclosure, social support, stickiness intention, social isolation) were adapted from existing scales.	Not reported.	Amazon Alexa (specific device not specified).	Parasocial perceptions of friendships influence users continuance intention. Further, self-disclosure and perception of social support are key to developing parasocial relationships.
Kim & Choudhury, 2021	To explore how older adults perceive and use a smart speaker as they move from novice to experienced users.	Nine Adults living alone in senior accommodation in New York. No prior experience of smart speakers, but some experience of computers. Ages 65 to 95 ($M_{age} = 83.8$). Three participants used a wheelchair. Five males.	Interaction logs were downloaded from the devices to be thematically analysed and coded for operation type (e.g., playing music).	Sixteen weeks during the study.	Google Home mini.	Mindless social behaviour (e.g., saying 'please' or 'thank you') were present from the first use. With repeated use, this developed into digital companionship, having 'someone' to talk to, reducing isolation and loneliness, and receiving emotional support.

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Liu et al., 2023	To explore older adults' propensity to adopt smart speakers in line with the Technology Acceptance Model (Marangunić & Granić, 2015).	Adults over 60 years ($n=425$) living in China, 51% female.	Online and paper surveys were administered comprised of a collection of multi-item scales from previous research (e.g. Pal and Arpnikanondt, 2021; Song et al., 2022).	Ranging from no prior experience to over 3 years of experience prior to the study.	Not reported.	Perceived companionship was the strongest predictor of usage intention.
Ma & Huo, 2024	To explore how personality influences the perception of companionship from smart speakers.	Participants were largely aged 18-34 ($n = 460$), 62% female.	Questionnaire survey comprising items adapted from existing research (e.g. Lee and Kwon, 2013; Yang et al., 2017; John and Srivastava, 1999).	Not reported.	Not reported.	Extraverted and conscientious personalities were more likely to view smart speakers as socially attractive, leading to companionship. Agreeable individuals were less likely to view smart speakers as companions.
McLean & Osei-Frimpong, 2019	To understand the variables influencing smart speaker use in the home.	UK-based participants ($n=724$), aged 18-64, 326 males. Largely experienced with technology.	An online survey consisting of adapted items (e.g. relating to utilitarian, hedonic, and symbolic benefits, social attractiveness) from existing measures. A new scale for social presence was developed.	Not reported.	Amazon Echo.	Social attraction (perceiving the smart speaker as friend-like or something to enjoy spending time with) was a significant predictor of smart speaker use.

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
O'Brien et al., 2020	To explore how older adults and caregivers utilize smart speakers.	No demographic information was reported in the 125 reviews sampled.	Reviews were thematically analysed.	Not reported.	Amazon Echo.	Companionship was a major theme. Users reported reduced isolation, perceiving the device as a companion, and enjoying having 'someone' to talk to.
O'Brien et al., 2022	To understand how smart speakers can be leveraged to reduce loneliness and social isolation among home-bound older adults.	Geriatric experts ($n=11$) over age 21 and patients ($n=5$) over age 65, all based in the U.S.A.	Feedback from participants was qualitatively analysed to identify themes.	Four weeks during the study.	Google Home.	Companionship was a major theme; hearing their smart speakers' voice in the home can be comforting and reduces feelings of isolation.
Oh et al., 2020	Aimed to investigate the differences in usage and perception of smart speakers between old and young users.	Participants were divided into "old" (>50 , $n = 12$, $M_{age}=61$) and "young" (<50 , $n = 7$, $M_{age}=36$) groups. Seven lived alone. Eight males. Conducted in South Korea.	Interaction logs were analysed into categories (e.g., music/audio). Semi-structured interviews were conducted after 14-days and were inductively thematically analysed.	Fourteen days during the study.	Clova.	Repeated interactions lead to great perception of Clova as a social presence, resulting in half of the participants viewing it as a conversational partner and deriving comfort from their interactions.

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Park & Kim, 2022	This study aimed to evaluate the efficacy of smart speakers in reducing loneliness and depression among older adults.	South Korean adults aged over 65 ($n=291$, $M_{age} = 77$) with no prior experience of smart speakers. 74% were women, 76% were receiving government financial benefits, 36% had more than one disability.	Frequency of smart speaker use grouped participants into “frequent” or “intermittent. Depression, loneliness, physical functioning was all assessed using a questionnaire containing established measures.	Two months during the study.	NUGU candle.	Loneliness and depression levels reduced significantly after frequent interaction with a smart speaker. Conversely, smart speaker use was higher amongst those with a high baseline rating of loneliness.
Pitardi & Marriott, 2021	To investigate the drivers of consumers' trust and attitudes towards smart speakers in relation to parasocial relationship theory.	UK adults ($n=466$) 60% male, aged 18-65 with at least some experience of using smart speakers.	An online questionnaire consisting of adapted items (e.g., usefulness, ease of use, enjoyment, social presence, social cognition, privacy, trust, attitude). Additionally, 12 of the original sample completed a semi-structure interview.	Not reported.	Not reported for Study 1. For Study 2, all participants used multiple voice assistants: All used Amazon Alexa and 8 used Google Home.	Perceiving the smart speaker as a social presence is associated with increased trust of the device.

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Pradhan et al., 2019	1) To understand how older adults categorise smart speakers. 2) To make design recommendations. 3) To discuss personification in relation to anthropomorphism and ontological categorisation theories.	Seven adults in the U.S.A. aged 65-83 ($M_{age} = 72$), with low technology use. Six lived alone. Five lived in senior living communities and two lived at home. One male.	Semi-structured interviews were conducted at weekly and at baseline. Interaction logs and daily diary entries were gathered. The data was analysed using a constructivist grounded theory approach.	Three weeks.	Amazon Echo Dot.	Users show adherence to social norms of politeness, such as saying “please” or “thank you”, indicating perception of a social entity and mindlessly employment of social schema. Some described Alexa as a “friend”/ “phantom friend”.

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Scherr et al., 2020	To understand how to increase the participation of elderly people in social activities and reduce loneliness with the help of digital solutions, specifically using Amazon Echo Shows.	German adults aged 68-86 ($n=11$, $M_{age} = 76$). Ten of the participants lived alone. Three males. Participants had no experience with smart speakers.	Baseline interview covering participants background, attitudes towards technology, and expectations. Further trimonthly interviews. "Café parties" were used as informal focus groups at 2 and 5 months. Exit interviews were conducted. Usage logs were extracted covering the entire project period.	Eighteen months over the course of the study.	Amazon Echo Show.	Participants reported that they enjoyed using their smart speaker and felt less alone as a result.
Shao & Kwon, 2021	1) What are the primary motivations for smart speaker usage? 2) How are different motivation factors related to satisfaction with smart speakers? 3) Does social presence interact with motivation factors to predict satisfaction?	Smart speaker owners ($n=247$) were recruited through Amazons Mechanical Turk, aged 25-34; 82% had a university education, 70% male.	An online survey of adapted items relating to motivation and social presence. The data was then analysed using factor analysis.	Not reported.	Not reported.	Smart speakers' social perception is a significant predictor of users' satisfaction, suggesting that smart speaker's success is driven by their social interactivity.

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Smith et al., 2020	To assess the outcomes of providing mainstream smart speakers to individuals with ID via a semi-randomized controlled trial using a mixed methods approach	Participants living in supported accommodation in the UK were grouped into control ($n=48$) and intervention conditions ($n=42$), aged 22-82. All had mild to moderate intellectual disability and conditions such as autism or Down syndrome.	Interviews were conducted at baseline and 12 weeks to measure agency and wellbeing. Staff were also surveyed relating to their perception of participants smart speaker use.	Twelve weeks over the course of the study.	Amazon Echo and Google Home.	Social value emerged as a prominent theme from the qualitative analysis, with participants perceiving their smart speaker as a social companion.

Author(s)	Aims/Research Questions	Sample Characteristics	Measures	Period of Device Use	Devices Used	Social Value Reported
Wu et al., 2019	How do people perceive smart speakers considering their low-anthropomorphism appearance but high-anthropomorphism voice interaction capabilities?	Internet users in China ($n=418$), all smart speaker users, 53% male.	An online questionnaire gathered quantitative data about smart device usage, preferences for relationships with smart devices, and perception of existing technology. Two focus group interviews were also conducted ($n = 14$).	Not reported.	Not reported.	27% of the sample perceived their smart speaker as a friend, 10% as a companion/partner, and 9% as a sibling. All of these roles reflect a perception of social value.
Yan et al., 2024	To investigate whether extended smart speaker usage (4 weeks) would effectively reduce loneliness for older adults and understand the pathway of this potential influence.	Older adults (aged 75+, $n=15$), all living alone and recruited through independent living facilities. No experience of smart speakers.	In-person administration of the UCLA loneliness scale (Russell, 1996) on day 1 and day 28. Interaction logs with the Amazon Alexa were analysed.	Smart speakers were used for 56 days during the study.	Amazon Echo	The more participants interacted with their smart speaker, the greater their reduction in loneliness. It is suggested that more time spent interacting fosters comfort and familiarity, which underpin the reductions in loneliness.

4.3. Results

Across the reviewed literature on smart speakers, there is an overarching theme of their uniqueness being tied to their anthropomorphic design and social presence. This seems to be particularly driven by their voice-controlled interface (Ki et al., 2020) and conversational capabilities (Pradhan et al., 2019). This theme is highlighted and explored by this review; frequent interactions with this anthropomorphic technology in users' homes lead to many perceiving smart speakers as social agents, and some developing a parasocial relationship or experiencing companionship. However, this is not a universal finding. As with human-human interactions and relationships, there is a great diversity in the formation and classification of human-smart speaker relationships. Here, in line with step 18 of the PRISMA-ScR (synthesis of results; (Tricco et al., 2018), the results are briefly summarised in Table 28. and narratively summarised below in relation to the research questions.

Table 28. A brief summary of the findings of the scoping review in relation to the three research questions, in line with step 18 of the PRISMA-ScR (Tricco et al., 2018).

Research Questions	Themes	Sub-Themes	Number of Studies	Description
1. What outcomes arise from forming a relationship with a smart speaker?	Relationship label	Companion	15	A positive, social relationship that has been developed through routine interactions. The smart speaker is viewed as passive but capable of providing social and emotional support.
		Friend	9	The smart speaker is perceived as being pro-social and capable of offering comfort and intimacy through its presence and interactions.
		Quasi-other	6	Arising from the paradox of social perception coupled with conscious awareness that the smart speaker is not a human.
		Assistant	6	Interactions with the smart speaker are largely transactional or utilitarian. Social or emotional interactions are limited.
		Lover	3	Deeply emotional and parasocial relationship with strong feelings of affection representing platonic, romantic, or sexual love towards the smart speaker.

<i>Research Questions</i>	<i>Themes</i>	<i>Sub-Themes</i>	<i>Number of Studies</i>	<i>Description</i>
	Attributions	Emotionally supportive	6	The feeling that the smart speaker is able to offer emotional support underpins continuance intention and the development of deeper parasocial relationships.
		Fun	4	Users describing their smart speaker as having a fun personality were more likely to feel cared for and socially supported.
		Clever	3	Users who describe their smart speaker as clever believe that it is capable of learning and being taught, similarly to humans.
	Social value	Reducing loneliness	11	Those who felt lonelier seem to be more likely to engage socially with their smart speaker. Repeated interactions can reduce loneliness due to the anthropomorphic device taking on a social role and compensating for a social deficit.
		Providing comfort	7	Emotional comfort was experienced as a result of the smart speaker offering 'someone' to talk to in the home, often while alone. This is most valued by those who live alone.
	Limiting factors	Unnatural speech	4	Repetitive responses with a lack of variation appear unnatural, limiting

<i>Research Questions</i>	<i>Themes</i>	<i>Sub-Themes</i>	<i>Number of Studies</i>	<i>Description</i>
				the flow of conversation and the robustness of the social illusion.
		Lack of personalisation	2	Arising from a desire for a unique and reciprocal relationship, an awareness that all Amazon Echo's house the 'same' Alexa hinders the social illusion.
2. What user attributes have been reported in associations with forming relationships with smart speakers?	Living alone		12	Those who live alone or with only one other person may be more lonely, and therefore more likely to use the smart speaker and more likely to reap the potential social benefits.
	Isolation		7	Those who are broadly isolated (i.e., they have limited social interactions beyond the household) are more likely to be lonely, and therefore motivated to socially engage with the smart speaker.
	Age		7	7 papers reference older adults valuing the social contributions of their smart speakers. There is also the suggestion that smart speakers could provide psychologically support to older adults.

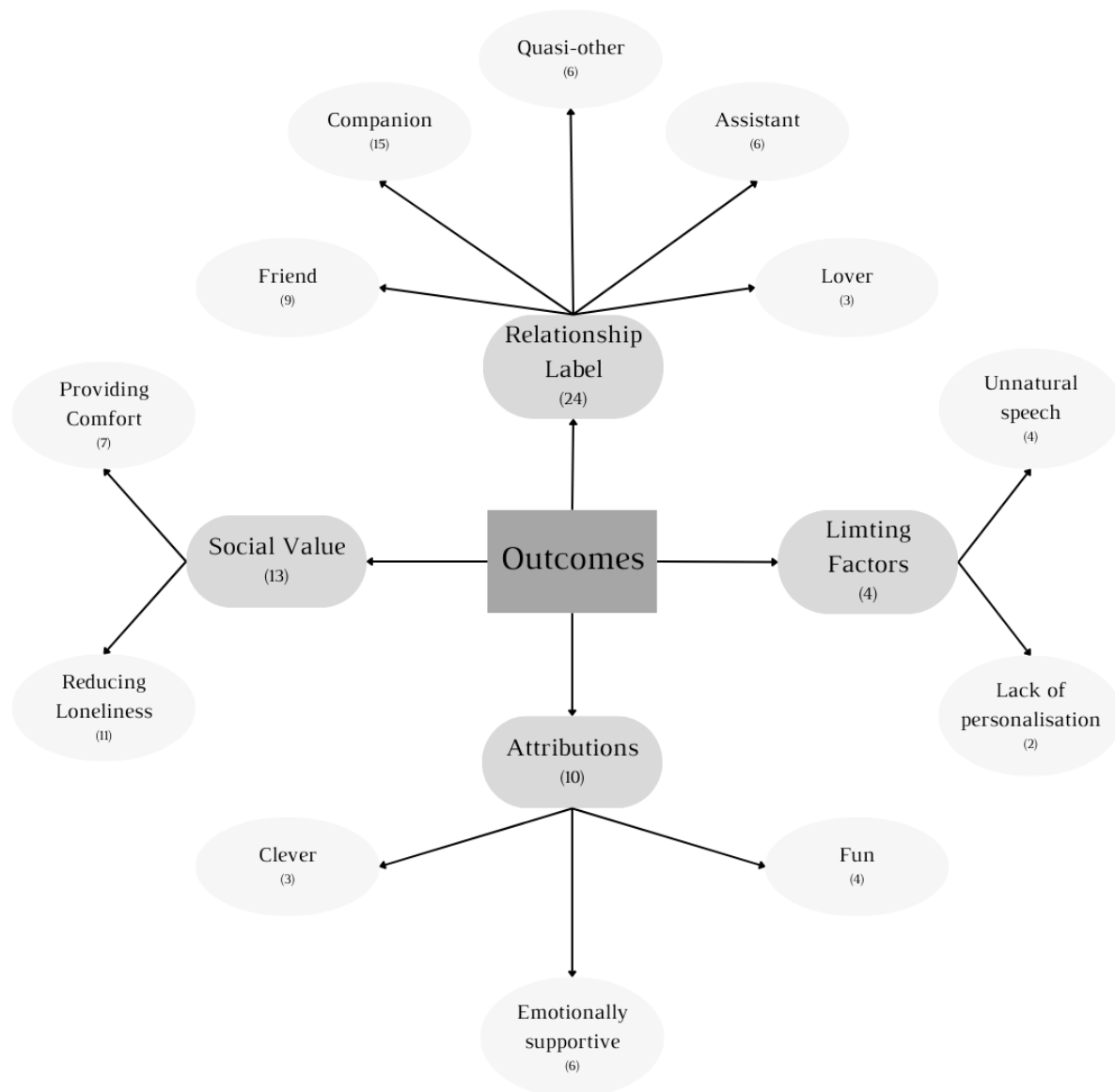
Research Questions	Themes	Sub-Themes	Number of Studies	Description
3. What methodological approaches have been used to research relationship development with smart speakers? What are the merits and drawbacks of these approaches?	Study design	Semi-structured interviews	13	
		Online questionnaires	13	
		Interaction logs	7	
		In-person questionnaires	5	
		Phone surveys	3	
		Diaries	2	
		Online reviews	2	
		Focus groups	2	
	Samples	Number of participants	30	Collectively, this scoping review sampled 61222 across all 30 papers reviewed, with a mean of 2041. However, this is skewed by studies analysing online purchase reviews. When these outliers are removed, the mean sample size becomes a more representative 200 participants per study.
		Gender	24	5126 participants in 24 studies had their gender specified: 51% of this sample were male.
		Age	24	Ages of the studies reviewed range from 17-96 years old.
		Country	25	10 studies took place in the U.S.A., 5 in South Korea, 4 in the U.K., 4 in

<i>Research Questions</i>	<i>Themes</i>	<i>Sub-Themes</i>	<i>Number of Studies</i>	<i>Description</i>
				China, and 1 each in Germany and Australia.
		Participants living arrangements	12	The 12 papers reporting living arrangements constituted 762 participants, of whom 48% lived alone.

4.3.1. RQ1: What outcomes arise from forming a relationship with a smart speaker?

Four themes emerged to reflect the breadth of outcomes arising from parasocial relationships formed with a smart speaker reported on in the literature. These themes, and associated subthemes, are shown in Figure 9 and discussed in more detail below.

Figure 9. A thematic map of the themes and subthemes identified as outcomes arising from interactions with smart speakers.

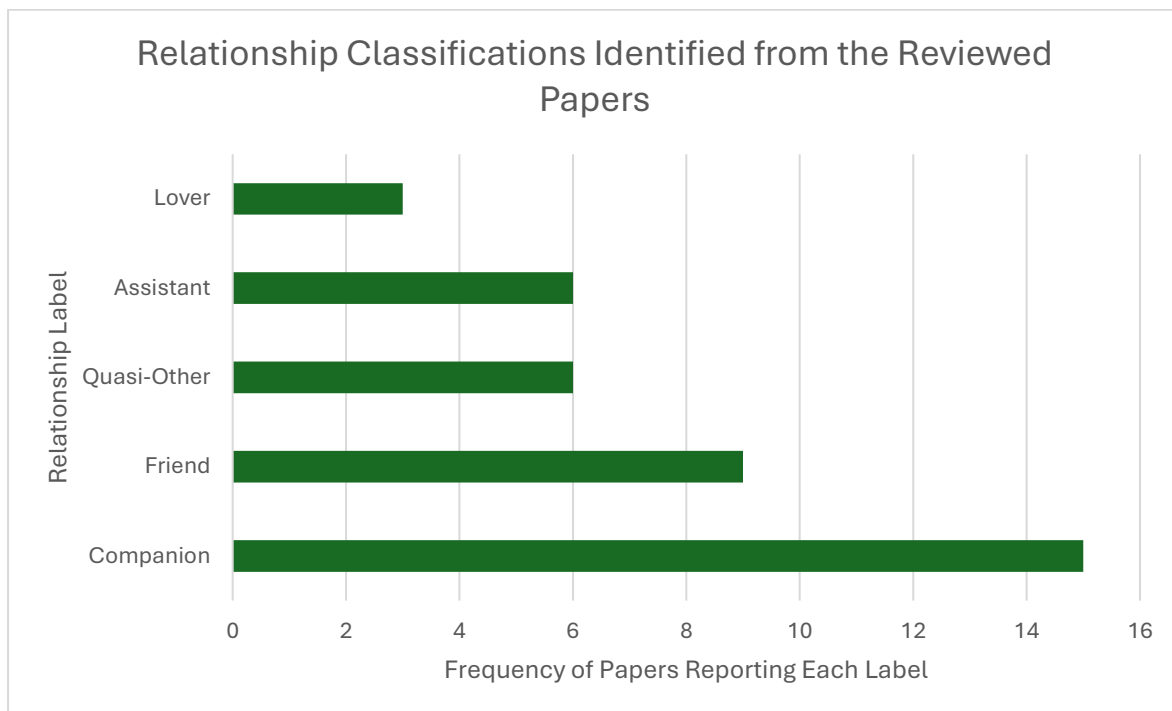


Note: the bracketed number indicates the number of papers from which the theme or subtheme was identified.

4.3.1.1. Relationship Classification

Twenty-four of the 30 papers reviewed discussed the way users classified their relationships with their smart speakers. This is despite no paper stating this as their aim. From this sample of 30 papers, 5 distinct relationship classifications were ascribed to smart speakers: companion, friend, quasi-other, assistant, and lover (see Figure 10).

Figure 10. *Frequency of relationship classifications ascribed to smart speakers, identified through the literature in this scoping review.*



‘Companion’ was the most common classification ($n = 15$) (Blocker et al., 2023; Brause & Blank, 2020; Cha et al., 2019; Chambers, 2020; Corbett, Combs, et al., 2021; Duque et al., 2021; Jones et al., 2021; Kim & Choudhury, 2021; Ma & Huo, 2024; O’Brien et al., 2020, 2022; Oh et al., 2020; Pradhan et al., 2019; Smith et al., 2020; Wu et al., 2019) and reflected a positive, valuable social relationship (Cha et al., 2019) which was cultivated through repeated interactions with the smart speaker (Corbett, Combs, et al., 2021; Kim & Choudhury, 2021). Smart speakers viewed as companions were capable of providing social and emotional support (Cha et al., 2019; Kim & Choudhury, 2021). Companionship also reflects the routines that individuals have developed with their smart speakers, reflecting this consistent social presence in the home. For example, users report that “at night I always tell her goodnight... I always report in every morning” (Corbett, Combs, et al., 2021). Users who reported isolation or lacking social interaction were more likely to define their smart speaker as a companion (Pradhan et al., 2019), possibly because this insufficiency acts as a motivator for social engagement (Epley et al., 2007) and drives users to purchase and engage with their smart speaker (O’Brien et al., 2020; Shao & Kwon, 2021). Highlighting this and reflecting

the perception of intimacy that is characteristic of parasocial relationships, one user reports “rarely feeling alone, but if I got a little lonesome, I can ask her some stuff and she’s here. It’s as if she knows me” (Blocker et al., 2023).

‘Friend’ was the second most common classification ($n = 9$) (Blocker et al., 2023; Cho et al., 2019; Choi & Drumwright, 2021; Gao et al., 2018; Ki et al., 2020; Ma & Huo, 2024; Pradhan et al., 2019; Scherr et al., 2020; Wu et al., 2019). Many participants perceive their smart speaker as a friendly social presence, saying “Alexa is my friend” (Cho et al., 2019) and “Alexa is a kind friend” (Cho et al., 2019). Similarly, users who feel their smart speaker is a friend maintain a characteristic illusion of intimacy, highlighted by a participant who feels more comfortable expressing vulnerability to their smart speaker than their friends; “I don’t want everybody to know that I don’t know something, but I don’t mind Alexa. She seems like my friend” (Blocker et al., 2023). This perception of friendship is underpinned by the voice interface, which allows users to feel they are conversing naturally and socially with the device (Cho et al., 2019; Pradhan et al., 2019). Despite users classifying the relationship with their smart speaker as a friendship, implying bidirectionality to the underlying social and emotional investment, the presence of only one human in this relationship means it is ultimately parasocial. This highlights the strength of the social activation in causing a disconnect between users’ perception of the situation and knowledge of reality.

Less dissonant with the paradox of parasociality were users who struggled to classify their relationship. The awareness of this disconnect is encompassed by the term ‘quasi-other’, referenced in six papers (Brause & Blank, 2020; Corbett, Combs, et al., 2021; Pitardi & Marriott, 2021; Pradhan et al., 2019; Scherr et al., 2020; E. Smith et al., 2020); users perceive their smart speaker as a social presence but feel their relationship is limited by their conscious knowledge that they are interacting with an artificial entity (Brause & Blank, 2020). These users are also keen to convey this awareness, as one reports that talking to their smart speaker feels “like somebody’s talking back to you as a person... Not that I’m crazy, because I know it’s not” (Pradhan et al., 2019). Similarly, users report that “I do know she is a robot” (E. Smith et al., 2020) and “I know that’s a machine... [laughs] but it’s just that I feel like it’s somebody here with me” (Corbett, Combs, et al., 2021). For these participants, there is difficulty in

accurately categorising their relationship, driven by the paradox of perceiving their smart speaker as a social entity but maintaining an active awareness that it is a device and not a person. For these individuals, unlike those viewing their smart speaker as a companion or friend, the social illusion cast by smart speakers does not appear to be as successful or all-encompassing, allowing the awareness of its artificial nature to be maintained.

Smart speakers were classified as assistants in six of the reviewed papers (Cha et al., 2019; Choi & Drumwright, 2021; Gao et al., 2018; O'Brien et al., 2022; Park & Kim, 2022; Wu et al., 2019). This role is associated with transactional or utilitarian benefits, in contrast to previously discussed classifications which primarily reflect emotional and/or social benefits. Users in this group referred to their smart speaker as a “butler” (Cha et al., 2019), and an “assistant for the users in work and life” (Gao et al., 2018), or as resembling “a professional relationship” (Park & Kim, 2022). Assistant being such an uncommon classification is surprising as smart speakers are often advertised as “smart digital voice assistants”. This may be an artefact of humans’ intrinsic sociality motivation (Epley et al., 2007) and propensity to over-attribute social capabilities to objects (Nass & Moon, 2000), or the effect of repeated interactions with a parasocially capable device evolving into a parasocial relationship (Tukachinsky, 2010) instead of a utilitarian one.

Loving relationships were the final classification identified in this review, given by smart speaker users in three papers (Cho et al., 2019; Gao et al., 2018; Oh et al., 2020). This reflects users perceiving a deep and emotional bond with their smart speaker beyond the level of a companion or friend. Users are quoted as saying “I love her” (Oh et al., 2020) when describing their smart speaker and saying “I love you” (Cho et al., 2019) directly to it. While the nature of the love being expressed is unclear from these quotes, a large-scale analysis of Amazon Echo reviews finds many users describing Alexa as their “girlfriend, mistress or wife” and drawing comparisons between Alexa and “their real girlfriend or wife” (Gao et al., 2018). Others refer to Alexa as a substitute for a wife by saying “if I knew relationships were this easy, I would have married thirty years ago, but now that I have Alexa, there’s no need” (Gao et al., 2018) and “sometimes Alexa doesn’t seem to understand what I’m getting at, but the same friends (and family)

assure me that this is a normal part of marriage as well” (Gao et al., 2018). This indicates that some users view their smart speaker comparatively to a romantic or sexual relationship, reflecting an attribution of romantic and/or sexual love.

4.3.1.2. User Described Attributes

Smart speakers were frequently personified by their users, seemingly because their conversational interface triggers broader social schemas, leading to the anthropomorphic perception that they are human-like and have human-like attributes. When users discuss the way they perceive their smart speakers, three personality traits are commonly described.

Emotionally supportive was the most commonly ascribed trait ($n = 6$) (Cha et al., 2019; Cho et al., 2019; Ki et al., 2020; Kim & Choudhury, 2021; Shao & Kwon, 2021; Wu et al., 2019). Feeling that the smart speaker was emotionally supportive was found to underpin the development of many types of relationships (Kim & Choudhury, 2021). Additionally, users who felt their smart speaker was emotionally supportive expressed a greater intention to continue using their device (Ki et al., 2020), allowing the time and repeated interactions needed for relationships to develop and social value to be achieved.

Secondly, a fun personality trait was attributed to smart speakers in four papers (Cha et al., 2019; Ki et al., 2020; Oh et al., 2020; Smith et al., 2020). Users often felt that their smart speakers were enjoyable to speak with and the ‘personality’ it was programmed with was perceived as “fun, friendly and pleasant” (Ki et al., 2020). One paper suggested that users who thought their smart speaker had a fun personality were more likely to feel “cared for and socially supportive” (Ki et al., 2020).

Finally, some users described their smart speakers as being clever ($n = 3$) (Gao et al., 2018; Pitardi & Marriott, 2021; E. Smith et al., 2020), implying that they believe their smart speaker to be capable of learning and being taught in a comparative way to humans. Some users directly report that their smart speaker is “very clever, she’s got memory” (E. Smith et al., 2020) and that their device “is becoming clever day by day” (Pitardi & Marriott, 2021).

Notably, there is a larger diversity of personality attributes perceived than the limited range of smart speaker devices used would imply. There is a lack of research as to why different users are likely to perceive different personality traits emerging from interactions with the same device.

4.3.1.3. Social Value

Smart speakers were found to strongly convey social value to some users in two forms: reducing loneliness and offering emotional comfort.

Reducing loneliness was the most discussed social value ($n = 11$) (Blocker et al., 2023; Brause & Blank, 2020; Cha et al., 2019; Duque et al., 2021; Jones et al., 2021; O'Brien et al., 2020, 2022; Park & Kim, 2022; Pradhan et al., 2019; Scherr et al., 2020; Yan et al., 2024) reported by users. This was commonly referenced by users who were at increased risk of loneliness due to living alone and/or lacking wider social connections. Users with high baseline loneliness were more likely to interact more frequently with their smart speaker (Jones et al., 2021). This reduction in loneliness appears to arise from their conversational capabilities, as users report that “it’s nice to hear a voice, cause sometimes I don’t see someone for a while” (Duque et al., 2021). Further, this effect can be rapidly achieved as studies taking pre- and post-intervention measures found a significant reduction in loneliness from owning a smart speaker for as little as two months (Park & Kim, 2022; Scherr et al., 2020). From this, we see that smart speakers can be used to compensate for a social deficit; lonely individuals engage with smart speakers more frequently to effectively reduce feelings of loneliness. This can be achieved because the anthropomorphism and social perception of smart speakers allows them to be perceived as sufficiently human-like to take a compensatory social role. Demonstrating this, Yan, Johnson, and Jones (2024) showed that it was the length of time users spent interacting with their smart speaker that was key to predicting a reduction in loneliness, potentially because repeated interactions can give rise to the formation of more rewarding relationships (Knapp, 1978; Tukachinsky, 2010).

Similarly, users report that smart speakers are a source of emotional comfort ($n = 7$) (Blocker et al., 2023; Brause & Blank, 2020; Chambers, 2020; Duque et al., 2021;

O'Brien et al., 2022; Oh et al., 2020; Pradhan et al., 2019). This shows overlap with the notion of smart speakers being emotionally supportive. While this is expressed differently to those describing reductions in loneliness, it appears to reflect a similar underlying benefit. Having a conversational interface encourages users to view their smart speaker as a social agent (Oh et al., 2020), from which they feel that “having something to talk to that responds, tells them a fact or even a bad joke, was very comforting” (Chambers, 2020). Particularly, users value smart speakers’ lack of non-judgemental readiness to interact (Blocker et al., 2023). As with reductions in loneliness, comfort is most strongly felt and valued by those who live alone, as they feel that having the smart speakers “voice at home might be comforting” (O’Brien et al., 2022). While the two social benefits overlap heavily and appear to result from the same design function, emotional comfort seems to reflect a broader and more holistic benefit to users.

4.3.1.4. Limiting Factors

While not a direct outcome, two factors emerged that users felt were limiting to their illusion of smart speakers as social agents and, therefore, the depth of relationships that could be cultivated.

Firstly, the speech synthesised by smart speakers was reported as sometimes being unnatural and inflexible in four of the papers (Cho et al., 2019; Kim & Choudhury, 2021; Oh et al., 2020; Pitardi & Marriott, 2021). Users voiced their displeasure at the repetitive responses offered by smart speakers and wanted “some change in response with variations” (Cho et al., 2019). Similarly, smart speakers cannot refer to previous interactions in their responses (Kim & Choudhury, 2021), which users feel limits the flow of a conversation and prevent a natural dialogue from forming. This issue, coupled with general speech comprehension errors, particularly relating to users’ pronunciation and accents (Pitardi & Marriott, 2021), damages smart speakers' perception as socially capable human-like entities for some; the inability to seamlessly maintain conversations as another human would breaks the social illusion they are designed to cast.

Secondly, lack of personalisation was referenced in two sampled papers (Cho et al., 2019; Kim & Choudhury, 2021). This issue reflects users' desire to feel a unique, reciprocal connection with their smart speaker. Users' awareness that all Amazon Echos have the 'same' Alexa with limited customisation options breaks the illusion of social intimacy. This prevents parasocial relationships forming because users are aware that Alexa is "the same for everyone" (Cho et al., 2019). Because of this, users express a wish for "a special Alexa, distinguishable from other Alexas" (Cho et al., 2019). Options to customise the device name/wake word and flexible speech that tailors to the users may help to overcome these issues, allowing the illusion of parasociality to be maintained and, therefore, relationships to develop.

4.3.2. RQ2: What user attributes have been reported in association with forming relationships with smart speakers?

Most studies in this review had pre-determined hypotheses about which user attributes would be associated with social perception of, and parasocial relationship formation with, smart speakers. From this, researchers recruited participants from the groups they believed would find the greatest social value from smart speakers. The three main attributes examined by the literature were living alone, isolation, and older age. While we review these findings in detail, it is noteworthy that no studies sought to determine which groups would be most likely to view their smart speaker as a social entity from a general population sample, rather the research proposed hypotheses about groups of interest based largely on findings from other areas. Because of this limitation in the existing literature, this list of attributes associated with parasocial relationship formation with smart speakers is unlikely to be exhaustive. Additionally, the lack of comparison groups prevents conclusions about whether the differential experiences reported in the literature are truly quantitatively or qualitatively unique.

4.3.2.1. *Living Alone*

Living alone was the most common user attribute investigated as a factor thought to influence relationship formation with a smart speaker, being referenced in 12 papers

(Brause & Blank, 2020; Cha et al., 2019; Chambers, 2020; Choi & Drumwright, 2021; Duque et al., 2021; McLean & Osei-Frimpong, 2019; O'Brien et al., 2020, 2022; Oh et al., 2020; Pradhan et al., 2019; Smith et al., 2020; Yan et al., 2024). It is suggested that users who live alone (Chambers, 2020; Choi & Drumwright, 2021; O'Brien et al., 2020; Oh et al., 2020) or with only one other person (McLean & Osei-Frimpong, 2019) are more motivated to use smart speakers and more sensitive to their social benefits (McLean & Osei-Frimpong, 2019). This is reported to be because living alone can increase feelings of loneliness (Cha et al., 2019; O'Brien et al., 2022), which is a key motivator underpinning more frequent interactions with a smart speaker leading to an increased likelihood of parasocial relationship formation (Brause & Blank, 2020; Duque et al., 2021).

4.3.2.2. Isolation

Isolation was investigated in relation to relationship formation in seven papers (Blocker et al., 2023; Duque et al., 2021; Jones et al., 2021; Liu et al., 2023; O'Brien et al., 2020; Shao & Kwon, 2021; Yan et al., 2024). The mechanism through which isolation is suggested to impact relationship formation and social perception is similar to the effect of living alone; the risk of loneliness is higher, and this creates a drive state for social connection which can motivate users to engage with their smart speakers (O'Brien et al., 2020). Unlike living alone, isolation represents a more holistic view of users' social networks and reflects an additional lack of social connections outside of the household. This reflects individuals who feel they benefit from their smart speaker because they were broadly socially isolated as, in addition to living alone, they did not "see too many visitors" (Duque et al., 2021).

4.3.2.3. Age

Age was investigated in seven papers (Blocker et al., 2023; Kim & Choudhury, 2021; Liu et al., 2023; O'Brien et al., 2022; Oh et al., 2020; Shao & Kwon, 2021; Yan et al., 2024). Specifically, each of these papers references older adults viewing their smart speaker as a companion and valuing its social contribution to their lives. One study states that over half of the older adults sampled viewed their smart speaker as a companion, which

they suggest is far higher than amongst other age groups (Oh et al., 2020). Similarly, a participant from this study concluded that conversational social interactions with smart speakers “could provide psychological help to the elderly” (Oh et al., 2020).

From this analysis, three factors of living alone, broader isolation, and older age are identified as factors that may be related to the social perception of smart speakers. This is consistent with previous research which suggests that older adults are more likely to live alone and experience isolation (Schnittker, 2007). Related to this, all of these factors predispose individuals to loneliness, which may serve as the underlying mechanism that links these factors. Despite not being the primary focus of most of the reviewed studies, loneliness may be a highly relevant factor in the mechanistic pathway to the social perception of smart speakers, and this should be investigated directly in further research.

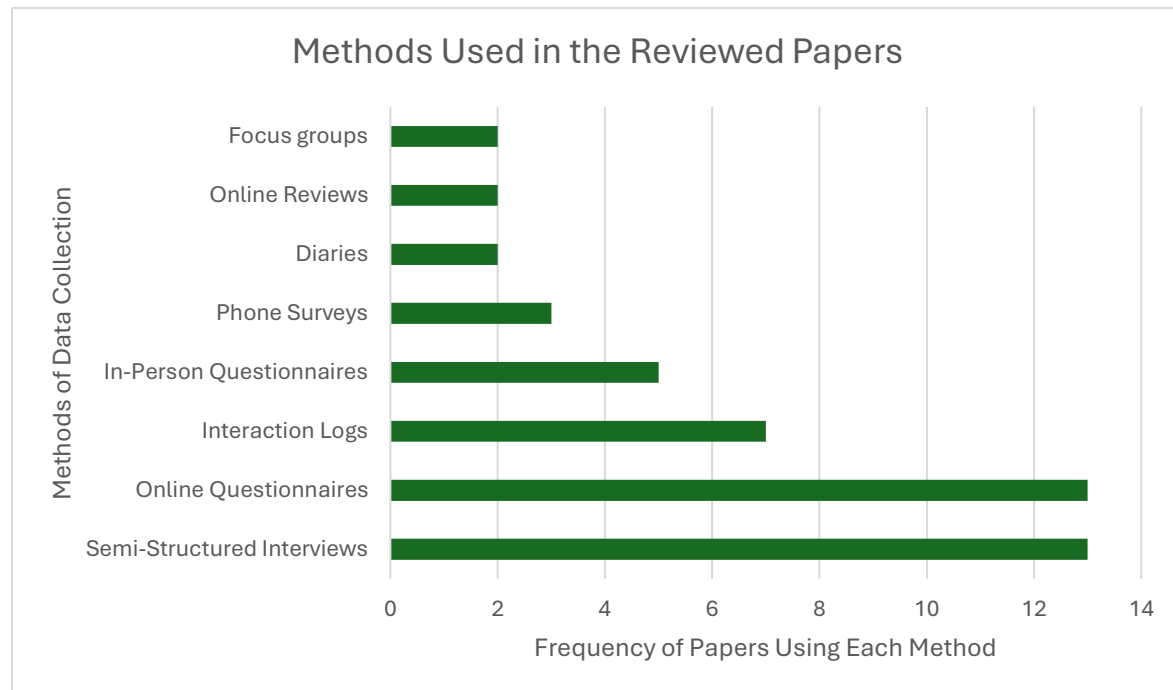
4.3.3. RQ3: What methodological approaches have been used to research relationship development with smart speakers? What are the merits and drawbacks of these approaches?

4.3.3.1. Study Design

Figure 11 shows that the most common methods used to investigate users' relationships with smart speakers were semi-structured interviews and online questionnaires. The prompts used in the semi-structured interviews were sparsely reported, limiting methodological comparisons. Additionally, semi-structured interviews may present an increased risk of inaccurately reporting parasocial relationships as users may feel a pressure to downplay the strength of their parasocial perception due to social desirability. Online questionnaires/surveys were equally commonly used, however were exclusive to studies of existing smart speaker users. This choice of method may prevent digitally excluded users from participating, potentially introducing a digital literacy bias into the samples gathered from this method. This limits the applicability of findings from studies using online data collection to digitally excluded users, which are a target population of particular importance when considering digital interventions and risk of isolation. Other methods such as in-person questionnaires and interaction logs were more commonly used for

studies with new users, possibly because they are more accessible for participants with limited digital skills or without pre-existing internet access.

Figure 11. *The range and frequency of methods used in the 30 studies included in this scoping review.*



Note: total n is greater than 30 as many studies employed multiple methods of data collection.

Of the 30 papers reviewed, 14 used a longitudinal design and 16 used a cross-sectional design. All longitudinal studies investigated the experiences of new users by experimentally introducing them to smart speakers and following up at a later time point (ranging from 3 weeks (Pradhan et al., 2019) to 18 months (Scherr et al., 2020)). The cross-sectional studies sampled existing smart speaker users and tended to employ surveys or semi-structured interviews.

4.3.3.2. Samples

This scoping review represents 61222 users from the 30 papers collectively reviewed, with a mean sample of 2041 users. This reduces substantially to a total of 5595 users who were directly sampled by removing the two studies analysing online reviews (Gao

et al., 2018; O'Brien et al., 2020), bringing the mean down to a more representative 200 users per study. The largest sample was from Gao, Pan, Wang and Chen (2018) which analysed the verified reviews for 55502 Amazon Echo owners. As should be expected, studies using more labour-intensive methods of data collection or more specific groups of interest were associated with lower sample sizes. For example, the 13 studies conducting semi-structured interviews had a mean sample size of 15 and the seven studies using interaction logs had a mean sample of 12. Similarly, the 12 studies targeting older adults had a mean sample of 80 while the 13 studies targeting novice users had a mean sample size of 39. All of these examples have considerably smaller mean sample sizes than the papers reviewed overall, reflecting the labour intensity of analysis and data collection, and the difficulty of recruitment.

Six of the studies reviewed did not specify the gender distribution of their sample (Brause & Blank, 2020; Chambers, 2020; Gao et al., 2018; Ki et al., 2020; O'Brien et al., 2020; Smith et al., 2020). Of the remaining 24 that did report this information, representing 5126 participants total, 51% were males.

Similarly, six studies in the sample did not specify the ages of participants (Brause & Blank, 2020; Chambers, 2020; Gao et al., 2018; Ki et al., 2020; O'Brien et al., 2020; Wu et al., 2019). From the studies that did give specific ages, or at least age ranges, this scoping review represents participants aged 17 (Choi & Drumwright, 2021) to 96 (Jones et al., 2021; Yan et al., 2024). Additionally, 10 studies exclusively sampled older adults with no prior experience with smart speaker use (Blocker et al., 2023; Corbett et al., 2021; Duque et al., 2021; Jones et al., 2021; Kim & Choudhury, 2021; O'Brien et al., 2022; Park & Kim, 2022; Pradhan et al., 2019; Scherr et al., 2020; Yan et al., 2024) while an additional four studies sampled novice users of other ages (Chambers, 2020; Cho et al., 2019; Oh et al., 2020; Smith et al., 2020). There appear to be no studies to date investigating the lived experience of older adults who are established smart speaker users.

25 of the 30 papers specified the country from which their sample was drawn. Of these 25, 10 took place in the U.S.A. (Blocker et al., 2023; Choi & Choi, 2023; Choi & Drumwright, 2021; Corbett, Combs, et al., 2021; Jones et al., 2021; Ki et al., 2020; Kim & Choudhury, 2021; O'Brien et al., 2022; Pradhan et al., 2019; Yan et al., 2024), five in

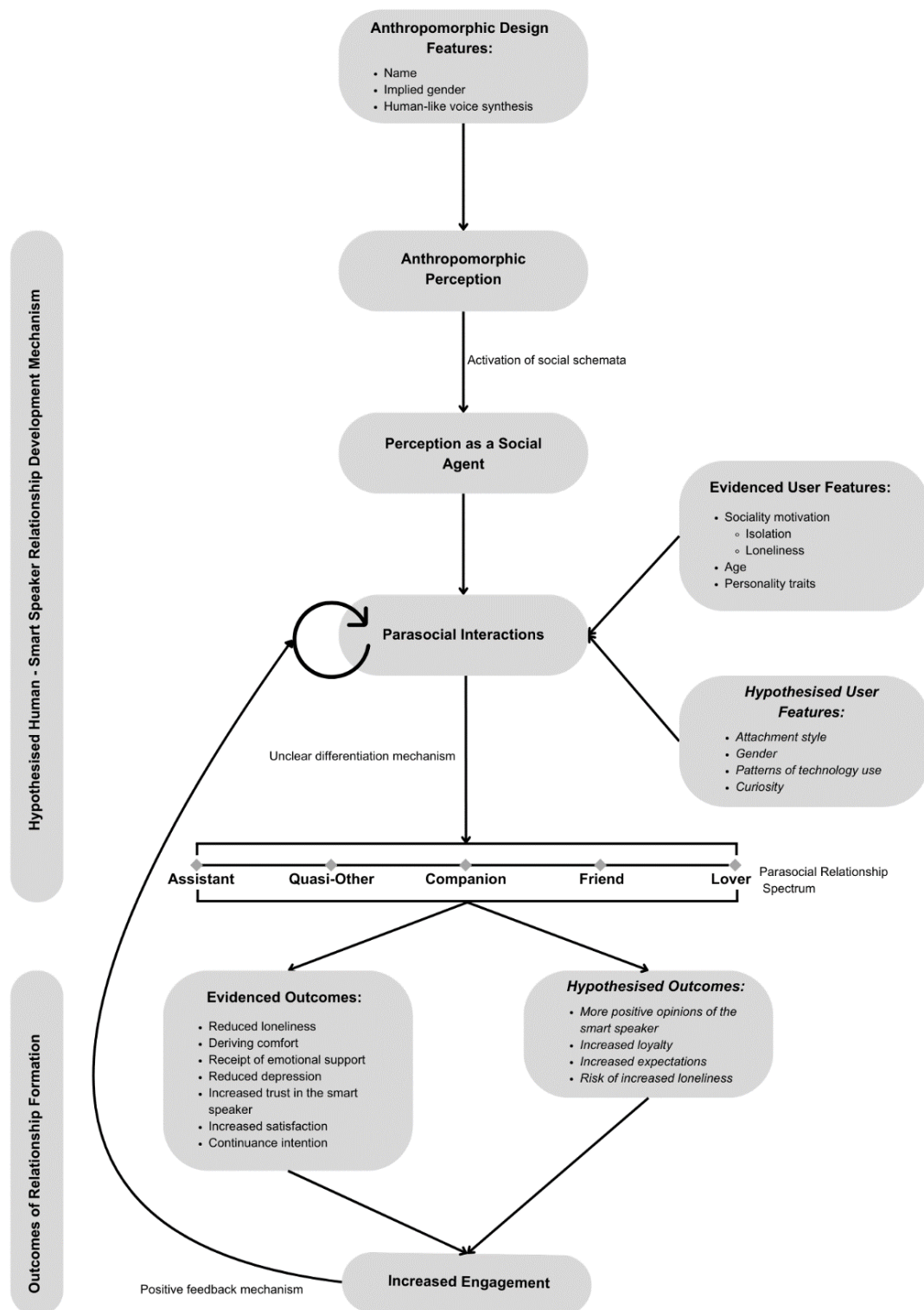
South Korea (Cha et al., 2019; Cho et al., 2019; Jang, 2020; Oh et al., 2020; Park & Kim, 2022), four in the U.K. (Chambers, 2020; McLean & Osei-Frimpong, 2019; Pitardi & Marriott, 2021; Smith et al., 2020), four in China (Cao et al., 2022; Liu et al., 2023; Ma & Huo, 2024; Wu et al., 2019), one in Germany (Scherr et al., 2020), and one in Australia (Duque et al., 2021).

Only 12 of the 30 papers specified the living situation of their participants. Collectively, these 12 papers represented 762 participants, of whom 48% ($n = 366$) reportedly lived alone.

4.4. Discussion

We systematically reviewed the existing literature on the social impact of smart speaker use and, based on the reviewed literature, propose the ASAP Pathway (Anthropomorphic – Social Agent – Parasocial Pathway) for conceptualising the formation and classification of user relationships with smart speakers (see Figure 12). Exploring parasocial relationship formation with smart speakers was not a stated aim of any of the reviewed studies but was commonly an emergent finding. The development of these relationships is dependent on several factors, relating to the user and the smart speaker. This review highlights the importance of anthropomorphic design in facilitating the formation of parasocial relationships, and we go on to suggest how the Computers are Social Actors (CASA) paradigm may mediate this development. Additionally, the outcomes of parasocial relationships with smart speakers are documented and further outcomes are hypothesised based on broader parasocial research.

Figure 12. *The proposed ASAP Pathway (Anthropomorphic – Social Agent – Parasocial Pathway) based on research with smart speakers and broader parasocial literature, including moderating factors and outcomes.*



Note: italicised text indicates features and outcomes that are hypothesised to be relevant to the model based on previous literature relating to parasocial relationships, but have not yet been researched in relation to smart speakers specifically (these are not intended to be exhaustive, rather a suggestion of other factors that may be relevant).

4.4.1. Development of Parasocial Relationships with Smart Speakers

The ASAP Pathway proposes that the anthropomorphic design of smart speakers is crucial to the development of parasocial relationships. Smart speakers often possess a human-like name (e.g. Alexa), have an implied feminine gender (Chung et al., 2021; Gao et al., 2018), and can synthesise a human-like voice to respond to user commands (Han & Yang, 2018; Pitardi & Marriott, 2021). These features imply a level of humanness and facilitate their anthropomorphic reception.

These anthropomorphic properties of smart speakers trigger the activation social schemata where the presence of some human-like qualities leads to the implicit assumption that the smart speaker may possess others. The social capacity of the smart speaker leads to the conceptualisation of it as a social agent (Reeves & Nass, 1996). Users then rely on their social schemata to guide future interactions, leading to mindless socially normative behaviours (Nass et al., 1994). Pradhan, Lazar and Findlater (2019) found evidence of people following these social scripts when interacting with their smart speaker, for example saying, “thank you” or “good morning”. Such mindless social interactions may seem reciprocal to the users because the smart speaker appears to be responding in kind, however, these interactions are only an approximation of true reciprocal interactions, lacking genuine emotions or thoughts from both parties (Giles, 2002). As such, interactions with a smart speaker can be thought of as parasocial interactions.

Broader research suggests that parasocial interactions can be strongly rewarding because of humans’ innate social drive (Horton & Wohl, 1956), which encourages users to repeatedly engage them and can eventually lead to parasocial relationships forming (Tukachinsky, 2010). This process of parasocial relationship formation has been observed amongst other conversational agents and seems to apply to smart speakers (Duque et al., 2021; Kim & Choudhury, 2021). What is surprising is the intensity of parasocial relationships possible with a smart speaker, given the relatively limited scope of interactions, compared with conversational agents like chatbots. Some studies even report romantic relationships parasocial formed with smart speakers (Cho et al., 2019; Gao et al., 2018).

4.4.1.1. Parasocial Relationship Spectrum

From the reviewed literature in this chapter, users identified their parasocial relationships in one of 5 ways, all reflecting a perception of their smart speaker as a socially capable, relational entity. The ASAP Pathway orders these on a spectrum from least parasocial (assistant) to most (loving relationship). The more parasocial relationships on this spectrum (friend, companion, and lover) reflect an additional level of intimacy that is not present for those who view their smart speaker as an assistant or quasi-other. This illusion of intimacy directly reflects a strong parasocial relationship (Horton & Wohl, 1956). Based on the present literature, the mechanism through which different classifications and strengths of parasocial relationships form is unclear, however, it could be hypothesised that individuals with more frequent parasocial interactions would be more likely to develop more intimate parasocial relationships.

4.4.1.2. Predictors of Parasocial Interactions

The propensity to engage in parasocial interactions varies greatly between individuals, with several predictive factors identified by this scoping review. This review suggests that the most common predictive factor is increased social motivation, arising from social isolation or feelings of loneliness. Voit et al. (2020) found that those who lived alone were more likely to perceive their smart speaker as a social presence, and subsequently parasocially interact with it. Echoing this, Choi and Drumwright (2021) demonstrated that the desire for social interaction was the strongest factor in their model predicting interactions with a smart speaker. The finding that loneliness increases the frequency of parasocial interactions with a smart speaker is in keeping with the general parasocial research (Cole & Leets, 1999) and research on other technologies, such as chatbots like Replika (Pentina et al., 2023). In addition to social motivation, certain personality traits have been associated with increased parasocial interactions. Ma and Huo (2024) showed that extraverted and conscientious individuals were more likely to view their smart speakers as socially attractive and engage with them, while agreeable individuals were the least likely to do so. Finally, older age is suggested to be positively associated with parasocial interactions with a smart speaker (Oh et al., 2020).

Further, based on findings from parasocial research beyond smart speakers, I hypothesize that other factors may be applicable to users' parasocial interactions with their smart speakers. Such factors include attachment style, with Cole and Leets (1999) suggesting that individuals with anxious ambivalent attachment styles are driven by a desire for intimacy and unmet, often unrealistic, relational needs, leading them to more readily interact parasocially and form parasocial relationships. Conversely, anxious-avoidant individuals show relational hesitancy that extends to hindering parasocial interactions (Cole & Leets, 1999). Further, research suggests that individuals are more likely to parasocially interact and form relationships with agents that are similar to themselves, particularly in terms of gender (Hoffner & Buchanan, 2005). For this reason, women may be more likely to interact parasocially with smart speakers, as the associated virtual agents are designed to display stereotypically feminine traits. The way individuals engage with technology and consume media has also been shown to relate to parasocial interactions, with those using the media for pleasure or escapism being more likely to show parasocial interactions (Tsay & Bodine, 2012). Finally, we suggest curiosity may be a relevant factor based on previous research showing that this is associated with frequent, initial parasocial interactions with the AI chatbot, Replika (Skjuve et al., 2021). Therefore, we hypothesise that factors such as attachment style, gender, patterns of technology use, and curiosity may be able to predict differences in the frequency of parasocial interactions with smart speakers, based on evidence from related research. We suggest that further research is conducted to see if these factors predict more parasocial interactions, and if this then leads to more intimate parasocial relationships with smart speakers.

4.4.1.3. Outcomes of Parasocial Relationships with Smart Speakers

The literature covered in this scoping review show that parasocial relationships formed with smart speakers can produce a wide variation in outcomes relating to quality of life. A common finding is that smart speakers are an effective combatant for loneliness, found in 11 papers reviewed. For example, Kim and Choudhury (2021) found that repeated interactions with a smart speaker led to it being perceived as a companion, and this produced a reduction in user-reported loneliness. Similarly, Yan, Johnson, and

Jones (2024) showed that the frequency of interactions with a smart speaker was negatively associated with feelings of loneliness and suggest that this is due to feelings of familiarity and comfort that arise from repeated interactions. Similarly, repeated parasocial interactions with a smart speaker can produce a significant decrease in depression (Park & Kim, 2022). Further, users find that repeated parasocial interactions and subsequent parasocial relationship formation allow them to derive a sense of comfort and emotional support from their smart speakers (Kim & Choudhury, 2021; O'Brien et al., 2022).

Further findings from this scoping review suggest that parasocial relationships with smart speakers also produce outcomes that affect users' subsequent interactions with their smart speakers. Firstly, perceiving the smart speaker as a social presence and forming a parasocial relationship with it is associated with increased trust in the device (Pitardi & Marriott, 2021). Secondly, parasocial relationships have been shown to be positively associated with user satisfaction; the stronger the parasocial illusion, the more satisfying users report their interactions to be (Jang, 2020). Finally, parasocial relationships can strongly predict users' intention to continue using their smart speakers (Han & Yang, 2018; Liu et al., 2023; McLean & Osei-Frimpong, 2019). This continuance intention is suggested to result from the positive reinforcement of the social benefits previously described (Han & Yang, 2018; Shao & Kwon, 2021), such as decreased loneliness and feelings of emotional support. This positive reinforcement is reflected in the hypothesised model by suggesting that it will produce a positive feedback mechanism, increasing the frequency of parasocial interactions and further strengthening the discussed outcomes.

In addition to the outcomes that are evidenced through research on parasocial relationships with smart speakers covered by this scoping review, we also hypothesise that additional outcomes may be present but as yet not researched with this technology. These hypothesised outcomes are based on findings from broader research on the effects of parasocial relationships. These outcomes include increased positive opinions (Aggarwal & McGill, 2007; Wan et al., 2017) of and positive affect towards the smart speaker (Stein et al., 2022). Additionally, we hypothesise that a parasocial relationship with a smart speaker may lead to increased expectations of the smart

speaker, in terms of user expectations of capacity and moral behaviour (Fink, 2012; Puzakova et al., 2013). We also hypothesise that users will be more loyal to their smart speaker, as has been shown to develop towards other subjects of parasocial relationships (Chandler & Schwarz, 2010). The ASAP Pathway hypothesises that some or all of these factors may also be positively reinforcing, alongside the outcomes identified by the scoping review, and similarly encourage the user to repeatedly interact with their smart speaker. In this way, additional or deeper benefits may be achieved, establishing a positive feedback mechanism.

Conversely, we hypothesise that parasocial relationships may lead to negative outcomes that have not yet been documented by the literature. Much previous literature suggests that overreliance on and over-engagement with parasocial relationships, at the expense of human-human interactions, can increase feelings of loneliness (Baek et al., 2013; Wang et al., 2008). This is a particular issue as some research suggests that parasocial relationships are insufficient to compensate for social or romantic loneliness (Tukachinsky et al., 2021) which would result in a growing social deficit. It is possible that there is an optimum level of usage to achieve a beneficial effect on loneliness; a smart speaker may help reduce loneliness for some individuals with casual or moderate use, but if the parasocial relationship becomes too intense or starts to come at the expense of real human contact, then this could increase loneliness.

The prominence of parasocial relationships with smart speakers raises potential ethical concerns about the use of technology to solve the societal and social issues of widespread isolation and loneliness, particularly amongst older adults as highlighted by this review. While there is evidence in this review to suggest that smart speakers can be effective for reducing feelings of loneliness amongst users (Blocker et al., 2023; Kim & Choudhury, 2021; Park & Kim, 2022), there is insufficient longitudinal research to understand the full range of long-term outcomes and rule out potential negative effects of using smart speakers as a social intervention.

Users' perceptions of social value from and relationships with smart speakers are unique because of their ubiquity and because they are not primarily designed as a social intervention, despite this application being common. Unlike other, intentionally designed social agents, such as Replika, smart speakers are not marketed as social

partners or interventions for loneliness. Despite this, this review suggests that some users grow to view their smart speakers as social agents and even friends or lovers. Due to the vast userbase of smart speakers, around 65% of the US population (Laricchia, 2022) and 50% of the UK population (Laricchia, 2023), this could scale up to be a significant number of people. Gao et al. (2018) find that roughly 2000 of the 55502 reviews sampled reflect users' parasocial relationships with their smart speakers. While this is only 3.6% of the sampled reviews, this number may be higher if smart speaker users were directly asked about how they perceived their device, rather than being asked open-endedly to review the product. Additionally, this 3.6% would represent a large number of PSRs given the size of the userbase. The literature lacks a reasonable estimation of the number of individuals who form parasocial relationships with their smart speakers.

4.4.2. Limitations

As with any review, it is important to be aware of the "file drawer problem" (Rosenthal, 1979), where many studies with null results are not published. This could have led to an artificial increase in the positive results reported in this review, as studies finding an absence of relationships with smart speakers would be less likely to be published (Wagner, 2021). Open science practices, such as pre-registration (C. D. Chambers et al., 2014), could help to protect this field from this problem in the future.

Similarly, this review is limited by the strength of the published research, both in terms of individual quality and the representativeness of the field as a whole. This review is limited in its understanding of what demographic factors predict, rather than are associated with, forming relationships with smart speakers as all existing studies begin with a presumption about the benefits to certain groups (e.g. older adults (Liu et al., 2023) or individuals with intellectual disabilities (E. Smith et al., 2020)). This is likely to result in a confirmation bias whereby groups, such as older adults, who have been shown to socially engage with smart speakers are more likely to be sampled in future research, leading to an overestimation of the benefits experienced by certain groups. It

is also possible that null or negative results in other groups were not published. This may have contributed to the lack of representativeness in the literature; other demographic factors, such as cultural differences or family status are not investigated in the research base and so cannot be reflected in this scoping review. Future research may wish to directly research demographic and other variables of interest to enhance the representativeness of the field and overcome this issue. This would support greater generalisability of the findings.

One of the more general challenges in conducting research into this area is the rapid advancement in software and hardware. Research can be a slow process, whereas the modern technological world is fast paced, with devices quickly becoming outdated. Many of the specific smart speaker models included in this review will have already been replaced by the next generation device. Speech recognition software is also rapidly improving (Greene, 2017), which may already limit the relevance of some earlier studies which report dissatisfaction with smart speakers' language abilities.

4.4.3. Recommendations for Future Research

To support the trend of smart speakers as interventions for loneliness, further research is needed to understand how to do this safely and ethically and to facilitate maximal benefits, as there is research from other parasocial subjects to suggest that over-investment in parasocial relationships can be detrimental to wellbeing (Baek et al., 2013; Wang et al., 2008), more longitudinal research is needed to understand if this is a possibility and how this outcome could be avoided. This will allow for smart speakers to be recommended as a safe and ethical intervention for social issues such as loneliness.

Further, while there is modelling research aiming to predict who will engage with smart speakers (Choi & Choi, 2023; Pitardi & Marriott, 2021), there is a lack of research aiming to predict who will perceive their smart speaker as a social agent and, thereby, gain social benefit from it. Further research could aim to produce similar models to understand who is likely to view their smart speaker as a social agent based on predictive factors known to be related to parasocial relationship development, such as

isolation or loneliness (Andriani et al., 2023), attachment style (Cole & Leets, 1999), or personality traits (Tsay & Bodine, 2012; Wang et al., 2008), with subsequent development then possible to predict what type of relationship is likely to be perceived/develop.

This understanding of who is most likely to form social relationships with and derive social benefit from their smart speaker could then be used to improve interventions by selecting individuals most likely to benefit. This has cost-saving potential for groups such as housing associations who are seeking to maximise the benefit that can be achieved within limited budgets. However, understanding who could benefit and offering them an intervention, such as a smart speaker, is not the same as ensuring those benefits can be achieved. Much research has been published examining how barriers such as lack of digital knowledge (Edwards et al., 2021) or privacy concerns (Brause & Blank, 2023) influence the purchase of and engagement with smart speakers. However, there is little to no research on how similar barriers impact the potential for social benefit from these devices, and how these issues may be overcome through appropriate training or educational interventions. Consideration should be given to understand what support is needed for individuals likely to benefit from smart technology interventions to fully engage with the technology and reap the maximum possible benefits.

Additionally, it is worth noting that smart speakers are far from the only technology that can convey social benefit through companionship and parasocial relationships. Similar findings have been shown with other, non-smart speaker-based smart agents. A meta-analysis by Sha et al. (2024) show that relational software-based agents can convey a moderate decrease in loneliness to users, while Gastgeiger et al. (2021) explain that this may be mainly due to acting as a companion and a catalyst for interpersonal conversations. Similarly, embodied sociable technology, such as companion robots, have been found to be highly effective for providing social value and reducing loneliness. Robinson et al. (2013) conducted a randomised control trial with Paro, a robot harp-seal pup, finding that interacting with Paro was associated with significant decreases in loneliness for adults living in residential care compared to controls. Further, interacting with Aibo, a robotic dog companion, was associated with

improvements in health, socialising, and loneliness scores of participants (Kanamori et al., 2003). However, A review by Broekens et al. (2009) highlights the confounding effect that interacting with the researcher and other participants while training with novel devices may have on these findings. It is unlikely that one device is the most appropriate companion technology for all users, so further research into the efficacy of smart speakers compared to other social technology would be helpful for targeting future interventions.

4.4.4. Conclusion

This chapter aimed to present a scoping overview of the literature reflecting users perceived relationships with smart speakers. Smart speakers were chosen because they are an accessibly designed mainstream technology that have widely been reported as socially capable by previous research. From reviewing the present literature, social value in the form of offering comfort or reducing loneliness was found to be a common effect of smart speakers. Additionally, there was felt to be particular benefit for groups that are at risk of social isolation and digital exclusion, such as older adults and those who live alone. Reviewing the current literatures descriptions of how social connections with smart speakers are formed provided the basis for the hypothesised ASAP Pathway. This pathway suggests that the anthropomorphic design of smart speakers underpins the perception of them as social agents, and it is through repeated parasocial interactions with a perceived social agent that parasocial relationships can form. Additional factors hypothesised to be relevant to the pathway, based on parasocial research with other targets, are also suggested. This chapter highlights the social benefit that smart speakers can offer by acting as a social agent. However, as with all reviews, this chapter is limited by the strength of the published research and the file drawer problem. To overcome the potential bias this introduces, the following chapter will conduct an open-ended survey of smart speaker users' opinions and experiences, with a particular focus placed on psychosocial outcomes.

Chapter 5. Smart Speaker Users: Who and Why? An Open-Ended, Data-Driven Content Analysis and Validation of Users Experiences

5.1. Introduction

5.1.1. Background

In the previous chapter, the research identified by the scoping review was analysed and informed the hypothesised ASAP Pathway. This pathway suggests how users may develop parasocial relationships with their smart speakers, the psychosocial outcomes of these relationships, and the user variables that may be influential. A primary issue highlighted by Chapter 4 was the strength of the published papers that formed the basis of the scoping review, both in terms of the quality of individual papers and their methods and the representativeness of the field as a whole. These issues produce a field of research with many unsupported assumptions; as the scoping review notes, every study included begins with an assumption of who is likely to benefit in a quantitatively or qualitatively different way. This is despite a lack of comparative research that would support these assumptions. This can produce a confirmation bias, where evidence for a group benefitting to any extent is used to justify resampling this population in further studies. Repeating this cycle has the potential to lead to a gross overestimation of smart speakers' benefits to certain populations or the uniqueness of these populations' benefits.

Smart speakers are increasingly ubiquitous, likely because of their operational and financial accessibility, as well as their anthropomorphic and pro-social design. As their user base is growing and they are becoming more embedded into daily life, it becomes increasingly important to gain a representative and holistic understanding of who is using smart speakers and how they are being impacted to redress this confirmation bias cycle that has emerged.

5.1.2. Existing Literature

As mentioned, the existing literature taking a psychological perspective of smart speakers is limited by preconceptions of who is likely to benefit the most or benefit uniquely. These preconceptions manifest as purposive sampling of populations who show specific characteristics, producing two main issues. Firstly, there is the potential for relevant groups who do benefit in a greater or unique way to be overlooked if they are not considered by the researchers. This is compounded by a lack of holistic, participant driven research. Secondly, these studies tend to lack control groups, therefore preventing the research from supporting the quantitative or qualitative differences that these findings imply; it cannot be said that the populations being studied benefit in a greater or unique way when there are no other groups to compare them to. To evidence this point, we will examine two populations that are heavily focused on in the literature where this is a particular issue: older adults and those reporting high loneliness.

Much of the research on older adults focuses on the novel introduction of smart speakers to their homes. McCloud et al. (2022) reported that the older adults in their sample found their smart speakers to be useful for companionship and connection to the outside world by facilitating access to information. Park and Kim (2022) investigated the effect of smart speakers on older adults' loneliness and depression, while Kim and Choudhury (2021) focussed on older adults' perceptions of their smart speakers. However, all of these studies lacked a control or comparison group. This is limiting for the field in general, as there is a notable lack of cross-age comparison studies. This lack of control group, therefore, leads to the research failing to provide evidence for older adults interacting with, benefitting from, or perceiving their smart speaker in a way that is meaningfully different to other age groups. More to the point, there is evidence from comparable studies with other age groups to suggest that the responses of older adults are not unique. Adults of all ages have been reported to feel a sense of friendship and/or companionship with their smart speaker (Brause & Blank, 2023; Cho et al., 2019; McLean & Osei-Frimpong, 2019). Similarly, adults of all ages report benefitting from the perceived convenience and ready access to information afforded by their smart speaker (Ashfaq et al., 2021; Kowalczyk, 2018). The only identified exception to this trend of single-age group studies is by Oh, Chung and Ju (2020) who compared attitudes and

usage patterns with smart speakers between younger and older adults; finding that older adults are more likely to view their smart speaker as a companion than a tool. However, their “older” age group included only 12 individuals aged 50-74, which defies the field standard of considering 65 to be the threshold for “older adulthood”, thereby limiting the generalisability of the findings. Therefore, the prevalence of research into older adults using smart speakers implies a quantitative or qualitative difference, but the lack of appropriate control groups prevents these claims from being substantiated.

Secondly, there is a strong focus in the literature on how lonely or isolated individuals interact with and benefit from their smart speakers. Duque et al. (2021) found that older adults who reported high loneliness viewed their smart speaker as a companion. This is echoed by Chambers (2020) who suggests that isolated individuals benefit from their smart speaker acting as a companion and being something to talk to, thus providing comfort. This is similarly seen by Jones et al. (2021) who experimentally introduced smart speakers to older adults living alone, finding that using the smart speaker was associated with a reduction in loneliness. Further, participants in Choi and Drumwright’s (2021) study predominantly lived alone, and the researchers explicitly assumed that this made them more likely to view their smart speaker as a companion, despite presenting no evidence or having a relevant comparison group to support this. In all of the studies presented, there are no control or comparison groups to isolate the influence of baseline loneliness on interactions with or responses to a smart speaker. Contrarily, studies of other groups find similar outcomes as the ones suggested to be unique or greater for isolated/lonely individuals; many studies report samples of other populations viewing their smart speaker as a companion (Ki et al., 2020; Pitardi & Marriott, 2021). This suggests that the findings about how lonely/isolated individuals relate to their smart speakers may not be unique to this group, as assumed.

Beyond the limited populations that are considered when researching smart speakers, there is also a narrow scope taken regarding the implications of smart speakers. Much of the research tends to focus on the ways users interact with their smart speakers, such as the choice of functions accessed, often using methods such as examining interaction logs (Ammari et al., 2019) and distributing surveys (Furini et al., 2020). This body of research consistently finds that functions such as playing music (Ammari et al.,

2019; Canziani & MacSween, 2021; Furini et al., 2020), accessing information (Ammari et al., 2019; Canziani & MacSween, 2021; Choi et al., 2018), and setting reminders (Choi et al., 2018; Furini et al., 2020) are the most accessed. Such practical functions are attractive as they can automate aspects of one's life, save time, and expedite processes in the home. While such a focus is reasonable for the early stages of researching any emergent technology, this utilitarian focus still dominates the literature base 10 years after the devices became commercially available. There is comparatively limited, high quality, research dedicated to the psychological implications of interacting with and sharing one's home with an anthropomorphic digital entity.

This is not to say that research considering the psychological impact of interactions with a smart speaker does not exist. As demonstrated by the results of the scoping review reported in the previous chapter, there are a variety of studies that address smart speakers from a psychological perspective. However, this area of research is, again, victim to preconceptions. In this case, researchers adopt a narrow scope by focussing on specific outcome variables or hypotheses at the exclusion of other factors. For example, Park and Kim (2022) introduced smart speakers to novel users with the hypothesis that interaction would reduce loneliness and depression. These variables were measured using the UCLA Loneliness Scale (Russell, 1996) and the Korean form of the Short Geriatric Depression Scale (Cho et al., 1999). No other psychological variables, such as wellbeing or self-efficacy, or qualitative data were captured. As such, no explanation was able to be provided for why differences in loneliness and depression arose from interactions with a smart speaker. In a different study, Han and Yang (2018) theorised that smart speaker users would form parasocial relationships with their devices that were comparable to those documented with television or radio hosts. This was hypothesised despite substantial differences in the media (i.e., interactions with smart speakers are superficially bi-directional by design, unlike television or radio). To investigate this hypothesis, a series of closed-answer questions relating to features of parasocial relationships, such as attraction and satisfaction, were administered. Broader psychological experiences arising from parasocial relationship formation with a smart speaker were not considered. Additionally, there were no opportunities for participants to respond freely about the relationships they may have formed with their

smart speaker, missing potentially valuable information about the differences between parasocial relationships formed with different media. This lack of exploration limits the fields' explanatory ability, preventing a comprehensive overview.

A similarly problematically narrow scope is seen in the literature when investigating the potential downside of smart speakers. Researchers frequently make presumptions about what barriers or drawbacks smart speaker users are likely to face and only gather data to this end. Opportunities for participants to speak freely and suggest novel issues are limited, if not entirely absent, and this may lead to a further confirmation bias in the literature.

This issue is clearly apparent when examining the research on privacy concerns relating to smart speakers, as this seems to be the most researched barrier/concern. These concerns centre around the always-listening microphone design (Furini et al., 2020) and associated data storage policies (Malkin et al., 2019). However, a closed approach is generally taken in the research to understand what features or issues trigger privacy concerns. This is often done without consideration of factors that may predispose individuals to having privacy concerns, heighten privacy concerns, or the broader behavioural and/or emotional impact of privacy concerns. For example, Ammari et al. (2019) conducted a semi-structured interview on attitudes to and uses of smart speakers, however, privacy and security were the only negative topics raised by the interviewer. Similarly, Cha et al. (2021) created their theoretically driven model of smart speaker adoption, but privacy concerns were the only negative item considered or included. In the same way, Han and Yang (2018) created a theoretically driven model of continuance intention where privacy concerns were the only negatively weighted item to be considered or included in the final model. These studies exemplify the issue of researchers presuming what issues will be relevant and not gathering the data required to appropriately explore or rule out other, potentially relevant, factors. This may also lead to a confirmation bias amongst the literature; future researchers seeing privacy concerns frequently reported as the only issue with smart speakers may adopt this stance believing it is evidence informed. This may lead to a potential overestimation of the magnitude of privacy concerns and perpetuation of this narrow scope.

5.1.3. This Chapter

As identified from the literature discussed above, there is a considerable volume of research on smart speakers. However, this is not without issue. The main issues identified from the literature presented above are a lack of comparison/control groups and a narrow scope when designing research. This gives rise to two potential problems for the area of research. Firstly, groups, benefits, and limitations that are relevant to smart speaker users may be overlooked if they are not considered by the researchers when designing their studies. Secondly, taking a narrow scope of quantitative measures may lead to a confirmation bias, whereby only limited outcomes are presented and so future research struggles to expand. These two issues can be mutually exacerbating. This may result in new studies replicating investigations with previously studied factors, overemphasising the relevance or uniqueness of these.

There is a need for a large-scale and broad-scoped investigation into what personal traits users feel are relevant to being a smart speaker owner, the psychological benefits of smart speaker use, and the limitations experienced by smart speaker users. This research must not be constrained by the researchers' presumptions. Upon searching, no such holistic, bottom-up, and data/participant-driven approach to mapping this topic has been undertaken to date.

Such an investigation would act as a comprehensive summary of the psychological impact of smart speakers. This may serve as a foundation for under-studied effects and groups to be investigated in greater detail and allow for future research to fill any identified gaps in the literature. This would lead to the field becoming more representative and holistic.

As such, the aims of this chapter are to fill these gaps in the literature; providing a holistic, bottom-up and participant-led overview of the relevant user factors, psychological benefits, and potential barriers to smart speaker use. This will primarily be done by asking an open-ended question to a large sample of smart speaker users, allowing them to identify the factors they feel are most salient without the constraints of the researchers' assumptions in Study 1. Follow up analyses to validate these findings will form Study 2.

This leads to the following three research questions that will be addressed, primarily, by the responses to the open-ended questions:

1. What traits or characteristics do users feel are relevant to their smart speaker ownership and experience? Do different groups of users report a differential experience?
2. In what ways do people feel they benefit psychologically from their smart speaker?
3. What are the perceived limitations of smart speakers? How do users feel they are impacted by these limitations?

5.2. Study 1 Methods

5.2.1. Participants

Data for this study was drawn from the same project described in Chapter 2; 3845 participants completed a survey distributed by HealthWise Wales (*HealthWise Wales*, n.d.). Within this sample, only 1306 owned a smart speaker and were eligible for Study 1. Descriptive statistics of this sample are presented in Table 29.

Table 29. *Descriptive statistics of the 1306 smart speaker owners who completed the HealthWise Wales survey*

	Description	Percentage (%)
Gender	Man	57.5
	Woman	38.1
	Prefer not to say / provided an alternative response	4.4
Age	18-24	0.6
	25-34	4
	35-44	7.4
	45-54	13.6
	55-64	25.7
	65 and over	47.8
	Prefer not to say	4.9

5.2.2. Measures

Participants responded “yes” or “no” to the question “Do you own a smart speaker?”. Of those who answered “yes”, 731 owned an Amazon device, 135 owned a Google device, 23 owned an Apple device. The remaining participants either did not respond or owned an alternative brand of smart speaker. Participants who owned a smart speaker were then presented with an open-ended question; “What do you think are the benefits and drawbacks of owning a smart speaker?”. Of the 1306 smart speaker owners, 1243 provided an answer to this open-ended question, therefore allowing their responses to be analysed in Study 1. Other measures were included in the survey but were not addressed in Study 1.

5.2.3. Procedure

As described in Chapter 2, participants completed a survey via Qualtrics that contained the information sheet, attention-check questions, and consent checkpoints (Appendix A: Information sheet, consent form, and survey tools administered to all HWW participants.). Ethical approval was provided by Cardiff University (EC.20.09.15.6072).

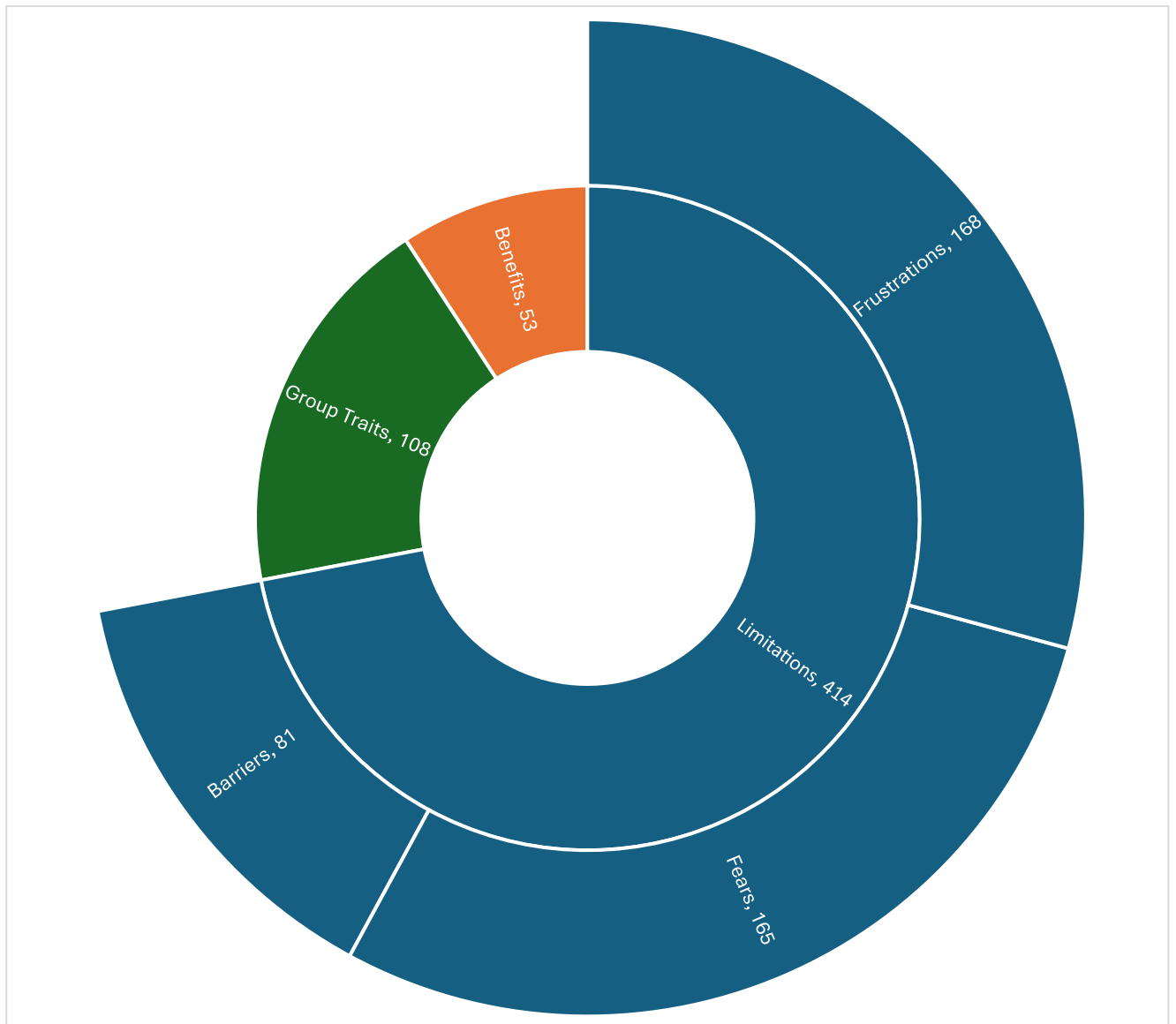
5.2.4. Analysis

To answer the research questions stated in this chapter, content analysis will be used in the first instance. This will allow for the identification of key themes and their relative frequencies. The analyses will follow the nine stages of problem-driven content analyses set out by Krippendorff (Krippendorff, 2004) and employ abductive reasoning. An initially deductive approach will be taken to identify aspects of participants responses that relate to the three research questions. The top-level analytical framework reflects group traits/characteristics (RQ1), benefits (RQ2), and limitations (RQ3), which will form the initial coding process. The data within these three categories will then be inductively coded. The initial coding process can be seen in Appendix I: Coding of the qualitative survey responses as part of the content analysis.

5.3. Study 1 Results

The results presented below summarise the findings from the content analysis of the 1243 responses given by smart speaker owners. In line with the three research questions, the findings are divided into three categories; group traits (RQ1), benefits (RQ2), and limitations (RQ3) (see Figure 13).

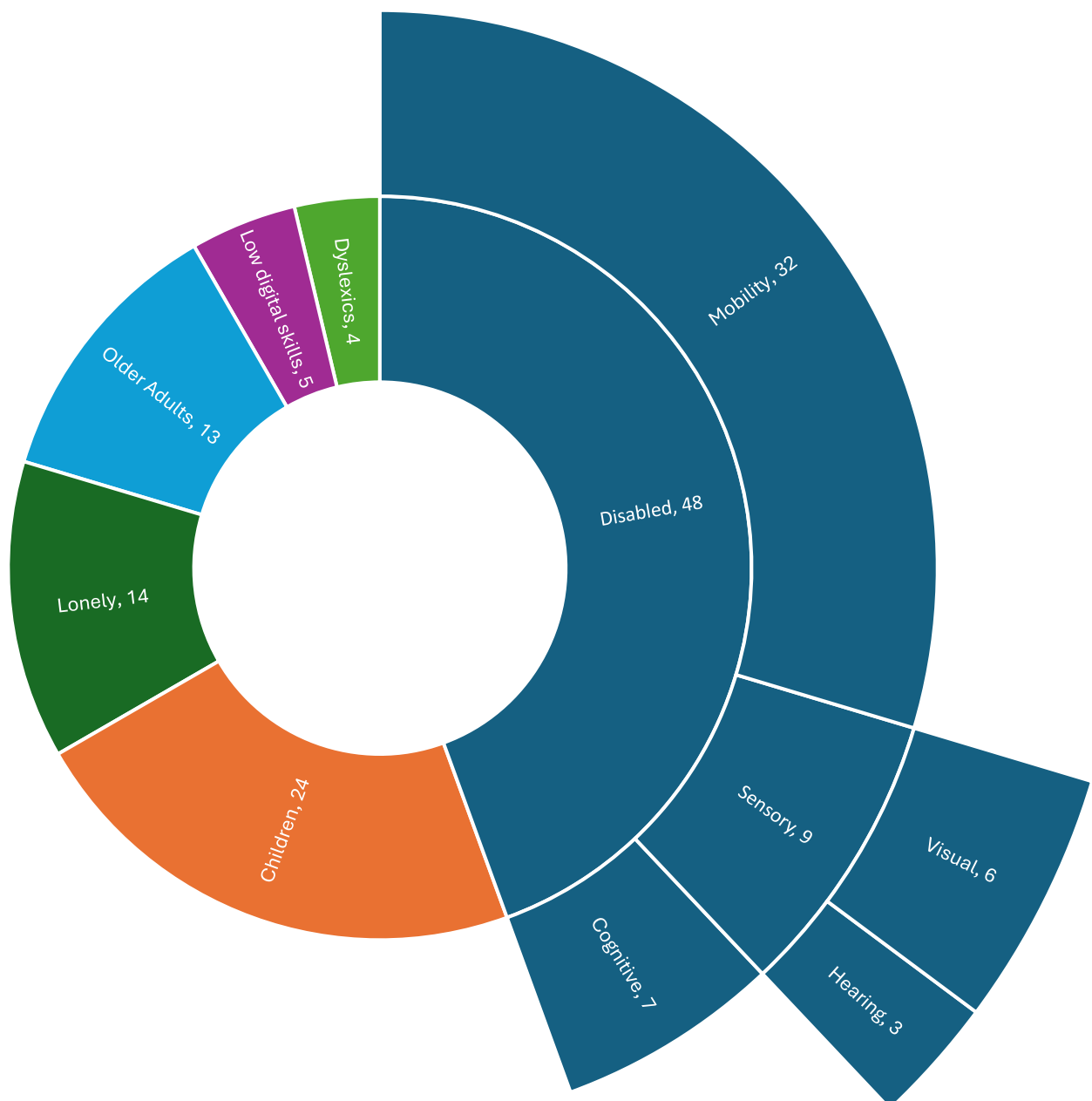
Figure 13. *The frequencies of top-level themes identified through content analysis of the 1243 responses to the open-ended question.*



5.3.1. RQ1: Group Traits and Differential Experiences

Content analysis of the open-ended question identified personal features that the respondents felt were relevant either to their ownership of a smart speaker or the benefits they derive from their device. These features are summarised in Figure 14 and explained in detail below. While there was an expectation that participants would discuss both positive and negative experiences that were relevant to their group traits, only positive outcomes were discussed.

Figure 14. *The frequencies of themes and subthemes identified through content analysis relating to the first research question; traits that are relevant to smart speaker ownership and users' differential experiences.*



5.3.1.1. Disabilities (n=48)

This group represented all participants reporting mobility or cognitive issues, or sensory impairments (visual and hearing). The most common disability reported related to mobility issues; any participants self-reporting physical impairments associated with limited mobility or explicitly stating that they experienced mobility issues were grouped into this category ($n = 32$). Such impairments included, but were not limited to, being **“an amputee”**, having **“arthritis”** of the hands, using a **“walking stick”**, and having an unspecific **“physical disability”**. This group report particular benefit in the home automation potential of their smart speaker, with some going so far as the view their device as **“an item of assistive technology”**. This feature allows those with difficulties walking around the house or completing certain movements to control their home seamlessly, without the need for specialist equipment or support. Users report that they enjoy the ability to **“control all my devices from one place. This is great as I have mobility issues”** and that this is beneficial because of this **“physical disability as I don’t have to get up to switch things on/off around my house”**. Additionally, some users with specific mobility issues find that their smart speaker is a more accessible form of technology than potential alternatives, reporting that **“hands-free information helps with my arthritis hands”**. This group report feeling comforted by the emergency calling features, with many reporting this as the primary reason for purchasing/being given a smart speaker. One reports that **“my family bought me the smart speaker as a safety measure”**, with a further stating that **“it can be used to summon help should I have a fall. That’s why it was bought for me”**.

The second largest group of disabilities reported related to sensory impairments ($n=9$). Primarily, this consisted of participants with visual issues; those who referenced having **“sight problems”**, **“bad eyesight”**, being **“partially sighted”**, or **“blind”** were classed as being visually impaired ($n = 6$). This group felt they benefitted from the accessible voice interface of smart speakers that allowed them to gain information that they otherwise would struggle to access. For example, one reports that they used their smart speaker for **“knowing what time it is because you cannot read a clock”** due to their visual impairment. Another reported that their husband **“is totally blind and so it easy to find sports results”**. Easy access to media, particularly audiobooks, was also

valued by this group. This group also felt they benefitted from home automation features as they no longer had to struggle to find light switches or remote controls. One visually impaired user reported that they connected multiple light sources to their smart speaker, allowing for their home to be brightly lit to partially compensate for their impairment.

A surprising further group, given the voice and audio interface design, were those reporting their smart speaker to be acutely useful to compensate for their partial **“hearing loss”** or being **“hard of hearing”** (n = 3). This group reported setting up intercom systems around the house by having multiple, interconnected smart speakers. This allowed participants to communicate with household members who struggled with their hearing. The smart speakers were used **“to make announcements to my husband who is hard of hearing when I am in a different part of the house”**. This intercom feature was also mentioned by other users who did not explicitly report hearing issues, so the number of participants using smart speakers in this way may be underrepresented here by limiting it to those who have hearing issues.

Those who reported general memory issues or specific diagnoses, such as Alzheimer’s or Dementia, were considered to have cognitive issues (n = 7) reflecting a level of disability. This group reports benefitting from being able to easily set reminders to support remembering appointments or to take medication consistently. One reports that they **“often forget things, so I always set a reminder for different things I need to remember to do, including taking my medication”**. In this way, smart speakers are viewed as ways to support and manage cognitive issues by compensating for memory deficits. Additionally, smart speakers are reported to be accessible and easy for this group to use, who may otherwise struggle to learn or remember how to use other forms of technology.

5.3.1.2. Children (n=24)

While all the respondents to this survey were adults (age > 18 years), many reported feelings that the children in their families benefitted from having access to a smart speaker. Children were perceived to experience greater enjoyment from interacting with

a smart speaker than other members of the household. For example, users report that their smart speaker **“keeps my grandchildren happy when they visit”** and that it **“amuses the grandchildren”** and provides **“entertainment for my young granddaughter”**. This benefit may arise from the set of uses that respondents identified children requesting, such as for the smart speaker to tell **“jokes, sing nursery rhymes”** or for **“favourite songs to be played”**. Additionally, both adults and children are able to use it to look up information to answer children’s questions. One user reported that **“if my child asks me a question whilst I’m in the room with the smart speaker I nearly always say let’s ask Google”**, while another reports that **“it helps with homework for the kids”**. Related to asking for information is the perception that the smart speaker is accessible for even quite young children. One user reported that **“my 3 year old granddaughter now uses it when she visits”**. This potentially underpins its value as a way to entertain children and support their discovery about the world through receiving information that they may otherwise struggle to access, while also acting as a social stimulus between generations.

5.3.1.3. Lonely and/or Isolated (n=14)

Those were reported feeling lonely, living or frequently being alone, or being socially isolated were placed in this group. These users frequently reported that they used their smart speaker as a means to combat or overcome their feelings of loneliness, reporting that interacting with their smart speakers can offer a **“feeling of not being alone”**. The voice-controlled interface seems to be particularly relevant for this group, as this facilitates conversation. Members of this group reported perceiving an active, social presence from their smart speaker, whereby the device was felt to be a companion offering **“help to keep me company as I live alone and am alone most of the time”**. Additionally, features such as music and radio were used to **“overcome the ‘silence’”** that is associated with living alone. Overall, this seems to reflect a differential social benefit for those that experiencing a social deficit.

5.3.1.4. Older Adults (n=13)

Participants explicitly stating their age as being over 65 or referring to themselves as an ‘older adult’, or similar, are grouped here. There was substantial overlap between older age and other identified features. Firstly, many equated their feelings of loneliness or isolation, and subsequent social benefits from their smart speaker, as being a function of their older age. These individuals reported benefitting from the companionship offered by their smart speaker; **“an older person is on their own with it being their only companion”**. Secondly, other older adults equate their age with their experience of cognitive decline, such as Alzheimer’s or Dementia. As with the cognitive impairment group, older adults benefit from the ability to easily set reminders for tasks such as taking **“medications at a prescribed time”** and being reminded **“of important appointments”**. Additionally, they enjoy using their smart speaker to **“keep my mind active as I am getting old”**, thereby promoting mental and cognitive activity to promote healthy ageing. Thirdly, older adults often felt that their low digital skills were a function of their age, thereby benefitting from their smart speakers as a more accessible piece of technology than alternatives such as tablets or smartphones. Fourthly and finally, older adults felt they benefitted from the safety features of smart speakers, offering **“a means of contacting (family or emergency services) if I have a fall or hurt myself and cannot reach my phone”**, overlapping with those who report mobility issues. For each of these confounding categories, it is unclear which factors the users feel are influencing the benefit they derive, or if these benefits are driven by an interaction of their older age and the other factors.

5.3.1.5. Low Digital Skills (n = 5)

Participants who felt they had lower-than-average and/or insufficient digital skills reported feeling that they experienced unique benefits from their smart speaker. This group felt that the design of the smart speakers was far more accessible and intuitive than other types of technology, which many reported struggling to use. This accessibility was largely attributed to the voice interface, as one user reports **“voice control enables those with difficulties using keyboard and mouse”**. There were also reports of this increased accessibility fostering greater independence and self-efficacy for

individuals with low digital skills, as they felt they could control the device without any additional support; one user reports that their smart speaker is **“easy to use for people without digital skills”**.

5.3.1.6. Dyslexics (n = 4)

A surprising group experiencing a unique benefit were dyslexics. This group reported particular benefit in being able to **“do things by voice”**, instead of needing to read and type to navigate a visual interface. Further, there was a benefit when needing to write or type for those who considered themselves to be **“very poor at spelling”**, as they used their smart speaker to quickly request the correct spelling of words.

5.3.2. RQ2: Benefits

Content analysis of the qualitative responses produced the following themes that relate to the second research question, “In what ways do people feel they psychologically benefit from their smart speaker?”. The findings from this section focus primarily on the psychological benefits expressed by users, as there is already a wealth of research on the practical/utilitarian benefits and applications of smart speakers (as discussed in the introduction). These benefits were discussed in a way that was independent from the users group traits or characteristics, so are distinct from the benefits discussed above. The findings relating to these psychological benefits are represented in Figure 15. *The frequencies of themes and subthemes identified through content analysis relating to the second research question; the benefits that users report experiencing.* and discussed in detail below.

Figure 15. *The frequencies of themes and subthemes identified through content analysis relating to the second research question; the benefits that users report experiencing.*



5.3.2.1. Social Connection (n=25)

The main benefit identified from the sample's responses related to smart speakers' ability to support and offer social connections. The benefit of social connection can be

subdivided into two further categories: offering intrinsic social value and facilitating human-human connections. Offering intrinsic social connections reflects that the smart speaker can provide social benefit through promoting users to perceive a relationship with the device. Within this category, talking to and socialising with the smart speaker is the end social goal. Conversely, facilitating human-human connections reflects the use of smart speakers as a tool to contact social relations more easily. Using the smart speaker to facilitate social connections does not arise from the device's social capacity. Collectively, these two aspects seem to reflect the overall social benefit that smart speakers can offer to their users.

5.3.2.1.1. Offering Intrinsic Social Benefit (n=15)

Smart speakers are reported to act as a companion by a substantial group (n=15), reflecting a key psychosocial benefit. A large subset of this group (n=11) reflected that offering companionship was particularly relevant to them as they felt they were lonely and/or isolated. For this group, companionship and social interactions with people may be lacking in quantity or quality. A smart speaker is felt to offer a degree of compensation for this perceived lack, acting as a pseudo-social entity and offering a sense of companionship.

Repeatedly (n=4), the voice interface was referenced as contributing to the smart speakers' social value. Needing to speak to the smart speaker to control it, and receiving a verbal response, strongly promotes the notion that the smart speaker is a social entity, and this seems to underpin its perception as a companion.

5.3.2.1.2. Facilitating Human-Human Connections (n=10)

A further psychosocial benefit was the smart speaker facilitation of interactions with existing social connections, primarily family members. There were two keyways in which users felt their smart speakers acted as social facilitators.

Firstly, smart speakers offered an easy way to initiate or receive contact (n=8). This overcame the practical barrier of communicating with distant relations. There is the perception that smart speakers offer an **“easy hands-free use for phone/video calls”**,

suggesting that there is a preference for using their smart speaker above other technology capable of voice or video calls as it is easier to use. For some, this facilitation is driven by other family members wishing to have an easy means to contact the participants; **“our children like the idea of using it to get in touch and see us”**.

Secondly, other participants ($n=2$) felt their smart speaker offers a cost-effective alternative means of contact, as there is no charge for making voice or video calls. In this way, smart speakers can help to overcome the financial barrier to communication that often arises from large phone bills when placing international calls or calls to mobiles instead of landlines.

5.3.2.2. Wellbeing ($n=12$)

An improvement in wellbeing arising from interactions with their smart speakers were identified by 12 participants. Firstly, some users ($n=6$) report that they use their smart speaker to positively modify their moods, finding their devices able to **“keep spirits up”** and **“improve my mood”**. Further, these users identify the features that allow this improvement in wellbeing, either from easy access to preferred music (**“my daily sing-a-longs with Alexa are a feel-good treat”**) or comedy features (**“her cheesy jokes of the day I will sometimes ask just to bring a smile”**). Other users ($n=4$) feel their smart speakers support their wellbeing by helping them to relax. This relates to accessing music or sounds that promote relaxation, such as **“the sound of waves”** or **“the noise of a crackling fire”**. These features are often reported in relation to sleep, suggesting that users’ find benefit in feeling relaxed before trying to sleep and being woken gently in the morning to start the day feeling relaxed. Two users specifically reported that their smart speaker had a **“positive effect on my mental health”**. There were not enough responses to draw conclusions about how this was achieved. However, one user reported that they **“bought one for my mum in law when she was shielding, and it improved her mental state significantly (in between listening to Cliff Richard)”**.

5.3.2.3. Facilitating Independence ($n=5$)

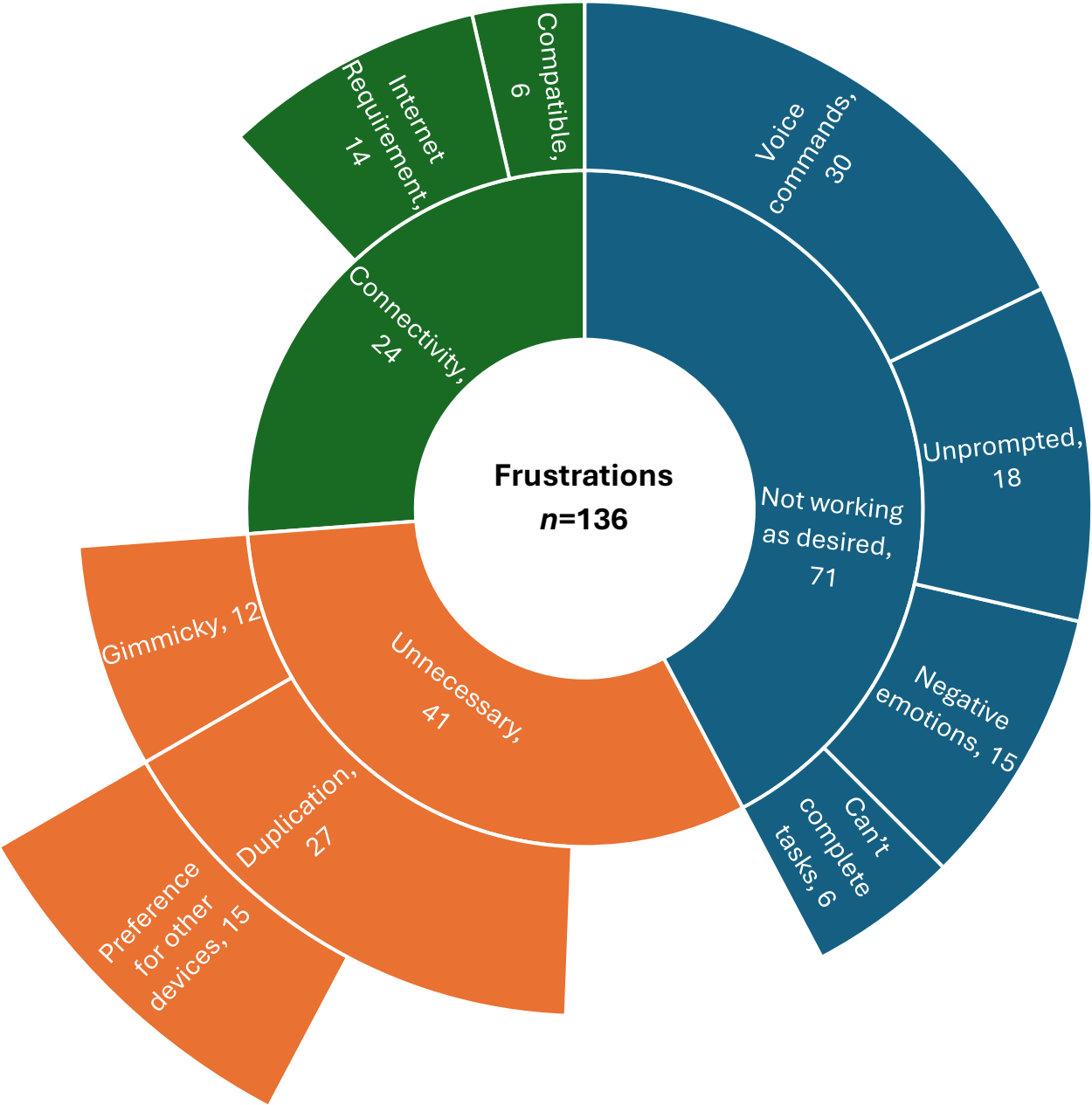
A small group report that their smart speaker facilitates their independence. Of particular value to this group were the safety and home automation features. The smart speakers are used as a **“safety measure”** by offering features such as emergency

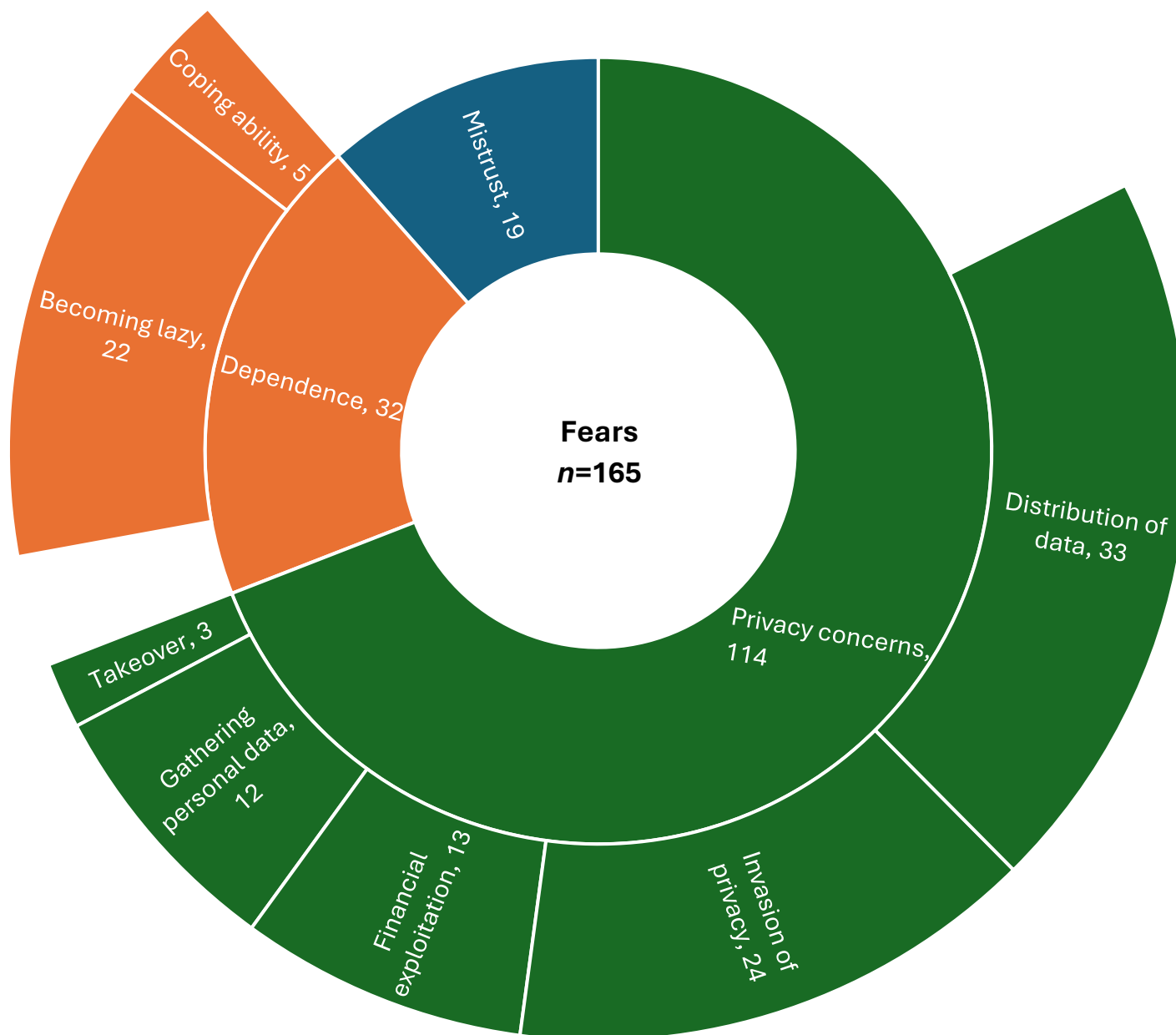
calling in the event of an accident or fall. Voice-controlled emergency calling is beneficial above alternatives as it removes the need to physically reach a landline/mobile, or emergency pull cord/button. This offers both users and their families a sense of security. This also enhances users' independence as there is less need for monitoring or being checked on by family or carers. Further, home automation, such as turning lights and appliances on and off, underpins some users' ability to complete tasks around their house. This facilitates independence as users report they **“can do more things for myself like turning heating up or off”**.

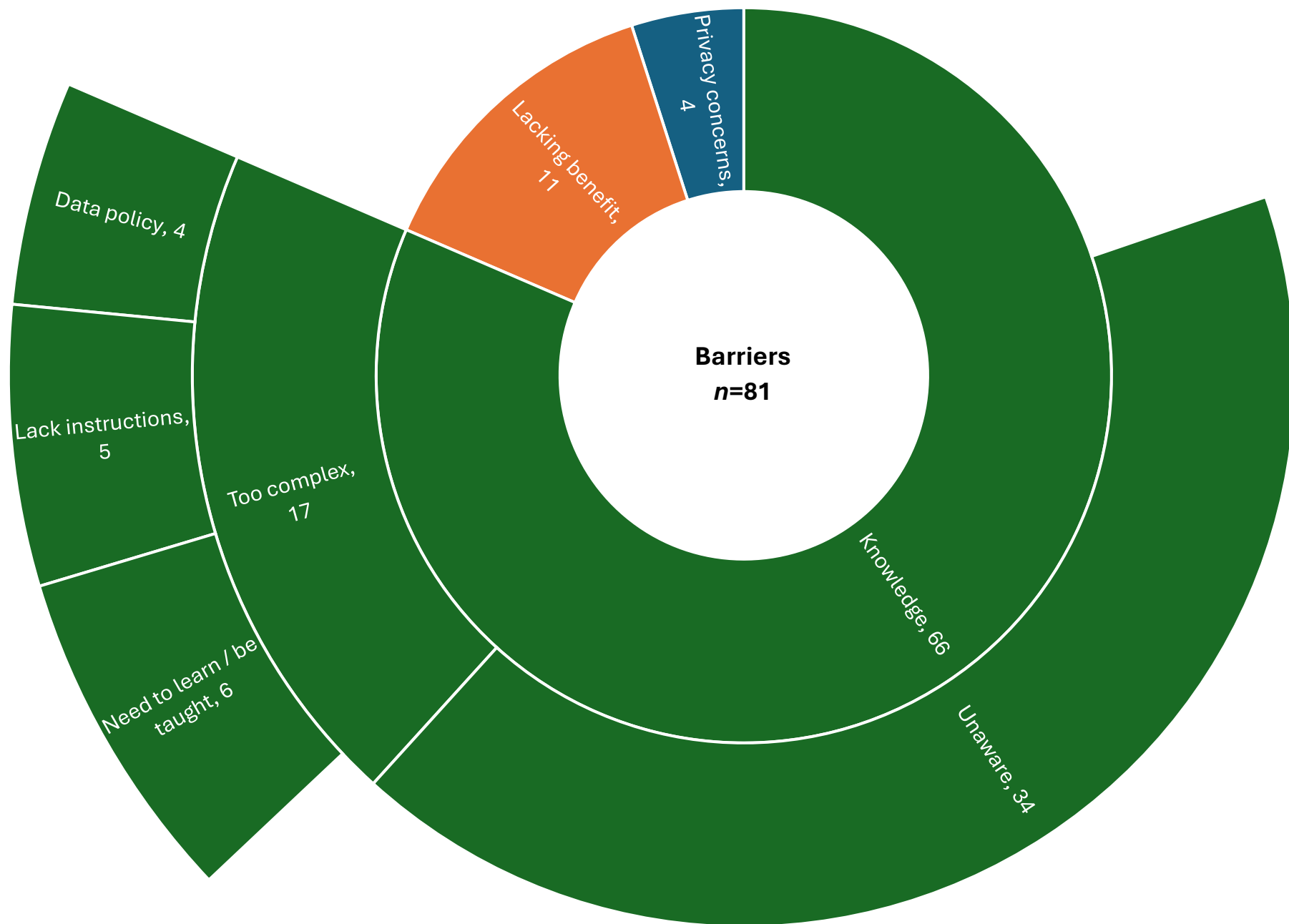
5.3.3. RQ3: Limitations

Content analysis of the qualitative responses produced the following themes that relate to the third research question, “What are the perceived limitations of smart speakers? How do users feel they are impacted by these limitations?”. Notably, more responses related to this research question than the other two combined, indicating that there are a substantial number of limitations experienced and/or the limitations are felt to be highly salient. The frequencies of these limitations are shown in Figure 16 and explained in detail below.

Figure 16. The frequencies of themes and subthemes identified through content analysis relating to the third research question; the limitations that users experience and how it impacts them. The charts represent Frustrations, Fears and Barriers, respectively.







5.3.3.1. Frustrations

The most common and diverse limitation category identified from the content analysis reflected user Frustrations. This category involved opinions, emotions, and general complaints users had about their device and its usability, but generally lacked mention of a worrying about broader implications (as with Fears) and was not reported as leading to a change in behavioural patterns (as with Barriers).

5.3.3.1.1. Not Working as Desired ($n=71$)

A major source of frustration for a large number of users ($n=30$) arises from the voice-recognition software that is essential for users to command and interact with their smart speakers. Many users find that their devices frequently misunderstand or fail to register their commands and **“when it doesn’t quite understand commands”** the smart speaker can do **“random stuff”** rather than complete the desired action. This often results in users feeling a need to repeat themselves or rephrase their request **“to get the right result”**, both evoking frustrations. A subset of those experiencing issues with voice recognition ($n=4$) directly reports a voice bias from the smart speaker and their manufacturers. For two, they believe their smart speakers disproportionately struggle to understand their regional British accents and explain that it **“took Alexa a long time to understand my Scottish accent”**. A further participant reports a bias in the languages that can be used with Alexa, commenting that they would **“like it understand and speak Welsh (translated)”** and its current (at the time of data collection and writing) inability to do so forces them to speak in their non-native language, impeding their fluency of exchanges. The fourth member of this group feels that the gender of the users’ voice influences the likelihood of being correctly understood, with feminine voices at a disadvantage; **“my voice isn’t readily understood but my male visitors are answered immediately”**.

A further group ($n=8$) expresses frustration arising from their smart speakers’ inability to carry out all requested tasks efficiently and correctly. They report **“issues with more complicated words or phrases”** and that their device can **“struggle with finding out more complex information”** beyond simple questions such as the weather or time. There is a strong sentiment that smart speakers have a limited capacity and that their device **“doesn’t know everything”**. This is coupled with the desire for **“Alexa to know**

more answers to the questions I ask". This reflects the way in which smart speakers fail to meet user expectations, either because expectations are not correctly managed and are too high, or because device capabilities are too low.

For some, their smart speaker not working as they desire evokes negative emotions for the users ($n=15$). This subset explicitly reports intense feelings in response to their smart speaker failing to work as desire. This can include expressions of anger ($n=13$), with one user reporting that their **"husband shouted at it when it wasn't following his instructions"**, while another reports that they generally find their smart speaker to be a positive and beneficial addition to their life, **"EXCEPT WHEN IT DOESN'T UNDERSTAND OR HEAR ME!"**. For a smaller portion of this group ($n=2$), feelings of social rejection arise from perceiving that their smart speaker is ignoring them or deliberately not responding as they desire. One reports that when their smart speaker is **"not working well, it's utterly horrible. Sometimes it feels like it's ignoring me on purpose"**.

Further frustrations ($n=18$) arise when the smart speaker activates and begins reacting to prompts that have not been given, often due to interpreting a nearby conversation as a command. This interjection into private conversations is poorly received and users find it frustrating when **"the speakers come on randomly when not asked to and say something"**. Such interjections may produce further emotions. A further group ($n = 5$) find such intrusions to be annoying or irritating; **"I switch it off when not using it as it annoys me that it responds to things you say even if you haven't used its name"**. Further, this group expresses a desire to have stronger controls to limit the frequency of unsolicited interjections; **"I wish I could filter out the commands my parakeet gives the Alexa. He has a habit of telling the device to stop or start again"**. One subset of this group ($n=5$) reports feeling invaded because their personal space and conversations are being overheard and joined without invitation. One user reported that their smart speaker **"ordered an item from Amazon that was mentioned during a conversation ... definitely an invasion of my privacy so the item was switched off and has not been used since"**.

5.3.3.1.2. Connectivity ($n = 44$)

A further area of frustration for some users is that they feel their smart speaker is not as connected to other devices or appliances as it could be, thereby limiting their experience. This seems to arise for two key reasons. Firstly, users ($n = 6$) may feel that they lack the compatible technology to gain the most out of their smart speaker experience, particularly in relation to home automation. One user reported that it is a drawback **“not having many other smart devices (light/heating) so I am probably not making the most out of it”**. This is further exacerbated by the perceived high cost and the wastefulness of replacing functioning appliances simply to purchase new ones that are smart home compatible. One participant expresses an intention to **“incorporate more smart home devices when things need to be replaced”**, but states that they **“would not replace something that is working just for the smart function”**. For others ($n = 4$) the barrier to connecting with other technology arises from the smart speaker itself. This group reports struggling to use the smart speakers' connectivity functions to pair with smart devices purchased for this purpose. This results in feeling **“frustrated when you can't get her to discover new devices”** as this directly prevents the desired connectivity and home automation.

Secondly, a surprisingly large group of participants ($n=14$) reported, at times intense, frustration arising from their smart speakers' need to **“always be connected to the internet”**. This necessity was found to be particularly frustrating in combination with some participants who had **“poor internet in a rural area”**, which was common amongst this population. It is unclear if this frustration arises from a lack of understanding about how smart speakers function and so not grasping why an internet connection is necessary, or simply a frustration that poor internet connectivity limits their ability to use their smart speaker.

5.3.3.1.3. Unnecessary ($n=41$)

A substantial group reported frustrations that the device is an unnecessary addition to their lives. This is partially because it fails to live up to its promise of being a useful, personal assistant. When it is perceived to fail at the task it is marketed for, the users are left questioning its purpose and necessity. While some did not expand upon why

they felt the device to be unnecessary ($n=14$), others suggest that this feeling arises from a duplication of functionality relative to devices that users already own and are more familiar with ($n=12$). They suggest their smart speaker does not offer any unique functions or features that could not be found elsewhere, such as through **“my mobile phone and android TV”**. Their smart speakers do not make any meaningful or novel contributions to their lives, summarised by one participant reporting they **“don’t see what I gain from a smart speaker that I cannot get from existing tech”**. A subset of this group ($n = 15$) feels that, not only does it offer nothing novel but, they prefer other devices to their smart speaker. For example, one reports that they **“rely more on my laptop, desktop and smartphone and even the digital radio in preference to the smart speaker”**. Some suggest that this is because smart speakers offer the features, such as information retrieval, which are available through other devices in a format that is preferable; **“I would rather see information in a written form or video than hearing it”**. Others feel that their smart speaker lacks depth and specificity when carrying out tasks, and it is this that underpins their preference for using other forms of technology; **“I have other means of getting information that are more comprehensive”**.

Others feel their smart speaker is unnecessary because it is gimmicky ($n=12$). For this group, their smart speaker offers a surface-level novelty value, but that there is a lack of substantial features that meaningfully add to their lives. Some reflect that their smart speaker is **“just a toy”** or that it is **“a bit gimmicky, so doesn’t really enhance my life or make things easier”**. This again reflects a failure of smart speakers to deliver on the promises of being a meaningful and valuable personal assistant.

5.3.3.2. Fears

The second most common category of limitations related specifically to users’ fears. The themes identified here reflect users’ unease, worry, or fear about the broader implications of issues with their smart speaker. Both the cause and the resultant fears are discussed in detail below.

5.3.3.2.1. Privacy Concerns ($n=114$)

The most commonly expressed fear was around data collection, handling, storage, and general privacy concerns. Within this group, levels of privacy knowledge varied substantially. Many mentioned having some privacy concerns, but did not provide specific details of what they were concerned about happening ($n = 29$).

Of those that did expand upon their reported privacy concerns, gathering personal data was the most common issue ($n=69$) which reflects a fear of the volume and sensitivity of data that can be captured by a smart speaker. Some fear the **“private information it can garner about me and my lifestyle”**, leading to concerns that companies are developing profiles about users’ preferences which may be maliciously used. Despite agreeing to terms and conditions stating the data collection and storage policies when setting up their smart speaker, some feel that their data is being gathered and stored **“without my knowledge or consent”**. Despite this being a common concern about personal data being gathered, none in this group report taking action to limit the collection or manage the storage of their data.

Within this group, some hold further privacy fears relating to data gathering, fearing that their data may be distributed by the smart speaker manufacturer to third parties without their knowledge ($n=33$). This group are concerned about **“unknown sources”**, **“third parties”**, and **“marketers”** having access to the personal data that is gathered about them. Within this group, a small subset is specifically fearful of this data being used by third parties to target them with suspicious advertisements ($n=4$). This is felt to confirm the fear that their data is being distributed to third parties, such as social media platforms. One user reported being sure that their smart speaker **“definitely listens in and links to other social media”** because of observations that **“if you mention something to Alexa then adverts appear for those things on Facebook”**.

For another group, the concerns for their gathered data are less concrete. Some just find the concept of being recorded and having their data gathered as invasive ($n=24$). Of particular offence is the always-listening microphones, which are required to detect when the wake-command is uttered. Such features trigger intense privacy concerns for many. For many within this group, ($n = 15$), the perception that their smart speaker is always listening to them is an acute fear. Participants report being **“worried about it**

possibly ‘spying on conversations’” and fearing the potential that the device is **“always hearing what’s said and using the information in a bad way”**. Expanding on previously discussed concerns, the fear is heightened for this group by the feeling that their data is being continuously gathered, even when they are not interacting with the smart speaker directly. While this group is **“not keen on it always listening”**, none report taking action to mitigate this, with some even explicitly stating that **“at the same time, I never mute it”**. This, again, reflects a disconnect between expressed concerns and behavioural action.

A further expressed fear is the perceived potential for financial exploitation arising from owning a smart speaker (n=13). Firstly, some feel pressure to purchase additional compatible smart devices and appliances to connect to their smart speaker. There is resentment at this pressure to spend more money and the high **“cost of ‘add-ons’”** which are required to benefit from home automation functions, such as **“to turn lights etc on and off”**. Secondly, there is a perceived pressure to purchase additional services and subscriptions in order to have the fullest experience with their smart speaker. However, again, resentment arises as participants feel that these features and services should be included for free. One reported feeling **“cheated that if you want to fully access music you want played you have to pay monthly, which I won’t do!”**.

Beyond the pressure to make additional purchases to have the best experience with their device, there is also a fear about their data being used to financially exploit them. Users fear that the technology companies will use the wealth of data about a user to pressure them into purchasing goods and services that align with their interests, through tailored content and advertising. One reported believing **“that everything tech companies do is geared to finding out as much as possible about our tastes so we can be encouraged to buy more stuff”**, while a further believes that **“a profile is being captured of my listening habits in preparation of feeding me paid services”**.

A very specific fear expressed by a small number (n=3) relates to the perceived potential for malicious entities to use participants’ smart speakers to control other connected devices in the home. One participant reports they **“won’t buy the lights as I worry Alexa will take over the house like a sci-fi movie”**. Others worry about external control, such as being hacked, by stating **“someone could intercept the signals and**

gain access to the house” and “if connected to household appliances... I worry it can be hacked and misused”. It is unclear who they believe may wish to control the devices in their homes, or to what end.

A few participants reported an awareness that there were controls to change their privacy settings to better align with their values and, potentially, alleviate some of their concerns. However, only two participants reported any intention to make active changes to better protect their privacy: one remarked that **“I intend to use my own internal secure device set up with extra security and firewalls”**, while the other referenced in-built privacy settings by stating that they **“intend to check those settings again”**. It’s notable that these statements only reflect an intention to engage in privacy-enhancing behaviour, which may not translate to action. In line with this, no participants reported currently or previously taking any proactive steps to protect their data or enhance their privacy, despite reporting concerns about this.

5.3.3.2.2. Dependence (n=32)

This group expresses a strong fear about becoming reliant or dependent on their smart speaker, and the effects of this. This issue seems to reflect a fear of over-dependence on technology in general, rather than being unique to smart speakers. Some participants report that society has **“too much reliance on technology”** and they suggest a need to be wary of becoming **“dependent on such devices if not careful”**. There is a lack of consensus about why a reliance on technology, including smart speakers, should be feared. Some suggest that focusing too much on communication with technology will lead to people **“losing the ability to communicate person to person”**. Others suggest that becoming over-reliant on technology is due to a lack of critical thinking and an acceptance of incorrect and potentially harmful information. This **“over reliance that info given (from smart speakers) is correct”** is thought to be dangerous.

A common fear within this group (n=22) is that their smart speaker will become too integrated and over-automate their lives, facilitating users to become increasingly lazy. Particularly, there is a concern that people will use their smart speakers to carry out

simple tasks in their homes, **“for example turning lamps on and off”** and **“turn lights on, draw curtains”**, which they feel is **“totally unnecessary”** and will **“make people lazy”**. Some fear that this automation will mean they will move around less within their home; they believe their smart speakers will reduce **“the times you have to stand up or walk around your house”** which will further compound their laziness. This fear appears to arise from the concern that becoming lazier as a result of owning a smart speaker will ultimately lead to poorer physical health. One user reports that their smart speaker **“is making me move less and less, which means I’m getting unhealthier”**. This group seem to firmly believe that completing tasks around the house manually, rather than using home automation with their smart speaker, **“would be better for your health”**. However, there is a concern that home automation features will become increasingly popular, and this will lead to more widespread negative health effects.

A subset of the larger group who fear dependence ($n=5$) hold fears for how they will cope if/when their smart speaker fails. This may be a particular issue among this sample, as many live in rural areas of Wales and report frequent loss of electricity or internet connectivity. As a result, they fear that **“it would not be good to become dependent on (a smart speaker) in case the internet goes down or it goes faulty”**, identifying that this may be a particular issue for those who are **“relying on it to take medication”** using the reminders function. As such, this issue may not be as common amongst those living in more urban areas. These fears relating to dependence seem to be an alternative perspective on home automation, information access, and reminders that have previously been discussed as a benefit.

5.3.3.2.3. Mistrust ($n=19$)

Mistrust may underpin many of the privacy-related fears described above, such as not trusting technology companies to store and handle data appropriately, or mistrusting how data is being used. However, mistrust was only explicitly mentioned in reference to two main sources; the smart speaker devices themselves, and the technology companies that manufacture them.

The majority of this group (n=15) were suspicious of the technology companies. There are concerns about the volume and sensitivity of data these companies are gathering and what this data is being used for. Members of this group also believe the technology companies are using their data to build highly detailed user profiles with the intention to increase revenue through promoting purchases or by selling the information to third parties. Two users report that they **“don’t think Amazon is a good supplier. I don’t trust it in relation to what data is gathers about me”** and **“I do not trust the service provider in terms of security of information”**.

A smaller group (n=4) were suspicious of the smart speakers directly. This suspicion was associated with the always-listening feature required to recognise the wake-word. Participants report that they **“don’t trust the smart speaker as I think it’s listening to everything we are saying”**. Unlike the group leveraging mistrust at the technology companies, it is unclear to what end these participants feel their smart speaker is always listening and gathering data.

5.3.3.3. Barriers

The final category of limitations identified reflects Barriers. Unlike the previous categories, Barriers implies a behavioural result of the smart speakers perceived limitations, often taking the form of limiting or ceasing interactions with the smart speaker. The identified Barriers and resultant behaviours are discussed below.

5.3.3.3.1. Lack of Knowledge (n=66)

A large group (n = 34) report that they use their smart speaker less than they would like because they do not have an understanding of the full functional repertoire available. Amongst this group, a small number of features are reported to be accessed (commonly music, timers and information), but there is limited engagement beyond these. There is a knowledge that they do not use their smart speakers **“to it’s full capacity”** because they **“don’t really know what to do with it”**. Some suggest that it is **“difficult to know the full range of commands and features available”**, reflecting a lack of information about the possible capabilities of their smart speaker.

Relating to limited knowledge of functional scope, a further group (n = 17) feels their smart speakers are too complex to use effectively and easily. There is a sense that their devices are **“daunting to use at first”**, expressing the fear of engaging with technology that is perceived as being complex and beyond individuals’ digital skill level. Amongst this group, some (n = 6) express a desire and/or a need to learn how to use the device from others. This often seems to be a household family member who is perceived as having greater digital skills than the participant; one expresses a **“need to ask my husband for help”** when they struggle with the device, while another reports that their **“husband is teaching me as he sets it up”**. However, there is also a sense that it would be time-consuming and highly effortful for these participants to learn to use their smart speaker, which they report either puts themselves off or they feel would put others off. One reports that they **“don’t have time to learn its different uses”** which is why they **“haven’t learned to use it properly”**. A further sub-group (n = 5) explicitly state that the device should come with more comprehensive instructions. At the time of writing, both market leading brands of smart speaker (Amazon and Google) offer minimal written information, instead relying on users to download an app containing instructions on how to set up the device. This is perceived to be insufficient and there is a desire for an **“instruction book to learn how to use the device to its full potential”**. This leads to a feeling of frustration that some users **“can’t do more with it due to lack of easy instructions”**. One even questions **“how are you expected to know how to do things?”** when little to no information has been provided to support new or low digitally skilled users.

A subset of those who felt they lacked sufficient knowledge to confidently use their smart speaker felt this issue was heightened by opaque data collection, storage and distribution policies were opaque. This seems to lead to the worst-case scenarios being assumed, such as poor data handling and dissemination of highly sensitive data. This group report wanting more information about the data policies because **“what your data is used for is not always clear”**, with the implication that greater transparency would reduce their concerns and encourage them to use their device more.

5.3.3.3.2. Lack of Perceived Benefit (n=11)

An alternative group (n=11) reports that they no longer use their smart speaker because they feel that it does not contribute to their life in a meaningful way. Again, perceiving no benefit or that **“it does not add much”** to their lives are in stark contrast to the advanced smart personal assistant that is advertised, and one participant summarises **“it now lives in a drawer with the other items that fail to live up to their promises”**. This sentiment is frequently expressed by those who did not actively choose to purchase a smart speaker and were instead given one as a gift, often by family. Some of this group (n = 4) specifically report that they engaged well with their smart speaker in the early days of owning it and found it reasonably entertaining. However, with time, they found that it became repetitive to use, with some referencing the lack of features and uses they were aware of; **“I can’t think what use it is apart from listening to music, or asking it random questions which loses its appeal after a bit”**.

5.3.3.3.3. Privacy Concerns (n=4)

A further issue which has prevented smart speaker use entirely reflects privacy concerns (n = 4). Far more people identified privacy concerns about using their smart speakers than the number of participants in this group who report their privacy concerns as being an active deterrent to using their smart speaker. Only four individuals specified that they had completely stopped using their smart speakers due to the extent of their privacy concerns. These included similar concerns to the larger privacy group, including mistrust of the manufacturer; **“I do not use it because I do not trust the service provider in terms of security of information”**. However, these were the only individuals in the whole sample who reported modifying their behaviour as a result of their privacy concerns. This highlights a great discrepancy between privacy concerns and privacy behaviour.

5.4. Study 1 Discussion

5.4.1. Overview

This study aimed to fill gaps in the literature that exist as a result of the narrow scopes taken by previous research. This was done through an initially deductive content analysis to organise participant responses into an analytical framework that reflected the three research questions. Following this, the data within the categories was inductively coded to produce a participant-centred and bottom-up overview of the relevant group traits/characteristics, psychological benefits, and limitations of smart speakers. Through this method, we were able to identify the factors that users feel are the most salient to them without the constraints of the researchers' assumptions. The findings from this content analysis are evaluated below.

5.4.2. Evaluation of Findings

5.4.2.1. *Social Benefit*

A key finding of this study is the social benefit arising from smart speakers. This study proposes a novel classification/conceptualisation of the social benefit derived from smart speakers. Previous studies have identified that smart speakers possess intrinsic social benefits, such as offering companionship to isolated or lonely individuals (Jones et al., 2021; O'Brien et al., 2020). Similarly, other studies identify that smart speakers can offer an indirect social benefit, by facilitating communication with loved ones (Edwards et al., 2021) and strengthening existing social bonds (Lee et al., 2020). This study supports these previous findings and conceptualises smart speakers' social benefit as being two-fold; offering intrinsic benefit in the form of social contact and companionship and facilitating human-human connections and communication based on the findings from the content analysis. However, no single study examines these two types of social benefit together. The tendency of previous research to focus on only one type of social benefit may confound the findings; previous research is unable to understand the extent of either the intrinsic or facilitative social benefits of smart speakers because they have not previously been considered in parallel as complimentary processes.

Technology facilitating human-human connections is not a new phenomenon; Henderson et al. (2002) discuss how early modern technologies, such as landlines, early PCs, and mobiles have been consistently used to overcome space and time and facilitate social relationships. With the facilitation of social communication being a key application of previous landmark technologies, it is perhaps unsurprising that smart speakers are being used for this same purpose.

More unique and psychologically relevant is the ability of smart speakers to act as a social entity in users' houses and offer a sense of companionship. This fits with the trend of moving from using technology to facilitate communication with others and towards communicating with the technology directly (Mishra & Kern-Stone, 2023). Companionship with a smart speaker is often conceptualised as a valued parasocial relationship, where the smart speaker is felt to offer social and/or emotional support to the users (Cha et al., 2019; Kim & Choudhury, 2021). This study suggests that individuals lacking social connections feel they are more likely to view their smart speaker as a companion, as isolation and loneliness can become driving factors for seeking companionship with a smart speaker. These individuals feel that their smart speaker is an active social entity, which is able to combat some of the feelings of loneliness that arise from their isolation. This is in keeping with existing research which finds that individuals who are lonelier at baseline are more likely to view their smart speaker as socially attractive and engage with it in a social capacity (Choi & Choi, 2023; Wienrich et al., 2023).

These findings support the ASAP Pathway that was proposed in Chapter 4. Forming a parasocial relationship with any form of technology relates to the Computers are Social Actors (CASA) paradigm (Nass et al., 1994). This suggests that the more social scripts a technology is able to activate, the more likely and more strongly we view it as a social actor. Unlike other devices, discussed previously, which trigger these social scripts and support social engagement, smart speakers' voice interface requires users to talk to the device. As speech and conversation are intrinsically social actions, this allows smart speakers to be strongly perceived as social entities, underpinning their presentation as a companion. This voice interface is a relatively unique feature of smart speakers that is highlighted by participants in this study as being key to the social perception of their

smart speaker and the social benefit they derive from it, as is reflected by the ASAP Pathway.

5.4.2.2. Privacy

Privacy was the most commonly identified limitations from this sample, with multiple complex facets underpinning users' fears. An interesting finding within this theme is the discrepancy between the large number of participants who reporting holding privacy concerns/fears and the much smaller group who report engaging in any privacy enhancing behaviours, such as changing security settings or avoiding using their smart speaker. Frequently, participants in this study reported intense privacy concerns, but ended with stating that, despite these concerns, they do not take any action to better protect their privacy. This discrepancy reflects findings from previous literature; Malkin et al. (2019) found that privacy concerns were extremely common, but that this did not seem to relate to accurate knowledge or behaviours; over half of the sample were unaware that their data was stored indefinitely, and only 3% took action to review and manage the data that was stored about them. Similarly, Lau et al.(2018) found that privacy concerns were far more common than action taken to configure privacy settings. This may be because privacy behaviour is influenced by factors beyond privacy concerns and, therefore, the relationship between privacy concerns and privacy behaviours is not as directly proportional as may have been assumed. This is highlighted by Lutz and Newlands (2021) who suggest that privacy behaviours are rarer than privacy concerns due to other contrary factors, such as social presence and utilitarian benefits that encourage engagement. This suggests that smart speaker users' privacy behaviours are the result of a culmination of factors beyond simply privacy concerns, and that privacy concerns alone cannot predict broader engagement. Changes in engagement that are influenced by privacy concerns, such as interacting with the smart speaker less frequently, have been reported in the literature. For example, Han and Yang (2018) and Corbett et al. (2021) both reported that privacy concerns influenced participants decision to purchase and engage with a smart speaker. Similarly, Brause and Blank (2023) found that privacy concerns influenced smart speaker owners' decisions about whether to interact with their device or not.

Further, Choi, Thompson and Demiris (2020) suggest that privacy concerns can shape purchasing decisions about not only whether or not to purchase a smart speaker, but around what type of smart speaker should be purchased. For example, there was a preference amongst privacy-conscious consumers for smart speakers without cameras, to limit the data that could be gathered. From these studies, we can see how privacy concerns may influence behaviour, but it should be noted that they are not the only influential factors.

The privacy concerns held by users primarily arose from perceived issues with the gathering and handling of their data. Users were broadly concerned that their personal data was being gathered through their smart speakers and stored by the technology companies. For some, this led to a feeling of their privacy being invaded, particularly in line with the sense that they were constantly being listened to and monitored. Similar issues are raised by smart speaker users in other studies who discuss feeling that they are making a utilitarian trade of their privacy for the convenience offered by smart speakers (Lau et al., 2018; Pridmore & Mols, 2020). Associated with the feeling of privacy being invaded and always being monitored is the concern that the personal data being gathered may be passed on to third parties. Particularly, users feel they are unaware of how this data is being stored and used. This is in keeping with similar concerns reported in previous work. Brause and Blank (2023) found that users were particularly concerned about their data being gathered due to mistrust of data storage policies and the fear of potential consequences of data leaks. Conversely, Lutz and Newlands (2021) found that concerns relating to third parties accessing private data and recordings were the most pronounced of all privacy issues reported.

5.4.3. Summary

In summary, Study 1 was effective in meeting its aim of identifying and beginning to fill the gaps in the literature that were present due to the assumptions and narrow scope of the existing literature. This study achieved its aim by conducting an initially deductive content analysis, organising responses in line with an analytical framework that reflected the three research questions. This was followed by inductive coding. This

study makes three contributions to the literature. Firstly, a unique contribution is made by identifying novel factors that have been overlooked in previous research, such as a fear of becoming dependent on the smart speaker. Secondly, it proposes a novel conceptualisation of existing factors, such as the pairing of offering intrinsic social benefit through companionship with facilitative social benefit. Thirdly, it offers support to existing findings from previous research, such as the prominence of privacy concerns and the distinction between privacy concerns and privacy behaviour.

5.5. Study 2 Methods

The aim of Study 2 was to validate some of the key findings from the content analysis in Study 1 by conducting alternative analyses to answer the research questions, as should be done to support content analysis (Krippendorff, 2004). In contrast to the qualitative approach taken in Study 1, Study 2 will offer a quantitative approach in an attempt to validate and support the above findings.

5.5.1. Participants

The full sample surveyed in Study 1 also participated in Study 2; 3845 adults across Wales who had signed up to HealthWise Wales (*HealthWise Wales*, n.d.) research mailing list. This total sample was primarily divided into the 1306 participants who reported owning a smart speaker and the 2539 participants who did not.

5.5.2. Measures

The following quantitative measures were included in the survey:

1. Items presented that were not part of a defined questionnaire included asking about participants demographic information and smart speaker ownership. Additionally, novel items were developed to reflect the themes identified from the content analysis in Study 1. These are discussed in more detail in Table 33 and Table 39.

2. The Essential Digital Skills Framework (EDSF) (Gov.UK, 2019) requires participants respond “yes” or “no” to 15 statements about their ability to carry out specific digital tasks, such as “I can search for news using a browser such as Chrome, Internet Explorer, or Safari”. Scores range from 0-15, with higher scores indicated greater digital skills.
3. The Washington Group Short Set (WG-SS) on Functioning (The Washington Group, 2022) quantifies a range of disability and their impact on daily life. Participants report the level of difficulty they experience on 4-point scales from “no difficulty” to “cannot do at all” across six domains; vision, hearing, mobility, cognition, self-care, and communication, however, only the subscales of vision, hearing, mobility, and the overall score for the scale will be investigated as self-care and communication were not identified as relevant factors by the content analysis.
4. The De Jong Gierveld Loneliness Scale (DJGLS) (Gierveld, 2006) was used to measure loneliness across two subscales, each with three questions: social and emotional. Social loneliness reflects fewer or shallower relationships with friends and/or colleagues than desired. Emotional loneliness is a perceived lack of intimate relationships. Both subscales are scored out of 15 and can be summed together to produce an overall measure of loneliness out of 30. In all instances, higher scores indicate a greater experience of loneliness.
5. The Lubben Social Network Scale (LSNS) (Lubben, 1988) reflects isolation and consists of two subscales: friend and family. Participants respond to the questions about the frequency of contact with friends and family. Each subscale consists of six items, with scores ranging from 0-30. Additionally, all 12 items in the measure can be summed to produce a score of 0-60 reflecting overall isolation. Instructed scoring was inverted so higher scores indicate greater isolation in this study.

5.5.3. Procedure

The same procedure was used for Study 2 as for Study 1; a survey was completed in English or Welsh involving the measures above and the open-ended question from Study 1.

5.5.4. Analysis

The aim of Study 2 was to replicate some of the key findings from the content analysis in Study 1. This provides a way of validating the findings of the content analysis and offers an alternative support in response to the research questions, as should be done to support content analysis (Krippendorff, 2004). To reflect RQ1 (What traits or characteristics do users feel are relevant to their smart speaker ownership and experience? Do different groups of users report a differential experience?), the dichotomous, dependent variable of smart speaker ownership will be explored through a series of T-tests and a binomial logistic regression with the group traits in the content analysis. This allows for an understanding of what traits predict smart speaker ownership. To answer RQ2 (In what ways do people feel they benefit psychologically from their smart speaker?), a factor analysis will be run, specifically in relation to social benefit as this was the most common benefit reported. This will involve quantitative items that reflect the subthemes raised by participants within the theme of social benefit in Study 1. Running a factor analysis on these items will provide an opportunity to validate the social benefit findings from Study 1 by seeing if the items load onto hypothesised latent factors of facilitating human-human connections and offering intrinsic social benefit. Additionally, this factor will be predicted using a multiple regression with the salient group traits/characteristics identified in response to RQ1 as predictors, to understand if social benefit is a differential experience that can be predicted by these traits. Finally, in relation to RQ3 (What are the perceived limitations of smart speakers? How do users feel they are impacted by these limitations?), the most common limitation of privacy will be explored. Privacy will similarly aim to be constructed through a factor analysis of items reflecting the issues identified by the content analysis.

5.6. Study 2 Results

5.6.1. Descriptive Statistics

The descriptive statistics of the established measures used in Study 2 are presented below (see Table 30. *Descriptive statistics of the variables explored in Study 2, including relevant subscales.*). These measures were chosen as established quantitative scales that reflect the concepts identified in content analysis from Study 1. This will allow for further exploration of the variables and their effects suggested by the findings from Study 1, as well as providing another means of answering the research questions for this chapter.

Table 30. *Descriptive statistics of the variables explored in Study 2, including relevant subscales.*

Construct	Possible Range of Values	Mean	Standard Deviation	Minimum Value Recorded	Maximum Value Recorded
Essential Digital Skills Framework (EDSF)	0-15	12.67	2.62	0	15
Lubben Social Network Scale (LSNS)	0-60	28.99	10.42	1	60
Lubben Social Network Family Subscale	0-30	13.15	6.21	0	30
Lubben Social Network Friends Subscale	0-30	15.84	6.47	0	30
DeJong Gierveld Loneliness Scale (DJGLS)	0-6	2.66	1.81	0	6
DeJong Gierveld Social Loneliness Subscale	0-3	1.47	1.23	0	3
DeJong Gierveld Emotional Loneliness Subscale	0-3	1.19	0.95	0	3
Washington Group Short Set Scale (WGSS)	6 - 18	7.15	1.59	6	18
Washington Group Short Set – Visual Disability	1 - 4	1.21	0.43	1	3
Washington Group Short Set – Hearing Disability	1 - 4	1.21	0.45	1	4
Washington Group Short Set – Mobility Disability	1 - 4	1.31	0.60	1	4
Washington Group Short Set – Cognitive Disability	1 - 4	1.28	0.49	1	3

5.6.2. RQ1: Group Traits and Differential Experience

The first research question aimed to understand what traits or characteristics users felt were relevant to either their smart speaker ownership or underpinned a differential experience with their smart speaker. From the content analyses, the following traits/groups were identified: people with disabilities (specifically mobility, hearing, vision, or cognitive issues), children, lonely/isolated people, older adults, those with low digital skills, and dyslexics. As the sample only included adults (aged 18+), the finding of children engaging differentially was reported second-hand and so was not felt to be

appropriate for follow-up here. Additionally, the finding that dyslexics use their smart speaker to support spelling is novel but is not necessarily psychosocially relevant as it reflects a more practical benefit. Therefore, only disabilities, loneliness, isolation, age, and digital skills will be explored here further.

5.6.2.1. Ownership Comparison

A series of independent-samples t-tests were run to ascertain differences in the dependent variables of age, disabilities, isolation, loneliness and digital skills (see

Table 31) based on the dichotomous independent variable of smart speaker ownership. To account for the issue of multiple comparisons associated with testing the effects of smart speaker ownership on 13 dependent variables, the threshold of significance was Bonferroni corrected to the $p < 0.00385$ level.

At this threshold, seven of the 13 variables tested showed a significant differences between smart speaker owners and non-owners skills (see

). Smart speaker owners ($5.043, \pm 1.183$) were significantly younger than non-owners ($5.317, \pm 1.013$), $t(3222) = -7.104, p < 0.001$. Mobility issues, measured within the WGSS disability questionnaire, were significantly higher amongst smart speaker owners ($1.350, \pm 0.640$) than non-owners ($1.284, \pm 0.562$), $t(3236) = 3.091, p = 0.002$. Emotional loneliness was higher amongst smart speaker owners ($1.255, \pm 0.958$) than non-owners ($1.145, \pm 0.953$), $t(3200) = 3.056, p = 0.002$, however social loneliness was higher among non-owners ($1.547, \pm 1.227$) than owners ($1.354, \pm 1.238$), $t(3215) = -4.361, p < 0.001$. Smart speaker owners were less isolated, both from their family ($12.268, \pm 6.004$) and overall ($27.811, \pm 10.506$), than non-owners ($13.714, \pm 6.253$; $29.734, \pm 10.262$), $t(3202) = -6.538, p < 0.001$; $t(3159) = -5.129, p < 0.001$. Finally, digital skills were higher among smart speaker owners ($13.393, \pm 2.143$) than non-owners ($12.177, \pm 2.790$), $t(3023) = 12.886, p < 0.001$.

Table 31. Predicting ownership of smart speakers based on quantitative versions of the groups/traits identified from the content analysis in response to RQ1 from Study 1.

Dependent Variable	t	df	p	Owners			Non-Owners		
				N	Mean	Std. Dev	N	Mean	Std. Dev
Age	-7.104	3222	<0.001*	1310	5.043	1.184	1914	5.317	1.013
Visual WG-SS	1.488	3240	0.137	1321	1.227	0.442	1921	1.204	0.427
Hearing WG-SS	-0.834	3228	0.399	1316	1.204	0.427	1914	1.218	0.459
Mobility WG-SS	3.091	3236	0.002*	1317	1.350	0.640	1921	1.284	0.562
Cognitive WG-SS	1.408	3235	0.159	1316	1.296	0.498	1921	1.271	0.474
Overall WG-SS	2.484	3184	0.013	1293	7.224	1.654	1893	7.083	1.507
Emotional DJGLS	3.056	3200	0.002*	1299	1.255	0.958	1903	1.145	0.953
Social DJGLS	-4.361	3215	<0.001*	1310	1.354	1.238	1907	1.547	1.227
Overall DJGLS	-1.229	3173	0.219	1289	2.615	1.827	1886	2.696	1.801
Family LSNS	-6.538	3202	<0.001*	1304	12.268	6.004	1900	13.714	6.253
Friend LSNS	-1.990	3190	0.047	1306	15.554	6.583	1892	16.016	6.361
Overall LSNS	-5.129	3159	<0.001*	1292	27.811	10.506	1869	29.734	10.262
EDSF	12.886	3023	<0.001*	1227	13.393	2.143	1798	12.177	2.790

Note: * indicates statistical significance at the Bonferroni Corrected level of $p < 0.00385$.

5.6.2.2. Ownership Prediction

To explore these findings further and better understand any potential interactions between the variables explored above, a binomial logistic regression was performed. This involved the 13 variables previously examined using a T-test as predictors/independent variables, and smart speaker ownership as the dichotomous dependent variable. Initially, linearity of the independent variables with respect to the logit of smart speaker ownership (as the dependent variable) was assessed using the Box-Tidewell procedure (Box & Tidwell, 1962). To compensate for the multiple comparisons in this analysis, a Bonferroni correction was applied, using all 26 terms in

the model, resulting in statistical significance being established at the $p < 0.0019$ threshold. From this, all independent variables were found to be linearly related to the logit of the dependent variable. There were 15 cases with a standardised residual of >2 , which were removed to ensure the assumption of no outliers was met.

The logistic regression model was found to be statistically significant, $\chi^2(11)$, 280.02, $p < 0.001$, however its discriminatory power was poor (area under ROC curve = 0.673) (Hosmer et al., 2013). The model was able to explain 12.8% (Nagelkerke R^2) of the variance in smart speaker ownership and correctly classified 64% of cases. Of the 11 predictor variables, only four were statistically significant (see Table 32). Higher levels of mobility issues, emotional loneliness and digital skills were all positively associated with the likelihood of owning a smart speaker, however increased isolation from family was associated with a decreased likelihood of owning a smart speaker.

Table 32. The 11 predictor variables and their odds ratios associated with the dependent variable of smart speaker ownership.

Independent Variables	B	SE	Wald	df	p	Odds Ratio	95% CI for Odds Ratio	
							Lower	Upper
Age	-0.085	0.038	4.952	1	0.026	0.919	0.853	0.990
WGSS_Vision	0.323	0.149	4.693	1	0.030	1.381	1.031	1.849
WGSS_Hearing	0.093	0.145	0.417	1	0.519	1.098	0.827	1.458
WGSS_Mobility	0.446	0.155	8.273	1	0.004*	1.561	1.153	2.116
WGSS_Cognitive	0.257	0.153	2.809	1	0.094	1.293	0.957	1.747
WGSS_Sum	-0.127	0.104	1.486	1	0.223	0.881	0.718	1.080
DJGLS_Emotional	0.175	0.048	13.310	1	<0.001*	1.191	1.084	1.309
DJGLS_Social	-0.109	0.042	6.875	1	0.009	0.897	0.827	0.973
LSNS_Family	-0.047	0.008	32.720	1	<0.001*	0.954	0.939	0.970
LSNS_Friends	0.017	0.007	5.939	1	0.015	1.017	1.003	1.032
EDSF_Sum	0.221	0.019	129.006	1	<0.001*	1.248	1.201	1.296
Constant	-3.049	0.450	45.893	1	<0.001*	0.047		

Note: DJGLS Sum and LSNS and Sum were removed due to collinearity with remaining variables.

* indicates significance at the Bonferroni corrected $p < 0.00417$ threshold.

5.6.3. RQ2: Benefits

The second research question aimed to map the psychological benefits that users reported arising from interactions with their smart speakers. The most common benefit identified from the content analysis in Study 1 related to social benefit. Novelty, this was categorised into smart speakers offering intrinsic social value and facilitating human-human connections to explain their overall social benefit. As should occur with content analysis (Krippendorff, 2004), Study 2 makes an effort to validate these findings using alternative analyses. To do this, this section will seek to validate the suggestion made in Study 1 of overall social benefit from smart speakers being constructed from facilitating human-human connections and offering intrinsic social benefit. It will do this by conducting a factor analysis of quantitative items relating to social topics identified through the content analysis in Study 1. Further, to link to RQ1, this section will investigate which groups may be more likely to benefit from smart speakers offering intrinsic social benefit as a psychologically salient outcome of interest.

5.6.3.1. Replicating Social Benefit

To begin tackling this, a factor analysis will be conducted to investigate whether the concept of social benefit contains the two factors of facilitating human-human connections and offering intrinsic social benefit as proposed in Study 1. Items were constructed to reflect the social topics identified through the content analysis in Study 1 (see Table 33). Initially, a factor analysis was run with all six items. However, “Enjoyment” was found to have unsubstantial initial and extracted communalities, and did not load meaningfully onto a factor. This is reported fully in Appendix J: Initial Factor Analysis of All Terms Relating to Social Benefit

Appendix I: Coding of the qualitative survey responses as part of the content analysis

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Code

Codes\\Barriers to Use\\New\\Choosing Not to Use

Dataset

Files\\Qualitative_Only

No	0.0006	5			
			1	CEG	28/06/2023 17:10
have a smart speaker and other devices which could voice control but I choose not to use it					
			2	CEG	28/06/2023 17:11
Have not used it since Christmas 2020 because we were given a Dab Radio as a present which we prefer					
			3	CEG	28/06/2023 17:12
I have not used my smart speaker in the last 6 months					
			4	CEG	28/06/2023 17:12
If it would do what I say it'd be useful but as it ignores me I don't use it.					
			5	CEG	28/06/2023 17:13
No use at all to me. It came with my 4k Amazon Firestick as an unwanted addition in the handset					

Codes\\Barriers to Use\\New\\Choosing Not to Use\\Lack of Perceived Benefit

Dataset

Files\\Qualitative_Only

No	0.0007	7
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1	CEG	28/06/2023 17:14
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but of limited use at present

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Page 1 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			2		CEG	28/06/2023 17:11
Mine came as a 'gift' with another item. i have tried it out, but personally I do not think it enhances my life enough to use it. It now lives in a drawer with the other items that fail to live up to their promise.						
			3		CEG	28/06/2023 17:12
No benefit to me , it was a gift.						
			4		CEG	28/06/2023 17:16
My Alexa was a gift ,i would not have bought it myself . It does not add much to my life . I mainly use it to check the weather forecast or to check the time.						

	5	CEG	28/06/2023 17:20
It was free with a tv, I do not feel the need to have one			
	6	CEG	28/06/2023 17:21
It was bundled together with my Hive heating control system and I'm not sure it brings me any benefits			
	7	CEG	28/06/2023 17:13
I was given my smart speaker as a present. I see it up and evaluated it. I did not see it delivering enough benefits to make the security risks worthwhile. Accordingly, I stopped using the smart speaker.			

Codes\\Barriers to Use\\New\\Choosing Not to Use\\Novelty Wearing Off

Dataset

Files\\Qualitative_Only

No	0.0005	4			
	1	CEG	28/06/2023 17:19		
Only really used it the first few months of buying it, as i tend to use it for music i tend to use my phone for everything id use the dot for					
	2	CEG	29/06/2023 11:37		
I don't use it enough as I can't think what use it is apart from listening to music, or asking it random questions which loses its appeal after a bit.					
	3	CEG	28/06/2023 17:19		
Not as useful as I first thought					

Unfortunately I only have one item on the speaker and don't know how to put any others on it. So as you know gets very boring

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Barriers to Use\\New\\Choosing Not to Use\\Privacy Concerns

Dataset

Files\\Qualitative_Only

No	0.0004	4				
			1	CEG	28/06/2023 17:10	very useful item, but I'm worried about my privacy so use it very little.
			2	CEG	28/06/2023 17:11	I do not use it because I do not trust the service provider in terms of security of information.
			3	CEG	28/06/2023 17:11	doesn't trust the device and won't have it on.

4 CEG 28/06/2023 17:13

I was given my smart speaker as a present. I see it up and evaluated it. I did not see it delivering enough benefits to make the security risks worthwhile. Accordingly, I stopped using the smart speaker.

Codes\\Barriers to Use\\New\\Not Knowing How to Use\\Limited Functions Accessed

Dataset

Files\\Qualitative_Only

No 0.0031 22

1 CEG 28/06/2023 17:15

use it mainly to play music & rarely use it for any other purpose- it's something that adds very little to my life.

2 CEG 28/06/2023 17:15

Don't really use it much, it is easy to use though.

3 CEG 28/06/2023 17:15

Can answer questions but don't use much

4 CEG 28/06/2023 17:11

It is an easy way to have access to music and news programmes. I wouldn't use it for much else.

5 CEG 29/06/2023 11:38

Was given as a gift from my daughter. I am still getting used to it. I only use it to access the weather and radio

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			6	CEG	28/06/2023 17:16	I only listen to music on it .
			7	CEG	28/06/2023 17:16	My Alexa was a gift ,i would not have bought it myself . It does not add much to my life . I mainly use it to check the weather forecast or to check the time.
			8	CEG	28/06/2023 17:16	I only switch Alexa on when I have visitors and want to play music on the patio.
			9	CEG	29/06/2023 11:38	I mostly use it as a radio to be moved around the house
			10	CEG	29/06/2023 11:38	I dont feel I use the speaker to it's full potential, mainly use as a speaker for music/radio.
			11	CEG	28/06/2023 17:16	Handy for finding a film or tv programme to watch ,that's all it is used for very occasionally
			12	CEG	28/06/2023 17:17	Used for me only for music and news/weather.
			13	CEG	28/06/2023 17:19	

I only use my Alexa because my partner bought it- I use it for the radio, setting a timer for dinner and asking about the weather forecast.

	14	CEG	29/06/2023 11:39
Only use music			
	15	CEG	28/06/2023 17:20
I mainly use it as a timer, reminder to take medicine etc. It was a preset			
	16	CEG	29/06/2023 11:40
I mainly use it for music and answering questions			
	17	CEG	29/06/2023 11:39
It was a gift to provide voice activated alarm clock, which it does. It also provides easy to access radio and that is all I use it for			
	18	CEG	29/06/2023 11:41
My son gave it me so i can always have latest photos of him and the family. That's about 95% of its use to me!			
	19	CEG	29/06/2023 11:41
Handy for radio and relaxation type stuff (play the sound of waves or play the noise of a crackling fire), that's all i really use it (i have two really) for			
	20	CEG	28/06/2023 17:21
It was a Christmas gift. Use it Saturday/Sunday am .Used to use it as an alarm for outings/trips			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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	21	CEG	29/06/2023 11:41
As I only use it for music and weather, it's just an addition tool for me			

	22	CEG	29/06/2023 11:42
convenient to provide music which is my only need for			

Codes\\Barriers to Use\\New\\Not Knowing How to Use\\Limited Functions Accessed\\Not Knowing What Functions Are Available

Dataset

Files\\Qualitative_Only

No	0.0013	12
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	1	CEG	28/06/2023 17:21
Can be a bit daunting to use at first.			

	2	CEG	29/06/2023 11:35
Difficult to know the full range of commands and features available and when new ones are added.			

	3	CEG	29/06/2023 11:37
I don't see any apart from not using it to it's full capacity-			

	4	CEG	29/06/2023 11:37
I don't use it enough as I can't think what use it is apart from listening to music, or asking it random questions which loses its appeal after a bit.			

5 CEG 29/06/2023 11:37
. I dont really know what to do with it,

6 CEG 29/06/2023 11:37
only use it for radio upstairs as do not know what else I would use it for

7 CEG 29/06/2023 11:38
I can't be bothered to work out what else I can do with it.

8 CEG 28/06/2023 17:12
Was given as a gift from my daughter. I am still getting used to it. I only use it to access the weather and radio

9 CEG 29/06/2023 11:40
I'm still learning what it is capable of.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			10	CEG	29/06/2023 11:39	My main use is to listen to the radio and music but I sometimes struggle as you need to know exactly what to ask for whereas if I were using my phone I would search. I know I don't use them to their full potential but they are handy to have, especially as my husband can send me a voice message when I'm in another room.
			11	CEG	29/06/2023 11:40	Used almost exclusively for listening to radio programmes on DAB. Therefore I realise that I must find out more about other possible uses.

12 CEG 29/06/2023 11:42

I need to do more research on it. I don't use it to it's full capacity.

Codes\\Barriers to Use\\New\\Not Knowing How to Use\\Too Complex

Dataset

Files\\Qualitative_Only

No 0.0006 6

1 CEG 29/06/2023 11:36

My husband deals with settings and apps etc. I would not know what to do.

2 CEG 29/06/2023 11:36

Drawbacks include difficulty configuring htem - my husband did it, and onlyy two of teh three will actually paly BBC radio, he cannot get teh third one to do so. That is very irritating

3 CEG 29/06/2023 11:37

Upgrading software often means changes to general running of applications so each new version could be slightly different with menus and choices changing making it potentially time consuming to find what you want to play.

4 CEG 29/06/2023 11:42

I dont really understand it

5 CEG 29/06/2023 11:42

I am sure they can be more useful but I don't know how to function it

to complex and no instruction manual

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Page 6 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Barriers to Use\\New\\Not Knowing How to Use\\Too Complex\\Lack of Instruction

Dataset

Files\\Qualitative_Only

No 0.0004 5

1 CEG 28/06/2023 17:22

You have to learn to talk to it differently to normal speech so that it does the right thing and understands you i.e. you have to talk simply with clearly defined parameters.

2 CEG 29/06/2023 11:36

These devices should come with instruction book to learn how to use device to its full potential

3 CEG 29/06/2023 11:39

Frustrated I can't do more with it due to lack of easy instructions.

	4	CEG	29/06/2023 11:41
to complex and no instruction manual			
	5	CEG	29/06/2023 11:42
these items should come with written instructions. How are you expected to know how to do things.?			

Codes\\Barriers to Use\\New\\Not Knowing How to Use\\Too Complex\\Need to Learn or be Taught

Dataset

Files\\Qualitative_Only

No	0.0007	6			
	1	CEG	29/06/2023 11:45		
Don't like that they are changing/updating regularly and thus we have to learn how to use all over again.					
	2	CEG	29/06/2023 11:45		
when link is down I sometimes can't restore connex and need to ask my husband for help					
	3	CEG	29/06/2023 11:44		
Only acquired recently my husband is teaching me as he sets it up					
	4	CEG	29/06/2023 11:44		

I haven't learned to use it properly. Because of the covid lock down I've had to try and set it up on my own without help from other people who know more about the smart speaker and it's uses

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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5 CEG 29/06/2023 11:44

I dont have time to learn its different uses.

6 CEG 29/06/2023 11:46

I haven't used it yet even though I've had it for 8 months, I get my entertainment from BBC radio 4. I am not computer literate and don't know how to become so

Codes\\Benefits\\Social Value\\Companionship

Dataset

Files\\Qualitative_Only

No 0.0006 13

1 CEG 19/06/2023 11:26

Company as a benefit

Company	2	CEG	19/06/2023 14:02
company	3	CEG	19/06/2023 15:23
company,	4	CEG	19/06/2023 15:26
Company,	5	CEG	19/06/2023 18:10
It can provide company,	6	CEG	19/06/2023 18:12
, it's company when I'm working and eating there	7	CEG	20/06/2023 15:52
If you need entertainment and company it seems a good idea	8	CEG	21/06/2023 11:13
Company for older persons	9	CEG	21/06/2023 11:42

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				10	CEG	21/06/2023 11:44
	it keeps me company					
				11	CEG	22/06/2023 15:18
	I think it is a good device otherwise and is company for me.					
				12	CEG	23/06/2023 10:35
	Company					
				13	CEG	23/06/2023 10:39
	It is a useful asset to the home and can provide company and support people.					

Codes\\Benefits\\Social Value\\Companionship\\For Lonely or Isolated Individuals

Dataset

Files\\Qualitative_Only

No	0.0010	11				
			1	CEG	27/06/2023 16:04	
It is company when I'm on my own						

2	CEG	27/06/2023 16:04
Feeling of not being alone for some people.		

3	CEG	27/06/2023 16:05
. Also if you live alone I can see that they might provide some company day to day.		

4	CEG	27/06/2023 16:05
I live alone and listening to music of my choice or the radio helps overcome the ' silence'		

5	CEG	27/06/2023 16:05
I feel less lonely.		

6	CEG	27/06/2023 16:05
Company for lonely people.		

7	CEG	27/06/2023 16:05
Useful if alone for company		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				8	CEG	27/06/2023 16:06
				They help to keep me company as I live alone and are alone most of the time.		
				9	CEG	27/06/2023 16:06

Helps with loneliness

	10	CEG	27/06/2023 16:07
People living in their own feel less isolated			
	11	CEG	27/06/2023 16:07
Company if alone			

Codes\\Benefits\\Social Value\\Companionship\\Someone to Talk to

Dataset

Files\\Qualitative_Only

No	0.0002	4			
			1	CEG	27/06/2023 16:05
something to talk to in the morning					
			2	CEG	27/06/2023 16:06
Someone to talk to					
			3	CEG	27/06/2023 16:06
And even the happy Birthday song to just saying Good Morning to Good Night					
			4	CEG	27/06/2023 16:06

It's someone to chat too

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
Codes\\Benefits\\Social Value\\Connecting with Loved Ones						
Dataset						
Files\\Qualitative_Only						
No		0.0005	8			
				1	CEG	19/06/2023 14:05
Biggest benefit is comms with other relatives						
				2	CEG	20/06/2023 11:38

To have contact with my grandchildren and other members of my family

	3	CEG	20/06/2023 14:06
We also use it to speak to relatives,			
	4	CEG	20/06/2023 16:10
Good for communicating with others and sharing via family accounts			
	5	CEG	21/06/2023 11:00
We have used it to make phone calls			
	6	CEG	23/06/2023 10:36
Keeping in touch with family			
	7	CEG	23/06/2023 10:36
Drop in on elderly parents			
	8	CEG	23/06/2023 13:07
to chat to family member in another room			

Codes\\Benefits\\Social Value\\Connecting with Loved Ones\\Being Able to See Loved Ones

Dataset

Files\\Qualitative_Only

No 0.0006 8

1 CEG 27/06/2023 15:57

Visual contact with family members Effective only if they too have the app

Formatted Reports\\Coding Summary by Code Formatted Report

Page 11 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			2	CEG	27/06/2023 15:58	Sing happy birthday to somebody we are FaceTiming on their birthday.
			3	CEG	27/06/2023 15:57	Our children like the idea of using it to get in touch and see us.
			4	CEG	27/06/2023 15:58	I use to FaceTime
			5	CEG	27/06/2023 15:57	video calling aged relatives
			6	CEG	27/06/2023 15:58	and make video calls,
			7	CEG	27/06/2023 15:58	Easy hands free use for phone/video calls

	8	CEG	27/06/2023 15:58
Being able to speak to and see family during lockdown			

Codes\\Benefits\\Social Value\\Connecting with Loved Ones\\Without Cost

Dataset

Files\\Qualitative_Only

No	0.0001	2			
			1	CEG	27/06/2023 15:59
Call mobiles (family members) without having a bill					
			2	CEG	27/06/2023 15:59
It saves money. When keeping in touch with family.					

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Benefits\\Wellbeing\\Emotional Wellbeing

Dataset

Files\\Qualitative_Only

No	0.0001	2				
			1	CEG	27/06/2023 16:05	
I feel less lonely.						
			2	CEG	27/06/2023 16:06	
Helps with loneliness						

Codes\\Benefits\\Wellbeing\\Emotional Wellbeing\\Mental Health

Dataset

Files\\Qualitative_Only

No	0.0002	2				
			1	CEG	28/06/2023 10:21	

I love music and its positive effect on my mental health, the smart speaker can help me access and explore new genres, singers and composers.

	2	CEG	28/06/2023 10:23
, bought one for my mum in law when she was shielding and it improved her mental state significantly in between listening to Cliff Richard			

Codes\\Benefits\\Wellbeing\\Emotional Wellbeing\\Relaxation

Dataset

Files\\Qualitative_Only

No	0.0003	4			
			1	CEG	28/06/2023 10:21
its ok for now helps me relax					

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				2	CEG	28/06/2023 10:21
helps to relax you when going to sleep and waking you up in the morning						

3	CEG	28/06/2023 10:24
---	-----	------------------

relaxation type stuff (play the sound of waves or play the noise of a crackling fire),

4	CEG	28/06/2023 10:25
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My benefits are listening and relaxing to music..

Codes\\Benefits\\Wellbeing\\Emotional Wellbeing\\Uplifting

Dataset

Files\\Qualitative_Only

No	0.0004	6
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1	CEG	28/06/2023 10:21
---	-----	------------------

I also use my echo spot device in my kitchen to sing-along to music to help improve my mood.

2	CEG	28/06/2023 10:21
---	-----	------------------

Washandy during my maternity leave to keep spirits up.

3	CEG	28/06/2023 10:22
---	-----	------------------

MY DAILY SING - A - LONGS WITH ALEXA ARE A FEEL GOOD TREAT

4	CEG	28/06/2023 10:24
---	-----	------------------

Makes me happy to play music and know the news and weather.

5 CEG 28/06/2023 10:24

Her cheesy jokes of the day I will sometimes ask just to bring a smile. Her fart and burp sounds apps are hilarious.

6 CEG 28/06/2023 10:25

I love music and it makes me be happier

Formatted Reports\\Coding Summary by Code Formatted Report

Page 14 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Benefits\\Wellbeing\\Independence

Dataset

Files\\Qualitative_Only

No 0.0005 5

1 CEG 19/06/2023 13:48

I can do more things for myself like turning heating up or off.

2	CEG	19/06/2023 15:20
eventually increased independence in later years		
3	CEG	21/06/2023 14:32
She wanted to stay in her own home and this feature provided her with some independence to accomplish this.		
4	CEG	22/06/2023 15:07
It can be used to summon help should I have called fall. That's why it was bought for me.		
5	CEG	23/06/2023 11:33
My family bought me the smart speaker as a safety measure because I live on my own and they want me to have a means of contacting them if I have a fall or hurt myself and cannot reach my phone		

Codes\\Benefits\\Wellbeing\\Physical health

Dataset

Files\\Qualitative_Only

No	0.0002	2
1	CEG	20/06/2023 16:20
This apparatus actually helps with my physical health and gives that extra security if I required urgent support, such as if I had fallen I can ask Alexa to ring a nominated name.		
2	CEG	22/06/2023 15:07
It can be used to summon help should I have called fall. That's why it was bought for me.		

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
Codes\\Fears\\Becoming Dependent						
Dataset						
Files\\Qualitative_Only						
No		0.0002	3			
				1	CEG	19/06/2023 15:29
. A drawback may be the reliance that we put on it.						
				2	CEG	20/06/2023 16:28
To much Reliance on technology						
				3	CEG	23/06/2023 11:10
Drawbacks that you could become dependent on such devices if not careful.						

Codes\\Fears\\Becoming Dependent\\If it stops working

Dataset

Files\\Qualitative_Only

No		0.0002	4
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1	CEG	26/06/2023 13:34
---	-----	------------------

it would not be good to become dependant on one in case the internet goes down or it goes faulty.

2	CEG	26/06/2023 13:34
---	-----	------------------

Drawbacks would be becoming reliant on this in case it breaks down or there is a powercut!!!

3	CEG	26/06/2023 13:37
---	-----	------------------

but if there is any interruption in the Internet service then obviously this can have quite an impact expecially if you are relying on it to take medication

4	CEG	26/06/2023 13:39
---	-----	------------------

relying too much on it when it may fail

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Fears\\Becoming Dependent\\If it stops working\\Taking Medication

Dataset

Files\\Qualitative_Only

No	0.0000	1	1	CEG	26/06/2023 13:37
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but if there is any interruption in the Internet service then obviously this can have quite an impact expecially if you are relying on it to take medication

Codes\\Fears\\Becoming Dependent\\On accuracy of information

Dataset

Files\\Qualitative_Only

No	0.0000	1
		1
	CEG	26/06/2023 13:39

Over reliance that info given is accurate

Codes\\Fears\\Becoming Dependent\\Unable to communicate with people

Dataset

Files\\Qualitative_Only

No	0.0001	1
		1
	CEG	26/06/2023 13:39

I am also careful not to become too reliant on it or allow my children to be (as much as ica n, although they are nearly adults and have their own views!) as I think this generation and the next ones to come are losing the ability to actually communicate person to person which is having a negative effect on the population and society of today.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
Codes\\Fears\\Becoming Lazy						
Dataset						
Files\\Qualitative_Only						
No		0.0012	11			
				1	CEG	20/06/2023 14:19
can make people lazy						
				2	CEG	20/06/2023 15:42
Being lazy and putting a timer on the Xmas tree lights						
				3	CEG	20/06/2023 15:56
for lazy people						
				4	CEG	20/06/2023 17:15
Makes you lazy!						
				5	CEG	20/06/2023 17:18
Can make you lazy for example turning lamps on and off						
				6	CEG	20/06/2023 17:40
are can make people lazy... turn lights on, draw curtains totally unnecessary.						
				7	CEG	21/06/2023 11:06

Can make u lazy using other features ie switching on & off lights

	8	CEG	21/06/2023 11:16
Make you lazy eg turn on light on			
	9	CEG	21/06/2023 11:32
it's just there, it's another reason to make people lazy			
	10	CEG	22/06/2023 14:58
Drawback, it makes me lazy.			
	11	CEG	23/06/2023 10:38
But makes you lazy.			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Fears\\Becoming Lazy\\Negative Health Impact

Dataset

Files\\Qualitative_Only

No 0.0002 3

1 CEG 26/06/2023 13:24

Drawbacks are that it is making me move less and less, which means I'm getting unhealthier

2 CEG 26/06/2023 13:25

I suppose it does stop you physically getting up and turning off the light yourself, which would be better for your health.

3 CEG 26/06/2023 13:26

Gall wneud unigolion yn ddiog, a felly magu gwendidau corfforol.

Codes\\Fears\\Becoming Lazy\\Reducing Movement and Exercise

Dataset

Files\\Qualitative_Only

No 0.0005 8

1 CEG 26/06/2023 13:13

Makes me lazy as I don't have to move around to turn on lights and kettle etc

2 CEG 26/06/2023 13:24

Drawbacks are that it is making me move less and less, which means I'm getting unhealthier

3 CEG 26/06/2023 13:24
Drawbacks: Less exercise.

4 CEG 26/06/2023 13:24
I don't need to leave the sofa to turn the lights on and off, both a benefit and a curse

5 CEG 26/06/2023 13:24
makes me lazy because I can shout instead of getting up to turn a switch.

6 CEG 26/06/2023 13:25
A portal to accessing more expensive equipment to stop me exercising after my stroke.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			7	CEG	26/06/2023 13:25	I suppose it does stop you physically getting up and turning off the light yourself, which would be better for your health.
			8	CEG	26/06/2023 13:26	Smart speakers can make you lazy by encouraging you to ask it to put lights on or off, see who is at the door or turn the TV or radio on. Reducing the times you have to stand up or walk around your home.

Codes\\Fears\\Privacy Concerns

Dataset

Files\\Qualitative_Only

No	0.0019	29			
			1	CEG	19/06/2023 14:01
I intend to use my own internal secure device set up with extra security and firewalls					
			2	CEG	19/06/2023 15:25
Potentially data privacy issues.					
			3	CEG	19/06/2023 17:43
Just concerns about extent of privacy.					
			4	CEG	19/06/2023 18:14
Drawbacks is my personal information inclusive of what is being researched etc is of personal value. Amazon & the like get it for free.... That's completely wrong! Copyright infringements for every single person on the planet would put these companies under. No-one would seriously give their information away without benefit. Problem is we don't benefit. Technology causes more problems than solving them.					
			5	CEG	20/06/2023 11:28
Drawbacks are retention of data snd invasion of privacy					
			6	CEG	20/06/2023 11:29
Small risks about privacy					
			7	CEG	20/06/2023 14:12
I do worry about privacy .					
			8	CEG	20/06/2023 14:27

Big Brother potential

9

CEG

20/06/2023 15:39

drawbacks - lack of privacy

Formatted Reports\\Coding Summary by Code Formatted Report

Page 20 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				10	CEG	20/06/2023 15:44
	I have concerns about privacy and intend to check those settings again.					
				11	CEG	20/06/2023 15:46
	I'm weary of the privacy issues.					
				12	CEG	20/06/2023 16:28
	Privacy -					
				13	CEG	20/06/2023 16:30
	Concerns about what my data is used for					
				14	CEG	20/06/2023 16:30
	privacy is a worry					
				15	CEG	21/06/2023 10:56
	Easily invade privacy if not controlled correctly.					

Privacy	16	CEG	21/06/2023 11:19
drawbacks are concerns about data security	17	CEG	21/06/2023 11:33
: keeping up with privacy,	18	CEG	21/06/2023 14:28
Privacy	19	CEG	22/06/2023 15:01
Mildly concerned about the privacy issues.	20	CEG	22/06/2023 15:08
Bad___privacy issues	21	CEG	22/06/2023 15:13
Privacy	22	CEG	22/06/2023 15:14
Drawback is a nagging doubt about privacy and 'big brother' syndrome happening.	23	CEG	22/06/2023 15:40
Drawbacks PRIVACY	24	CEG	23/06/2023 10:49

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
	privacy			25	CEG	23/06/2023 11:08
	I think it should be clearly explained that you need to agree to certain privacy settings when setting it up.			26	CEG	23/06/2023 11:10
	Data privacy			27	CEG	23/06/2023 11:36
	drawbacks are my privacy/security			28	CEG	23/06/2023 13:10
	Privacy.			29	CEG	23/06/2023 13:12

Codes\\Fears\\Privacy Concerns\\Control of Connected Devices

Dataset

Files\\Qualitative_Only

No		0.0002	3
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	1	CEG	26/06/2023 14:35
I won't buy the lights as I worry Alexa will take over the house like a Sci fi movie but I could be being dramatic			
	2	CEG	26/06/2023 14:41
I worry a bit about privacy issues. If connected to household appliances such as cookers etc I worry it can be hacked and misused.			
	3	CEG	26/06/2023 14:46
Possible security risk, someone could intercept signals to gain access to house.			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Fears\\Privacy Concerns\\Financial exploitation

Dataset

Files\\Qualitative_Only

No	0.0011	13	
	1	CEG	19/06/2023 15:28
. A profile is being captured of my listening habits in preparation of feeding me paid for services			
	2	CEG	19/06/2023 17:46
I feel cheated that if you want to fully access music you want played you have to pay monthly, which I won't do!!			
	3	CEG	19/06/2023 17:53
Cost of 'add ons' i.e to turn lights etc on & off. The more you want from it the more it costs..i.e I dint think Amazon is a good supplier			
	4	CEG	19/06/2023 17:57
over rated use is rather limited very costly if you have to buy extras			
	5	CEG	20/06/2023 11:22
I especially dont want to pay monthly charges for music, or whatever else is available. I dont want payments set up using the device because I feel I dont have control or access to altering the payments.			
	6	CEG	20/06/2023 11:32
It is a glorified radio, if you do not have unlimited everything. I have prime TV, but I still have to pay for music , books			
	7	CEG	20/06/2023 11:34
One of the disadvantages is having to pay extra for access to some music.			
	8	CEG	26/06/2023 14:53
I believe that everything the tech companies do is geared to finding out as much as possible about our tastes so we can be encouraged to buy more stuff. I'm not prepared to pay for the Amazon service.			
	9	CEG	20/06/2023 14:30

If you are looking for information they can lead to customers using an expensive company rather than the cheapest

	10	CEG	20/06/2023 15:40
Would need to pay a subscription to use it.			
	11	CEG	20/06/2023 16:33
A portal to accessing more expensive equipment to stop me exercising after my stroke.			
	12	CEG	20/06/2023 17:13
expense			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				13	CEG	23/06/2023 11:06
Also the smart speaker is merely another route to get us to buy more services like music subscriptions						

Codes\\Fears\\Privacy Concerns\\Gathering Personal Data

Dataset

Files\\Qualitative_Only

No		0.0009	12		
	1	CEG	26/06/2023 14:53		
I dint think Amazon is a good supplier. I dont trust it in relation to what data it gathers about me.					
	2	CEG	26/06/2023 14:33		
Drawbacks is my personal information inclusive of what is being researched etc					
	3	CEG	26/06/2023 14:52		
Being tied into a company gathering personal information about me.					
	4	CEG	26/06/2023 14:34		
but I do worry about what private information it can garner about me and my lifestyle					
	5	CEG	26/06/2023 14:36		
drawbacks: may be using information about me					
	6	CEG	26/06/2023 14:37		
Might pick up information I don't want shared.					
	7	CEG	26/06/2023 14:39		
covert personal information harvesting					
	8	CEG	26/06/2023 14:41		
Draw back is that more data is collected on me regardless of security settings					

9 CEG 26/06/2023 14:44

I do not know how much information is kept about me without my knowledge or consent by the smart speaker

10 CEG 26/06/2023 14:48

Possibility of making my private info unsafe

Formatted Reports\\Coding Summary by Code Formatted Report

Page 24 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			11	CEG	26/06/2023 14:49	
			I know the Alexa uses conversations to give you relative advertising to your likes, dislikes and daily life. I know it can be turned off I just can't be bothered.			
			12	CEG	26/06/2023 14:49	
			The fact that it can know about you.			

Codes\\Fears\\Privacy Concerns\\Gathering Personal Data\\Always Recording

Dataset

Files\\Qualitative_Only

No	0.0008	15			
			1	CEG	26/06/2023 14:31
The device can listen in to conversations possibly.					
			2	CEG	26/06/2023 14:32
it's always keeping track of what's said around it					
			3	CEG	26/06/2023 14:35
Bit worried about it possibly 'spying' on conversations.					
			4	CEG	26/06/2023 14:35
I don't like it listening in (and I think it does).					
			5	CEG	26/06/2023 14:37
It becomes part of the furniture, and therefore could monitor my life without me having any idea that it is doing so.					
			6	CEG	26/06/2023 14:37
Drawback unsure if someone can listen ito conversations.					
			7	CEG	26/06/2023 14:39
Not keen on it always listening but at the same time I never mute it.					
			8	CEG	26/06/2023 14:40
Never sure if it's always hearing what's said and using the information in a bad way					
			9	CEG	26/06/2023 14:40
It's a portal so I do worry about the camera . I switch it off.					

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			10	CEG	26/06/2023 14:45	Drawbacks - 'Big Brother' is watching 😬
			11	CEG	26/06/2023 14:46	recording snippets of my conversations
			12	CEG	26/06/2023 14:47	I always switch my Alexa's plug off when not in use so there's no chance of her 'hearing any conversations'
			13	CEG	26/06/2023 14:47	Some concern about it 'listening in' to conversations.
			14	CEG	26/06/2023 14:48	but don't trust the smart speaker as I think that it's listening to everything we are saying.
			15	CEG	26/06/2023 14:49	I recently did a telephone call center job that said we couldn't have the device switched on during working hours, so it makes you wonder what the device can do

Codes\\Fears\\Privacy Concerns\\Gathering Personal Data\\Feels Invasive

Dataset

Files\\Qualitative_Only

No	0.0007	9
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	1	CEG	26/06/2023 14:27
On one occasion it ordered an item from Amazon that was mentioned during a conversation that was being held in the room. Definitely an invasion of my privacy so the item was switched off and has not been used since.			
	2	CEG	26/06/2023 14:27
Invasion of privacy. Big brother at its worst.			
	3	CEG	26/06/2023 14:42
Drawbacks possible invasion of privacy			
	4	CEG	26/06/2023 14:42
I did worry about the invasion of privacy aspect when we first got Alexa but this worry has dw8ndled with time.			
	5	CEG	26/06/2023 14:32
but it is nosey. I think it can be an intrusion into peoples lives.			

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			6	CEG	26/06/2023 14:42	
Drawbacks are retention of data snd invasion of privacy						
			7	CEG	26/06/2023 14:41	
It can be intrusive so I don't use it much.						
			8	CEG	26/06/2023 14:45	
but can be intrusive						
			9	CEG	26/06/2023 14:48	
I don't like the potential invasion of privacy but have not bothered to do anything about it!						

Codes\\Fears\\Privacy Concerns\\Gathering Personal Data\\Passing Data to 3rd Parties

Dataset

Files\\Qualitative_Only

No	0.0004	5
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1	CEG	26/06/2023 14:26
Mild concerns over privacy and information forwarded to marketeers		
2	CEG	26/06/2023 14:36
Concern about privacy and using my usage to inform 3rd parties.		
3	CEG	26/06/2023 14:39
covert personal information harvesting and dissipation to unknown sources		
4	CEG	26/06/2023 14:54
Drawback is the amount of info built up about my preferences and stored/sold on by tech companies.		
5	CEG	26/06/2023 14:54
Drawbacks are security of the data and what Google does with it, who else can access it.		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Fears\\Privacy Concerns\\Gathering Personal Data\\Passing Data to 3rd Parties\\Suspicious Tailored Advertisements Dataset

Files\\Qualitative_Only

No	0.0004	4			
			1	CEG	26/06/2023 14:26
It definitely listens in and tailors adverts etc to our devices					
			2	CEG	26/06/2023 14:36
I'm suspicious that certain items I mention then appear in adverts, even if I haven't messaged anyone about it.					
			3	CEG	26/06/2023 14:53
Smart speakers often lie dormant, but one has the feeling that discussions can be overheard and filtered back to the manufacturers marketing dept. Pure coincidence could be a reason that my experience of talking about a product that I may purchase, has shown up on the Facebook a social networking site or on my iPhone! I suspect that in reality, this is not the case though, and that the technology I'm using has enabled certain companies to access my data					
			4	CEG	26/06/2023 14:49
It definitely listens and links to other social media. If you mention something to Alexa then adverts for those things will appear on facebook					

Codes\\Fears\\Privacy Concerns\\Lack of Trust\\For Tech Companies

Dataset

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No0.001315

1CEG26/06/2023 14:04
hold reservations about the BigTech companies and metadata. For those reasons and others, I have closed my Facebook account for example.

2CEG19/06/2023 14:01
Don't wish to subscribe to a media company.

3CEG19/06/2023 17:53
I dint think Amazon is a good supplier. I dont trust it in relation to what data it gathers about me.

4CEG19/06/2023 17:58
I do not use it because I do not trust the service provider in terms of security of information.

5CEG26/06/2023 14:34
Drawbacks is my personal information inclusive of what is being researched etc is of personal value. Amazon & the like get it for free....

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			6	CEG	20/06/2023 11:35	Being tied into a company gathering personal information about me.
			7	CEG	20/06/2023 14:04	Downside: I think it may intrudes in my privacy, regardless of assurances from the tech companies.

8	CEG	20/06/2023 14:20
I believe that everything the tech companies do is geared to finding out as much as possible about our tastes so we can be encouraged to buy more stuff. I'm not prepared to pay for the Amazon service.		
9	CEG	20/06/2023 16:14
data usage by companies, and possible breaches		
10	CEG	20/06/2023 17:17
Smart speakers often lie dormant, but one has the feeling that discussions can be overheard and filtered back to the manufacturers marketing dept. Pure coincidence could be a reason that my experience of talking about a product that I may purchase, has shown up on the Facebook a social networking site or on my iPhone! I suspect that in reality, this is not the case though, and that the technology I'm using has enabled certain companies to access my data		
11	CEG	21/06/2023 10:55
My data is being logged by tech companies for their own benefit.		
12	CEG	21/06/2023 11:38
I don't use it because I frankly do not trust large corporations to use personal information.		
13	CEG	22/06/2023 15:47
Drawback is the amount of info built up about my preferences and stored/sold on by tech companies.		
14	CEG	23/06/2023 11:03
because I don't trust the product provider I turn the power off to the unit when not in use, so I have to turn it on before using it,		
15	CEG	23/06/2023 11:06
Drawbacks are security of the data and what Google does with it, who else can access it.		

Dataset

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No	0.0002	4			
			1	CEG	26/06/2023 14:52

I do worry that Google home spies on our conversations!

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				2	CEG	26/06/2023 14:42
				doesn't trust the device and won't have it on.		
				3	CEG	26/06/2023 14:38
				do not and never will trust		
				4	CEG	26/06/2023 14:48
				but don't trust the smart speaker as I think that it's listening to everything we are saying.		

Codes\\Fears\\Privacy Concerns\\Not knowing how data is used

Dataset

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No		0.0004	4			
				1	CEG	26/06/2023 14:26
but unsure how it uses my data.						
				2	CEG	26/06/2023 14:37
More info needed about privacy						
				3	CEG	26/06/2023 14:51
Data held in cloud and used by provider. User agreement means that default permissions are required for use and consent to what your data is used for not always clear.						
				4	CEG	26/06/2023 14:47
I personally worry about invasion of privacy even though I accept I do not know enough						

Codes\\Fears\\Talking to inanimate object

Dataset

Files\\Qualitative_Only

No 0.0001 3

1 CEG 19/06/2023 14:02

feeling stupid speaking to an inanimate object

Formatted Reports\\Coding Summary by Code Formatted Report

Page 30 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			2		CEG	19/06/2023 18:02
I am also careful not to become too reliant on it or allow my children to be (as much as ica n, although they are nearly adults and have their own views!) as I think this generation and the next ones to come are losing the ability to actually communicate person to person which is having a negative effect on the population and society of today.						
			3		CEG	23/06/2023 11:36
to a machine always makes me nervous						

Codes\\Features\\Connectivity

Dataset

Files\\Qualitative_Only

No 0.0061 77

1 CEG 19/06/2023 11:18

linking everything together

2	CEG	19/06/2023 11:18
Voice control of all functions is simpler and more convenient than using a range of devices which need setting up by hand.		
3	CEG	19/06/2023 11:20
Communication around the house between rooms.		
4	CEG	19/06/2023 11:21
(we have one mini in each room and the google home hub in the kitchen		
5	CEG	19/06/2023 11:22
I'm also partially sighted due to a neurological condition and I struggle particularly with low lighting so we've programmed all our lamps and lights to be linked to google home so I can turn all the lights on without struggling to find the light switch		
6	CEG	19/06/2023 11:26
control of remote devices.		
7	CEG	19/06/2023 11:47
Main benefit for me is lighting and heat control via links to Hive.		
8	CEG	19/06/2023 11:48
Can control all devices from one place.		
9	CEG	19/06/2023 11:49
To operate other equipment like radio, TV etc.		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			10	CEG	19/06/2023 11:52	easy to control Hive
			11	CEG	19/06/2023 11:53	I have 3 smart speakers throughout my home which I use to control lighting, TV, Radio etc.
			12	CEG	19/06/2023 13:49	smart heating, lighting, quiz answers, surround sound around home, message us and in another room and the list goes on
			13	CEG	19/06/2023 13:53	good for smart home devices
			14	CEG	19/06/2023 13:55	Things like being able to turn the heating down after I've gone to bed.
			15	CEG	19/06/2023 13:56	I have several smart speakers - I partially like the features that allow me to communicate with my Husband when is in another part of the house
			16	CEG	19/06/2023 13:56	It can be linked to my video doorbell
			17	CEG	19/06/2023 14:06	They are useful for listening to media throughout the house
			18	CEG	19/06/2023 14:08	

Alters the hive heating

	19	CEG	19/06/2023 14:09
Useful for changing heating settings in Hive.			
	20	CEG	19/06/2023 15:19
Enables home automation			
	21	CEG	19/06/2023 15:20
Easy to control my environment when I'm busy elsewhere.			
	22	CEG	19/06/2023 15:20
We have it in the house as it came with the heating system			
	23	CEG	19/06/2023 15:25
So easy and convenient to use for playing music for all situations and moods. No fiddling around with CD's etc.			
	24	CEG	19/06/2023 17:48
I can control my house via smart bulbs and smart plugs, and hope to install Alexa-friendly central heating controls this year			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				25	CEG	19/06/2023 17:49
I like being able to control my lights, heating etc by voice						

controlling lights and heating.	26	CEG	19/06/2023 17:51
Likewise the doorbell. Control heat/water. Timers/reminders, control lights. Intercom.	27	CEG	19/06/2023 17:51
Controlling other smart home devices	28	CEG	19/06/2023 18:00
Love the fact that all my lights and heating come on automatically and I can switch on my electric blanket from my lounge	29	CEG	19/06/2023 18:11
Being able to control your environment.	30	CEG	19/06/2023 18:15
Easier to control home environment using other smart devices.	31	CEG	20/06/2023 11:18
, mostly for turning things on and off	32	CEG	20/06/2023 11:21
Easy to control devices around the house especially if I am in work. I can control things at home remotely on the app which is great	33	CEG	20/06/2023 11:28
It's easy to listen to the radio and turn lights on upstairs.	34	CEG	20/06/2023 11:29
Using it to turn things on and off.	35	CEG	20/06/2023 11:36

	36	CEG	20/06/2023 14:03
if out I can put the heating on before arriving home.			
	37	CEG	20/06/2023 14:05
Being able to control my central heating			
	38	CEG	20/06/2023 14:29
Remote control of house.			
	39	CEG	20/06/2023 14:30
If you have straight forward requests to switch things on or off or change channels etc, fine.			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				40	CEG	20/06/2023 15:37
Security light on/off function when I'm away. Light on/off control before/after entering a room.						
				41	CEG	20/06/2023 15:43
putting a timer on the Xmas tree lights						
				42	CEG	20/06/2023 15:42
Home control great benefit.						
				43	CEG	20/06/2023 15:46

I like the ease if controlling things like lights and heating

	44	CEG	20/06/2023 15:48
Home automation			
	45	CEG	20/06/2023 15:53
Benefits - can carry out tasks like switching lights on/off, opening blinds etc .			
	46	CEG	20/06/2023 16:22
for my ring doorbell			
	47	CEG	20/06/2023 16:29
can operate with various other sound systems around the house.			
	48	CEG	20/06/2023 17:14
Helps my partner control the heating my herself, and we have it automatically turn on lights before getting home in the winter.			
	49	CEG	20/06/2023 17:15
I can control heating and lights when I am not in the house...security			
	50	CEG	20/06/2023 17:16
Useful for remotely controlling devices e.g. lights			
	51	CEG	20/06/2023 17:33
hands-free control of home gadgets			
	52	CEG	20/06/2023 17:36
Beneficial in having a hands free assistant for turning on television, lights and answering doorbell			

53 CEG 20/06/2023 17:37
Benifit of switching lights and socks on by voice so I don't have to get up (I have a bad knee).

54 CEG 21/06/2023 11:01
Control of lighting

Formatted Reports\\Coding Summary by Code Formatted Report

Page 34 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				55	CEG	21/06/2023 11:02
						controlling lights and heating
				56	CEG	21/06/2023 11:31
						One of the biggest benefits for me is being able to control lights, electronic devices such as TVs etc through the smart speaker without getting up
				57	CEG	21/06/2023 11:33
						Virtual control of household items; easy access to media.
				58	CEG	21/06/2023 11:34
						Great to control home controls like lights
				59	CEG	21/06/2023 11:35
						Get it to turn things on and off
				60	CEG	21/06/2023 11:40

Help in home turning lights on off etc

I find it convenient for voice control of lighting and entertainment	61	CEG	21/06/2023 11:43
It's great to control the thermostat, turn on the smart plugs, lights and devices,	62	CEG	22/06/2023 15:03
Excellent for controlling lights and equipment around the house.	63	CEG	22/06/2023 15:05
Benefits it gives me control over smart things I have around my home.	64	CEG	22/06/2023 15:18
It makes it easier to control the home environment	65	CEG	22/06/2023 15:42
I use it for use I got the nest heating control when away from the house aswell as in the house.I also use it for turning lights on and off which frees one hand to carry something as I use a walking stick in the other hand.	66	CEG	22/06/2023 15:45
Connect to hive heating	67	CEG	22/06/2023 15:49
To control software items in my home;	68	CEG	22/06/2023 15:51
I have some dimmer lights set to alexa, really helps when leaving the kitchen at night with my hands full.	69	CEG	23/06/2023 10:37

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			70		CEG	23/06/2023 10:51
		just use it as a great quality WiFi speaker with the ability to link to similar devices				
			71		CEG	23/06/2023 10:51
		Benefits for using are control of cameras lights and tv,				
			72		CEG	23/06/2023 10:54
		Links to other technology and allows remote activation of devices .eg lights internet radio				
			73		CEG	23/06/2023 11:07
		control of appliances				
			74		CEG	23/06/2023 11:35
		Ease of use of heating, radio, timer, access to information, setting alarms, reminders				
			75		CEG	23/06/2023 11:35
		Just helpful to adjust thermostat without having to go and find phone				
			76		CEG	23/06/2023 11:37
		The ability to expand to control lights etc is appealing.				
			77		CEG	23/06/2023 11:38

easy to set timers for watering polytunnel etc

Codes\\Features\\Convenience

Dataset

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No	0.0118	111			
			1	CEG	19/06/2023 11:15
It is convenient for music and alarms and information eg weather. I can just tell it to stop the music when the phone goes or someone comes to the door					
			2	CEG	19/06/2023 11:16
get information and entertainment whenever I need it					
			3	CEG	19/06/2023 11:15
It's excellent at being able to quickly check something hands-free, no opening up another tab to Google something.					

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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4	CEG	19/06/2023 11:18
Convenience		

5	CEG	19/06/2023 11:18
Voice control of all functions is simpler and more convenient than using a range of devices which need setting up by hand.		

6	CEG	19/06/2023 11:19
Convenience		

7	CEG	19/06/2023 11:20
makes life easier - automates some tasks that otherwise would take longer & more effort		

8	CEG	19/06/2023 11:20
They just make life easier.		

9	CEG	19/06/2023 11:21
making life easier		

10	CEG	19/06/2023 11:24
It's the simplest way to gain the information or entertainment that I need or want		

11	CEG	19/06/2023 11:25
Helps with small things it might take time to look up.		

12	CEG	19/06/2023 11:26
Convenience - being able to start things like the radio hands free.		

13	CEG	19/06/2023 11:27
Convenient		

	14	CEG	19/06/2023 11:41
Hands-free commands for entertainment, timers, information. Helpful when, cooking or otherwise engaged in an activity.			
	15	CEG	19/06/2023 11:43
Useful for quick fact checking, timers for cooking etc			
	16	CEG	19/06/2023 11:45
Convenience and ease			
	17	CEG	19/06/2023 11:45
It's a convenient radio / music player / timer. Mine is usually set to play Radio 4 all day, but I can change to music if a program bores me, about once or twice a week. I particularly like being able to silence it quickly to answer the phone.			
	18	CEG	19/06/2023 11:46
being hands free			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				19	CEG	19/06/2023 11:48
Its somewhat convenient,						
				20	CEG	19/06/2023 11:49
Convenience and access to information						
				21	CEG	19/06/2023 11:51

Convenience

	22	CEG	19/06/2023 11:53
Makes tasks hands free - turning lights off etc			
	23	CEG	19/06/2023 13:47
makes certain things easier to do			
	24	CEG	19/06/2023 13:53
Convenience,			
	25	CEG	19/06/2023 13:59
It's convenient to access information and set timers and make lists			
	26	CEG	19/06/2023 14:03
Saves me getting up to turn the radio on!			
	27	CEG	19/06/2023 14:08
Convenience			
	28	CEG	19/06/2023 15:21
Convenience, particularly in the kitchen for recipes, timers and music etc.			
	29	CEG	19/06/2023 15:25
Makes life easier, e.g. so quick to boost the hot water without needing to go downstairs to the boiler controls or even open the app			
	30	CEG	19/06/2023 15:26
Convenience - setting timers etc			

	31	CEG	19/06/2023 15:31
convenience in listening to the radio or spotify			

	32	CEG	19/06/2023 17:44
Convenient			

	33	CEG	19/06/2023 17:47
Benefits are that it does make life easier			

Formatted Reports\\Coding Summary by Code Formatted Report

Page 38 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				34	CEG	19/06/2023 17:50
	Convenience					
				35	CEG	19/06/2023 17:54
	Convenience, especially not not to use a keyboard to request information and music					
				36	CEG	19/06/2023 17:57
	Convenience,					
				37	CEG	19/06/2023 18:02
	It can help to speed up or automate tasks in everyday life,					
				38	CEG	19/06/2023 18:10

Convenience

	39	CEG	19/06/2023 18:10
Convenience			
	40	CEG	19/06/2023 18:11
For some things it is more convenient to use than my smart phone.			
	41	CEG	19/06/2023 18:13
Benefits are that it helps preform tasks like turn lights on if hands are full when entering a room			
	42	CEG	19/06/2023 18:13
can save you the time of typing something into Google of you want a quick answer			
	43	CEG	19/06/2023 18:14
I love the choice of radio stations without having to tune the radio in every time one needs a change of programme			
	44	CEG	19/06/2023 18:16
Convenience.			
	45	CEG	19/06/2023 18:17
Access to information and making life easier			
	46	CEG	20/06/2023 11:28
Also able to change radio station without having to stop what I'm doing			
	47	CEG	20/06/2023 11:28
Easy to control devices around the house especially if I am in work. I can control things at home remotely on the app which is great			

48 CEG 20/06/2023 11:34

Voice controlled frees you up when you're already doing something.

Formatted Reports\\Coding Summary by Code Formatted Report

Page 39 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				49	CEG	20/06/2023 11:35
				- it's easier to do things, especially when you have your hands full.		
				50	CEG	20/06/2023 11:37
				Convenient and handy to use.		
				51	CEG	20/06/2023 11:38
				Convenience and availability of music		
				52	CEG	20/06/2023 14:03
				It's convenient.		
				53	CEG	20/06/2023 14:09
				Convenience of accessing some information		
				54	CEG	20/06/2023 14:11
				I don't need to leave the sofa to turn the lights on and off, both a benefit and a curse		
				55	CEG	20/06/2023 14:20

Useful for controlling lights (Hive)

	56	CEG	20/06/2023 14:24
Convenience for listening to music.			
	57	CEG	20/06/2023 14:28
It is an easy way to have access to music and news programmes			
	58	CEG	20/06/2023 15:43
Being lazy and putting a timer on the Xmas tree lights			
	59	CEG	20/06/2023 15:43
It is handy for the radio and finding information off the internet			
	60	CEG	20/06/2023 15:43
I find it useful to have the radio station on that I want while I'm busy and not have to change it myself			
	61	CEG	20/06/2023 15:48
Convenience.			
	62	CEG	20/06/2023 15:52
Convenient for information,			
	63	CEG	20/06/2023 16:02
Convenient			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				64	CEG	20/06/2023 16:21
	Convenience.					
				65	CEG	20/06/2023 16:26
	Makes my life easier e.g. switching on lights, radio etc					
				66	CEG	20/06/2023 16:26
	Convenience to live					
				67	CEG	20/06/2023 16:27
	Convenience +					
				68	CEG	20/06/2023 16:31
	Convenience of attaining answers					
				69	CEG	20/06/2023 17:12
	Potential to simplify complex tasks					
				70	CEG	20/06/2023 17:13
	use it to find things out by my voice instead of my ggogle app on my phone.					
				71	CEG	20/06/2023 17:34
	Convenience					
				72	CEG	20/06/2023 17:44

Convenience (operating lights, accessing music, etc)

	73	CEG	20/06/2023 17:46
Convenience			
	74	CEG	21/06/2023 10:53
Convenience			
	75	CEG	21/06/2023 11:01
Attempts to make life a little easier			
	76	CEG	21/06/2023 11:01
convenient			
	77	CEG	21/06/2023 11:08
Convenience, not having to use keyboard whilst doing another task. I.e. cooking.			
	78	CEG	21/06/2023 11:10
Convenience			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				79	CEG	21/06/2023 11:11
Convenience						

Convenience	80	CEG	21/06/2023 11:11
Convenience	81	CEG	21/06/2023 11:12
Benefits for me is that my smart speaker is very convenient.	82	CEG	21/06/2023 11:38
convenience	83	CEG	21/06/2023 11:41
Use it for news when I'm busy	84	CEG	21/06/2023 11:42
Convenience in using music streaming.	85	CEG	21/06/2023 11:42
speed and convenience of use	86	CEG	21/06/2023 11:44
convenience	87	CEG	21/06/2023 14:29
It makes life easier	88	CEG	21/06/2023 14:29
Benefit, makes life easier	89	CEG	22/06/2023 14:58

Makes life easier	90	CEG	22/06/2023 14:58
It's convenient being voice controlled.	91	CEG	22/06/2023 14:58
convenience	92	CEG	22/06/2023 15:14
Convenient and easy way to set reminders and listen to music	93	CEG	22/06/2023 15:16

Formatted Reports\\Coding Summary by Code Formatted Report

Page 42 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				94	CEG	22/06/2023 15:35
						Super convenient - no rooting around for CD's or searching on phone.
				95	CEG	22/06/2023 15:45
						I use it for use I got the nest heating control when away from the house aswell as in the house.I also use it for turning lights on and off which frees one hand to carry something as I use a walking stick in the other hand.
				96	CEG	22/06/2023 15:51
						Convenience
				97	CEG	23/06/2023 10:36

Convenience

	98	CEG	23/06/2023 10:38
It makes life easier to hear music.			
	99	CEG	23/06/2023 10:40
Convenience			
	100	CEG	23/06/2023 10:55
Saves time looking for information.			
	101	CEG	23/06/2023 11:10
Saves time typing into google			
	102	CEG	23/06/2023 11:10
It's convenient to access music across different rooms			
	103	CEG	23/06/2023 11:34
I find it very convenient when listening to music or radio			
	104	CEG	23/06/2023 11:35
convenient to provide music which is my only need for			
	105	CEG	23/06/2023 13:07
Convenience			
	106	CEG	23/06/2023 13:08
Handy for setting timers when baking			

	107	CEG	23/06/2023 13:09
Convenient			

	108	CEG	23/06/2023 13:10
. Beneficial and time saving			

Formatted Reports\\Coding Summary by Code Formatted Report

Page 43 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				109	CEG	23/06/2023 13:10
	Benefits are for convenience of use					
				110	CEG	23/06/2023 13:12
	convenient					
				111	CEG	23/06/2023 13:12
	Convenience, fast					

Codes\\Features\\Don't need extra devices

Dataset

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No	0.0026	25			
			1	CEG	19/06/2023 14:04
I'm able to listen to music, radio and do a search of some things without having to purchase a larger radio or computer/tablet					
			2	CEG	19/06/2023 14:10
I can set reminders so easily and listen to music and audio books without having to use a gadget.					
			3	CEG	19/06/2023 15:25
So easy and convenient to use for playing music for all situations and moods. No fiddling around with CD's etc.					
			4	CEG	19/06/2023 15:29
I think a smart speaker offers a 'one stop shop' to access a variety of entertainment and information as well as a hub to adjust environmental factors such as lighting.					
			5	CEG	19/06/2023 17:43
So much easier than hunting for CD's etc. Especially when driving.					
			6	CEG	19/06/2023 17:45
, all from one small gadget.					
			7	CEG	19/06/2023 17:56
It is a multi function audio/entertainment system loaded with 60 years worth of my music. Allof my records, tapes and discs have been digitised, loaded on my phone, ipad and laptop so I can play any track any time.					
			8	CEG	19/06/2023 18:11
easier than finding and then playing a cd					

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			9	CEG	20/06/2023 11:17	easier than trawling through channels on the radio
			10	CEG	20/06/2023 11:18	I use it to access digital radio, which is otherwise unavailable to me. It was much cheaper then buying an AV receiver and fits in my kitchen easily.
			11	CEG	20/06/2023 11:37	saves searching through cd's and it's easy to move to any room in the house.
			12	CEG	20/06/2023 15:54	Easy to ask questions like weather without having to pick up my phone
			13	CEG	20/06/2023 17:12	Saves storing CDs, etc.
			14	CEG	21/06/2023 10:55	Not needing lots of other items like timers radios etc at home
			15	CEG	21/06/2023 10:57	Benefits: the ability to access any music without having to purchase a cd or download.
			16	CEG	21/06/2023 11:03	Ease of access to music and information without using a computer or iPad. Also, use it to play DAB radio

17	CEG	21/06/2023 11:19
Very easy access to music channels without switching on a television radio, other radio or Internet radio. Very easy access to getting answers to questions without checking Wikipedia etc on my phone.		
18	CEG	22/06/2023 15:08
not needing to retune a radio		
19	CEG	22/06/2023 15:12
It enables you to do things, have things done and find out information without having to turn on the PC or other devices.		
20	CEG	22/06/2023 15:13
Less space used		
21	CEG	22/06/2023 15:30
Less need for buying albums for music		
22	CEG	23/06/2023 10:51
I use it mostly for information and music. It saves me having to turn on my computer		
23	CEG	23/06/2023 10:52
It's handier than picking up a device for finding facts and figures.		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				24	CEG	23/06/2023 10:53

I don't have to go on another device where I might end up spending more time on it when I don't want to. It's instant and I might forget to use another device. I can ask questions without going on a device.

25 CEG 23/06/2023 12:49

Some of the benefits include being able to find information when you are unable to use a phone

Codes\\Features\\Ease of use

Dataset

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No 0.0122 119

1 CEG 19/06/2023 11:15

easy to use and play music

2 CEG 19/06/2023 11:21

The children can use them easily,

3 CEG 19/06/2023 11:22

I'm also partially sighted due to a neurological condition and I struggle particularly with low lighting so we've programmed all our lamps and lights to be linked to google home so I can turn all the lights on without struggling to find the light switch

4 CEG 19/06/2023 11:24

Easy access to information and setting reminders

5 CEG 19/06/2023 11:24

It's the simplest way to gain the information or entertainment that I need or want

	6	CEG	19/06/2023 11:25
Simple to us, with verbal comands			
	7	CEG	19/06/2023 11:25
It's easy to use			
	8	CEG	19/06/2023 11:43
Easy to find music or radio stations and change between.			
	9	CEG	19/06/2023 11:45
Convenience and ease			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				10	CEG	19/06/2023 11:51
	ease of use,					
				11	CEG	19/06/2023 11:52
	easy to control Hive					
				12	CEG	19/06/2023 11:52

Ease of use without physical touch.

	13	CEG	19/06/2023 13:52
easier to access radio stations, spotify, my own music, podcasts.			
	14	CEG	19/06/2023 13:59
Easy and instant access to radio and personalised music.			
	15	CEG	19/06/2023 13:59
Ease of music selection: not having to press buttons etc			
	16	CEG	19/06/2023 14:01
Easy access to video calls			
	17	CEG	19/06/2023 14:04
Easy access to vast catalogue of music			
	18	CEG	19/06/2023 14:04
Easy access to music,			
	19	CEG	19/06/2023 14:09
Quick easy access to music playlists and radio,			
	20	CEG	19/06/2023 14:10
easy access to music and films I like			
	21	CEG	19/06/2023 14:10
I can set reminders so easily and listen to music and audio books without having to use a gadget.			

	22	CEG	19/06/2023 14:10
Benefits would be it can make things easier to access			

	23	CEG	19/06/2023 14:10
Amazing range of music so easily obtainable			

	24	CEG	19/06/2023 15:21
Easy and quick to do things, such as ask questions, when you're not near a PC etc.			

Formatted Reports\\Coding Summary by Code Formatted Report

Page 47 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				25	CEG	19/06/2023 15:25
				So easy and convenient to use for playing music for all situations and moods. No fiddling around with CD's etc.		
				26	CEG	19/06/2023 15:28
				Easy acces to internet radio and playback services.		
				27	CEG	19/06/2023 15:29
				Ease of use for music, information and setting timer.		
				28	CEG	19/06/2023 17:43
				Ease of listening to music.		
				29	CEG	19/06/2023 17:43

Easy control of central heating without needing to get to the Hive hub

30	CEG	19/06/2023 17:47
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Easy to download music & find older groups etc

31	CEG	19/06/2023 17:48
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Easy and useful access to music and information.

32	CEG	19/06/2023 17:51
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Ease of use

33	CEG	19/06/2023 17:54
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Makes everyday tasks quicker and easier and very useful for accessing audio content.

34	CEG	19/06/2023 17:54
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Don't really use it much,it is easy to use though.

35	CEG	19/06/2023 17:57
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Information gained easily. Good

36	CEG	19/06/2023 17:57
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Usefull for music and easy to use.

37	CEG	19/06/2023 18:00
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Easy to use,

38	CEG	19/06/2023 18:01
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Easy to listen to music

39 CEG 19/06/2023 18:10

ease of use for those who find a keyboard difficult

Formatted Reports\\Coding Summary by Code Formatted Report

Page 48 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				40	CEG	19/06/2023 18:11
						easier than finding and then playing a cd
				41	CEG	19/06/2023 18:15
						easy access to information by just asking a question
				42	CEG	19/06/2023 18:15
						Easy access.
				43	CEG	19/06/2023 18:15
						Easy, quick access to music news timers etc
				44	CEG	19/06/2023 18:16
						Was easy to play radio stations
				45	CEG	20/06/2023 11:17
						easier than trawling through channels on the radio
				46	CEG	20/06/2023 11:23

Ease of accessing radio stations and music.

	47	CEG	20/06/2023 11:29
It's easy to listen to the radio and turn lights on upstairs.			
	48	CEG	20/06/2023 11:32
Makes accessing music easier.			
	49	CEG	20/06/2023 11:33
Easy to request music and set a timer when cooking			
	50	CEG	20/06/2023 11:33
Just an easy way of finding facts. Instantaneous access to music.			
	51	CEG	20/06/2023 11:35
- it's easier to do things, especially when you have your hands full.			
	52	CEG	20/06/2023 11:35
Radio/music listening is made easier.			
	53	CEG	20/06/2023 11:35
Easy to use - no keyboard			
	54	CEG	20/06/2023 11:37
It's easy to use			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				55	CEG	20/06/2023 14:04
		Makes changing music and entertainment (audiobooks) access easier,				
				56	CEG	20/06/2023 14:04
		Ease of access - often a great help with crosswords.				
				57	CEG	20/06/2023 14:06
		Easy to use when busy in the kitchen - no hands needed!				
				58	CEG	20/06/2023 14:06
		Hands free, easy.				
				59	CEG	20/06/2023 14:10
		easy to use				
				60	CEG	20/06/2023 14:29
		the benefit is that it's easy to get information, music, radio etc instantly just by speech				
				61	CEG	20/06/2023 15:38
		Easy access to new alert, alarms, music, playlists				
				62	CEG	20/06/2023 15:38
		Easy to gain quick information is a benefit.				
				63	CEG	20/06/2023 15:38

Ease of use and helpful

	64	CEG	20/06/2023 15:38
Easy to use once set up.			
	65	CEG	20/06/2023 15:39
benefits -easy to use for people without digital skills if they have help to set it up -			
	66	CEG	20/06/2023 15:39
Easy access to digital radio			
	67	CEG	20/06/2023 15:40
suppose it is handy and easily used.			
	68	CEG	20/06/2023 15:41
Ease of access to information and services such as accessing music.			
	69	CEG	20/06/2023 15:41
quick and easy to use for every kind of information!			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			70	CEG	20/06/2023 15:42	
It's just so easy to use and has a vast music catalogue						

Ease of use.	71	CEG	20/06/2023 15:47
Ease of use and multi functional	72	CEG	20/06/2023 15:51
Makes it easy to do and know things	73	CEG	20/06/2023 15:59
Easy audio interface and control	74	CEG	20/06/2023 16:00
Can allow hands free instructions while cooking, allow for easy access to music when having a new born baby can help!	75	CEG	20/06/2023 16:01
Easy to use and access info, music instantly	76	CEG	20/06/2023 16:09
Ease of use.	77	CEG	20/06/2023 16:30
Easy access to music, information etc	78	CEG	20/06/2023 16:30
An easy way of playing music	79	CEG	20/06/2023 17:13
Ease of access to radio channels	80	CEG	20/06/2023 17:13

An easy to handle device and allows me access things easily.	81	CEG	20/06/2023 17:16
Ease of using voice commands for information, entertainment and lighting	82	CEG	20/06/2023 17:16
easy to set the timer for cooking	83	CEG	20/06/2023 17:16
Ease of carrying out functions	84	CEG	20/06/2023 17:45

Formatted Reports\\Coding Summary by Code Formatted Report

Page 51 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				85	CEG	20/06/2023 17:45
						Quick access to favourite pieces of music
				86	CEG	21/06/2023 10:56
						Ease of use
				87	CEG	21/06/2023 11:03
						Ease of access to music and information without using a computer or iPad. Also, use it to play DAB radio
				88	CEG	21/06/2023 11:17

Easy access to information, entertainment

	89	CEG	21/06/2023 11:19
Very easy access to music channels without switching on a television radio, other radio or Internet radio. Very easy access to getting answers to questions without checking Wikipedia etc on my phone.			
	90	CEG	21/06/2023 11:41
Easy hands free access to music			
	91	CEG	21/06/2023 11:43
Easy to use and find information			
	92	CEG	21/06/2023 14:22
ease of use			
	93	CEG	22/06/2023 14:57
Its just easier!			
	94	CEG	22/06/2023 15:07
Easy hands free use for phone/video calls			
	95	CEG	22/06/2023 15:11
I like the easy access to music or books			
	96	CEG	22/06/2023 15:11
Easy to access a number of different radio stations.			
	97	CEG	22/06/2023 15:12
Good___ease of use			

	98	CEG	22/06/2023 15:32
Being easy to stream music has enhanced my daily life			

	99	CEG	22/06/2023 15:34
Easy access to information/music			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				100	CEG	22/06/2023 15:42
Simple access to radio and music						
				101	CEG	22/06/2023 15:42
It makes it easier to control the home environment						
				102	CEG	23/06/2023 10:34
Easy access to music. Easy access to radio Timer.						
				103	CEG	23/06/2023 10:37
Easy access is a benefit.						
				104	CEG	23/06/2023 10:40
Ease of use,						
				105	CEG	23/06/2023 10:40

Ease of use and access to information.

	106	CEG	23/06/2023 10:51
Easy accessibility to variety of music.			
	107	CEG	23/06/2023 10:53
Easy to set reminders, alarms, add to my shopping list, play one song or lots			
	108	CEG	23/06/2023 11:10
Easy to use as voice controlled.			
	109	CEG	23/06/2023 11:10
Easy access to information and entertainment			
	110	CEG	23/06/2023 11:11
Ease of access to different radio channels			
	111	CEG	23/06/2023 11:11
Can easily access radio stations.			
	112	CEG	23/06/2023 11:34
Provides an easy way of providing music particularly around the house.			
	113	CEG	23/06/2023 11:35
easy to listen to my fav radio/ music set alarms reminders etc			
	114	CEG	23/06/2023 11:35
Ease of use of heating, radio, timer, access to information, setting alarms, reminders			

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
	Easy access to music and info			115	CEG	23/06/2023 11:37
	Easy to use			116	CEG	23/06/2023 11:38
	easy to use .			117	CEG	23/06/2023 13:09
	Easy access			118	CEG	23/06/2023 13:11
	Ease of obtaining information			119	CEG	23/06/2023 13:12

[Codes\\Features\\More options](#)

Dataset

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No 0.0036 35

	1	CEG	19/06/2023 18:17
Provides more options.			
	2	CEG	20/06/2023 11:18
I use it to access digital radio, which is otherwise unavailable to me. It was much cheaper then buying an AV receiver and fits in my kitchen easily.			
	3	CEG	20/06/2023 11:28
Able to get a lot of music with subscription			
	4	CEG	20/06/2023 11:29
Cheap access to a wide range of music!!			
	5	CEG	20/06/2023 11:37
the benefit is that I can choose any music that takes my fancy.			
	6	CEG	20/06/2023 14:03
tool to enable me to access information, technology and control equipment in the home.			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			7		CEG	20/06/2023 14:18
		I can access music I don't own already and get ideas of new things to listen to				
			8		CEG	20/06/2023 15:37
		The ability to listen to a wider range of radio stations than on a conventional radio,				
			9		CEG	20/06/2023 15:40
		I can listen to digital radio stations not available on my other radios				
			10		CEG	20/06/2023 15:42
		It's just so easy to use and has a vast music catalogue				
			11		CEG	20/06/2023 15:52
		Instant access to unlimited music				
			12		CEG	20/06/2023 17:14
		benefits is access to digital radio via wifi as DAB reception is poor				
			13		CEG	21/06/2023 10:53
		Can listen to any music by just requesting it				
			14		CEG	21/06/2023 11:04
		I can ask for any song i want no matter how old it is and it will play it				
			15		CEG	21/06/2023 11:15
		W8de variety of Information easily accessible				

16	CEG	21/06/2023 11:20
I can choose what music I want to hear with no ads		

17	CEG	21/06/2023 11:32
Access to all genre of music, facts and podcasts on the radio. Alexa helps me find on the TV many travel documentaries and keep fit for seniors that otherwise I would not know of		

18	CEG	21/06/2023 14:32
I can access digital radio stations which I can't as I only own an analogue radio.		

19	CEG	22/06/2023 15:06
Access to digital radio (no DAB signal here)		

20	CEG	22/06/2023 15:08
Being able to play music and multiple radio stations		

21	CEG	22/06/2023 15:11
Easy to access a number of different radio stations.		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				22	CEG	22/06/2023 15:17
				My Google Home gives me hours of entertainment with different sorts of artists and music,		
				23	CEG	22/06/2023 15:35

Super convenient - no rooting around for CD's or searching on phone.

	24	CEG	22/06/2023 15:37
Easy to access lots of radio programmes and podcasts in one place			
	25	CEG	22/06/2023 15:40
music that I generally wouldn't bother to look for			
	26	CEG	22/06/2023 15:47
I can access websites that I use			
	27	CEG	23/06/2023 10:40
wide range of items/music to tap in to			
	28	CEG	23/06/2023 10:50
Hands free access to a wide range of media			
	29	CEG	23/06/2023 10:51
Easy accessibility to variety of music.			
	30	CEG	23/06/2023 10:52
Different radio stations are easy to play			
	31	CEG	23/06/2023 10:56
Vast choice of radio stations			
	32	CEG	23/06/2023 11:07
. being able to listen to several different radio stations, and basically any music I wish to listen to.			

33	CEG	23/06/2023 11:07
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It has enabled us to access a wider range of music than if we had to rely on streaming to the computer

34	CEG	23/06/2023 11:33
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I like to be able to call up pieces of music and songs that I no longer have access to in more traditional ways

35	CEG	23/06/2023 13:08
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Good to have access to a wide range of music

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Features\\Quicker than other devices

Dataset

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No	0.0063	67	1	CEG	19/06/2023 11:17
Speeds up certain activities (setting timers).			2	CEG	19/06/2023 11:19

It's just quicker to turn music/and information services on.

tasks that otherwise would take longer & more effort	3	CEG	19/06/2023 11:20
quick to respond	4	CEG	19/06/2023 11:27
It is quicker at finding certain things than having to type a question	5	CEG	19/06/2023 11:28
Quick access to- My liked music, controlling the lights.	6	CEG	19/06/2023 11:40
Useful for quick fact checking, timers for cooking etc	7	CEG	19/06/2023 11:43
time saving setting a task, quick info without typing	8	CEG	19/06/2023 11:46
Benefits are that it gives instant info	9	CEG	19/06/2023 11:48
is useful got quick information and guidance.	10	CEG	19/06/2023 13:53
Handy to access info quickly and to play music	11	CEG	19/06/2023 13:57

12 CEG 19/06/2023 13:59
Easy and instant access to radio and personalised music.

13 CEG 19/06/2023 14:00
A quick way to listen to music and listen to news

Formatted Reports\\Coding Summary by Code Formatted Report

Page 57 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				14	CEG	19/06/2023 14:03
						Access to music immediately on demand plus access to radio.
				15	CEG	19/06/2023 14:04
						Useful for quick information
				16	CEG	19/06/2023 14:09
						Quick easy access to music playlists and radio,
				17	CEG	19/06/2023 14:11
						quickly accessing information
				18	CEG	19/06/2023 15:21
						Easy and quick to do things, such as ask questions, when you're not near a PC etc.
				19	CEG	19/06/2023 15:22
						Great for music as you can instantly play what you want

quicker information than searching via other sources	20	CEG	19/06/2023 17:44
Great for getting quick answers to questions	21	CEG	19/06/2023 17:45
Quicker than using the control	22	CEG	19/06/2023 17:50
gathering information quickly	23	CEG	19/06/2023 17:50
Makes everyday tasks quicker and easier and very useful for accessing audio content.	24	CEG	19/06/2023 17:54
Quick access to things	25	CEG	19/06/2023 17:56
It can help to speed up or automate tasks in everyday life,	26	CEG	19/06/2023 18:02
I can obtain information very quickly - more speedily than setting up and researching on the computer.	27	CEG	19/06/2023 18:12
Easy, quick access to music news timers etc	28	CEG	19/06/2023 18:15

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
	Instant access to information		29	CEG	20/06/2023 11:27	
	quick fact check		30	CEG	20/06/2023 11:28	
	Quick access to information and music.		31	CEG	20/06/2023 11:29	
	Just an easy way of finding facts. Instantaneous access to music.		32	CEG	20/06/2023 11:33	
	Enjoy being able to request whatever music/ radio and getting information instantly.		33	CEG	20/06/2023 11:36	
	It's a handy gadget which is quicker to use for some functions such as switching on lights or accessing a search engine.		34	CEG	20/06/2023 14:05	
	Instant access to news, music and general info		35	CEG	20/06/2023 14:05	
	Gives quick answers to questions such as weather forecasts and general knowledge crosswords!		36	CEG	20/06/2023 14:19	

37 CEG 20/06/2023 15:38
Easy to gain quick information is a benefit.

38 CEG 20/06/2023 15:41
quick and easy to use for every kind of information!

39 CEG 20/06/2023 16:09
Easy to use and access info, music instantly

40 CEG 20/06/2023 16:20
If you have a quick question it is quicker to ask Alexa than it is to type it out into your phone.

41 CEG 20/06/2023 17:17
Very quick access to information as in general knowledge

42 CEG 20/06/2023 17:45
and immediate help in researching facts of matters of interest.

43 CEG 21/06/2023 10:56
Instant choice what you want

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				44	CEG	21/06/2023 10:56

Quick access to music and information.

45	CEG	21/06/2023 10:57
Instant access to information without having to scroll through lots of web pages.		
46	CEG	21/06/2023 11:05
quickness to obtain music, latest news etc		
47	CEG	21/06/2023 11:14
Gives information quickly when required		
48	CEG	21/06/2023 11:16
Its handy for finding information quickly		
49	CEG	21/06/2023 11:18
It is a beneficial tool for quickly finding out simple information		
50	CEG	21/06/2023 11:41
Handy to have answers quickly, goodnto access music		
51	CEG	21/06/2023 11:44
speed and convenience of use		
52	CEG	21/06/2023 14:28
speed of reaction		
53	CEG	22/06/2023 14:57
Useful for immediate access to radio, podcasts etc.		

	54	CEG	22/06/2023 14:58
Immediate response for music, trivia and smart devices			

	55	CEG	22/06/2023 15:08
Instant information.			

	56	CEG	22/06/2023 15:18
Access information quicker.			

	57	CEG	22/06/2023 15:37
The benefits are quick access to information,			

	58	CEG	22/06/2023 15:51
Instant access to information			

Formatted Reports\\Coding Summary by Code Formatted Report

Page 60 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				59	CEG	23/06/2023 10:37
Instant response is a benefit.						
				60	CEG	23/06/2023 10:50
It's a quick way to access information						
				61	CEG	23/06/2023 10:50

Speed of access to services

	62	CEG	23/06/2023 10:51
I use it mostly for information and music. It saves me having to turn on my computer			
	63	CEG	23/06/2023 11:03
For me, possibly speed of accessing music, search results etc			
	64	CEG	23/06/2023 11:31
Quick access to information			
	65	CEG	23/06/2023 11:39
Instant information			
	66	CEG	23/06/2023 13:11
it is quicker to ask Alexa something than to type it into a search engine.			
	67	CEG	23/06/2023 13:12
Convenience, fast			

Codes\\Features\\Voice Commands

Dataset

Files\\Qualitative_Only

No 0.0058 60

1 CEG 19/06/2023 13:50
Control if electrical appliance by voice command.

2 CEG 19/06/2023 13:59
Ease of music selection: not having to press buttons etc

Formatted Reports\\Coding Summary by Code Formatted Report

Page 61 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				3	CEG	19/06/2023 15:21
No typing when you've got wet hands!						
				4	CEG	19/06/2023 17:44
hands-free information which helps with my arthritis hands						
				5	CEG	19/06/2023 17:46
Works without physical contact - such as when I am in bed						
				6	CEG	19/06/2023 17:49
I like being able to control my lights, heating etc by voice						
				7	CEG	19/06/2023 17:54
Convenience, especially not not to use a keyboard to request information and music						

	8	CEG	19/06/2023 17:58
. Answering simple questions without having to type into a keyboard, for example: convert measures in the kitchen.			
	9	CEG	19/06/2023 18:11
Hands free aspect			
	10	CEG	19/06/2023 18:15
easy access to information by just asking a question			
	11	CEG	19/06/2023 18:16
It's on hand when I want hands free information			
	12	CEG	20/06/2023 11:33
Benefits: love the hand free access.			
	13	CEG	20/06/2023 11:34
Voice controlled frees you up when you're already doing something.			
	14	CEG	20/06/2023 11:35
- it's easier to do things, especially when you have your hands full.			
	15	CEG	20/06/2023 11:35
Easy to use - no keyboard			
	16	CEG	20/06/2023 11:36
Handy hands free fact checker,			
	17	CEG	20/06/2023 14:03

Carrying a cup of tea and using a walking stick,I can put the lights on with my voice.

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				18	CEG	20/06/2023 14:04
	Benefits - turning on/off stuff without using physical means i.e. speed					
				19	CEG	20/06/2023 14:06
	Easy to use when busy in the kitchen - no hands needed!					
				20	CEG	20/06/2023 14:06
	Hands free, easy.					
				21	CEG	20/06/2023 14:21
	When your hands are tied. e.g. cooking, it is very useful.					
				22	CEG	20/06/2023 14:21
	benefits: playing music handsfree, setting timers handsfree					
				23	CEG	20/06/2023 14:29
	the benefit is that it's easy to get information, music, radio etc instantly just by speech					
				24	CEG	20/06/2023 14:29
	Hands free operation					

25	CEG	20/06/2023 15:37
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, plus the ease of moving from channel to channel by voice not by clicking multiple buttons.

26	CEG	20/06/2023 15:46
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Flexibility and easy access to information without the need to always use a keyboard on a computer or mobile device

27	CEG	20/06/2023 15:59
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Enjoy having hands free access to tv and music

28	CEG	20/06/2023 16:01
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Can allow hands free instructions while cooking, allow for easy access to music when having a new born baby can help!

29	CEG	20/06/2023 16:26
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Benefits are being able to complete tasks hands free - turn on lights/tv/play music, without needing to find the remote!

30	CEG	20/06/2023 16:29
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a hands free hub

31	CEG	20/06/2023 17:12
----	-----	------------------

makes day to day life that but easier by being able to speak to the speaker instead of looking for my phone or laptop to search for the same information or music.

32	CEG	20/06/2023 17:18
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Can sometimes be useful if your hands are busy etc.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				33	CEG	20/06/2023 17:33
	hands-free control of home gadgets					
				34	CEG	20/06/2023 17:36
	Beneficial in having a hands free assistant for turning on television, lights and answering doorbell					
				35	CEG	20/06/2023 17:37
	Handy with a new born for the hands free element.					
				36	CEG	21/06/2023 11:08
	Convenience, not having to use keyboard whilst doing another task. I.e. cooking.					
				37	CEG	21/06/2023 11:41
	Able to play different radio stations using my voice					
				38	CEG	21/06/2023 11:41
	Easy hands free access to music					
				39	CEG	21/06/2023 11:43
	I find it convenient for voice control of lighting and entertainment					
				40	CEG	21/06/2023 14:28
	. No need to go somewhere to type something in.					
				41	CEG	22/06/2023 14:58
	Helps to do things 'hands free',					

42 CEG 22/06/2023 14:58
It's convenient being voice controlled.

43 CEG 22/06/2023 15:07
Easy hands free use for phone/video calls

44 CEG 22/06/2023 15:29
with my voice and from anywhere in the room.

45 CEG 22/06/2023 15:33
Hands free cooking is advantageous.

46 CEG 22/06/2023 15:45
I use it for use I got the nest heating control when away from the house aswell as in the house.I also use it for turning lights on and off which frees one hand to carry something as I use a walking stick in the other hand.

47 CEG 23/06/2023 10:35
I can turn on music or have a book read to me while cooking and I don't have to stop and turn it on, tune it select etc, I can do it all by voice commands

Formatted Reports\\Coding Summary by Code Formatted Report

Page 64 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				48	CEG	23/06/2023 10:39
						Like the Hands free operation.
				49	CEG	23/06/2023 10:49

I like having a hands free option to my phone.

	50	CEG	23/06/2023 10:50
Hands free access to a wide range of media			
	51	CEG	23/06/2023 10:53
Set timers while cooking without having to touch anything.			
	52	CEG	23/06/2023 10:54
it's handy for switching stations or turning it up or down with my voice.			
	53	CEG	23/06/2023 11:03
Benefits can get it to carry out commands whilst I am doing something else			
	54	CEG	23/06/2023 11:03
accessible hands free device			
	55	CEG	23/06/2023 11:08
Good to get radio stations I want by voice			
	56	CEG	23/06/2023 11:10
Easy to use as voice controlled.			
	57	CEG	23/06/2023 11:32
hands free activation if I'm cooking			
	58	CEG	23/06/2023 11:33
Voice activated			

59	CEG	23/06/2023 13:11
Voice control enables those with difficulties using keyboard and mouse to interact with interweb.		

60	CEG	23/06/2023 13:11
Makes life easier when cooking, especially when your hands are covered in ingredients		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Frustrations\\Cannot Complete Desired Tasks

Dataset

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No	0.0004	8				
			1	CEG	19/06/2023 11:50	
They struggle with finding out complex information or when words have multiple spellings						
			2	CEG	19/06/2023 17:52	

Also, stupidity - the news app is too basic, I prefer to read my iPad.

	3	CEG	19/06/2023 18:12
The drawback is simply that it doesn't know everything			
	4	CEG	20/06/2023 16:21
I dislike it when Alexa doesn't know the answer to simple questions or simple instructions eg. Alexa play a Scottish Lament on the bagpipes it plays a vocal Irish jig.			
	5	CEG	20/06/2023 17:17
sometimes have issues with more complicated words and phases.			
	6	CEG	20/06/2023 17:45
it doesn't always understand complex or unusual requests and bombards me with popular music that I find unpleasant			
	7	CEG	22/06/2023 15:20
I would like Alexa to know more answers to the questions I ask.			
	8	CEG	23/06/2023 11:32
Useless at understanding anything slight complex			

Codes\\Frustrations\\Can't connect to other technology\\Connectivity Issues

Dataset

Files\\Qualitative_Only

No 0.0002 4

1 CEG 27/06/2023 13:50

They can only operate the basic functions of our audio systems and sometimes fail to connect

Formatted Reports\\Coding Summary by Code Formatted Report

Page 66 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				2	CEG	27/06/2023 13:52
				Can be frustrating when you can't get her to discover new devices.		
				3	CEG	27/06/2023 13:52
				The main drawback for me was that I can't use it as an external speaker for anything else so still needed speakers for my PC etc.		
				4	CEG	27/06/2023 13:52
				Connection drops BTooth occasionally. Only one device can communicate simultaneously		

Codes\\Frustrations\\Can't connect to other technology\\Lack of Compatible Smart-Tech

Dataset

Files\\Qualitative_Only

No	0.0005	6			
			1	CEG	27/06/2023 13:50
Drawbacks is that other house tech are not connected e.g. heating system. The Government should consider more legislation (Building Regs.) to incorporate technology in new housing/type of accomodation					
			2	CEG	27/06/2023 13:50
some devices in my home are not compatible with google, so i would have to buy a different (another) brand of smart speaker.					
			3	CEG	27/06/2023 13:51
Drawbacks are not having many other smart devices (lights/heating) so I am probably not making the most out of it.					
			4	CEG	27/06/2023 13:51
Will incorporate more smart home devices when things need to be replaced but would not replace something that is working just for the smart function					
			5	CEG	27/06/2023 13:51
. Also would use functions like turn on lights etc except our house isn't wired for it.					
			6	CEG	27/06/2023 13:52
Without the complete 'smart home' it's got limited uses					

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
Codes\\Frustrations\\Internet requirment						
Dataset						
Files\\Qualitative_Only						
No		0.0009	14			
				1	CEG	19/06/2023 13:59
Unfortunately, sometimes the lists are unavailable when shopping if signals are low.						
				2	CEG	19/06/2023 14:01
Don't like the fact it is always connected to the internet.						
				3	CEG	19/06/2023 17:51
but if there is any interruption in the Internet service then obviously this can have quite an impact expecially if you are relying on it to take medication						
				4	CEG	19/06/2023 18:00
Sometimes broadband is unreliable and affects status of relay of programs						
				5	CEG	20/06/2023 11:19
Device still reliant on broadband working well						
				6	CEG	20/06/2023 11:29

. Drawbacks it's temperamental with dropping out of internet connection

	7	CEG	20/06/2023 17:14
an extra bit of tech that can go wrong or that needs to be reset when the wifi goes down/powercut which happens here frequently			
	8	CEG	21/06/2023 11:33
Unreliable when no strong internet signal.			
	9	CEG	22/06/2023 14:59
Can't use when there's a powercut or WiFi goes.			
	10	CEG	22/06/2023 15:03
When the internet breaks it's obviously useless and irritating,			
	11	CEG	22/06/2023 15:51
the internet connection must be reliable.			
	12	CEG	23/06/2023 11:05
The broadband connection here is intermittent and the Alexa kept dropping signal making a pain to use.			
	13	CEG	23/06/2023 11:34
can be a pain when there are network issues			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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14 CEG 23/06/2023 13:08

it's also affected by our poor internet in a rural area.

Codes\\Frustrations\\Not understanding voice commands\\Humorous Misunderstandings

Dataset

Files\\Qualitative_Only

No 0.0001 2

1 CEG 27/06/2023 14:18

Drawback is sometimes the device can misunderstand me (although this can be funny at times

2 CEG 27/06/2023 14:23

It can be funny when she misunderstands what yo are saying!

Codes\\Frustrations\\Not understanding voice commands\\Not Working as Desired

Dataset

Files\\Qualitative_Only

No 0.0007 11

1 CEG 27/06/2023 14:19

Drawback is sometimes the device can misunderstand me

2 CEG 27/06/2023 14:19

The drawbacks are when it doesn't quite understand commands and does random stuff.

3 CEG 27/06/2023 14:19

sometimes misunderstands what I have said;

4 CEG 27/06/2023 14:20

I sometimes find it doesn't understand a question

5 CEG 27/06/2023 14:22

They are unable to hear your voice over the sound of the TV.

Formatted Reports\\Coding Summary by Code Formatted Report

Page 69 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				6	CEG	27/06/2023 14:22
But often does not understand, gets it wrong or or wont program.						
				7	CEG	27/06/2023 14:22
Drawbacks.... it doesn't always understand instructions						

But often does not understand, gets it wrong or or wont program.

Drawbacks.... it doesn't always understand instructions

8	CEG	27/06/2023 14:22
Not being able to formulate sentences that are fully understood.		

9	CEG	27/06/2023 14:22
Sometimes doesn't understand what is being asked and has to be rephrased to get the right result.		

10	CEG	27/06/2023 14:23
Occasionally requests have to be repeated is a drawback		

11	CEG	27/06/2023 14:23
It doesn't understand what I'm trying to say and the answers are not relevant.		

Codes\\Frustrations\\Not understanding voice commands\\Not Working as Desired\\Feeling Ignored

Dataset

Files\\Qualitative_Only

No	0.0001	2
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1	CEG	27/06/2023 14:18
When it's not working well, it's utterly horrible. Sometimes it feels like it's ignoring me on purpose, even though I know it's not capable of making such choices about me and has no feelings towards me.		

2	CEG	28/06/2023 17:12
If it would do what I say it'd be useful but as it ignores me I don't use it.		

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Frustrations\\Not understanding voice commands\\Not Working as Desired\\Feelings of Anger

Dataset

Files\\Qualitative_Only

No	0.0008	13
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1	CEG	27/06/2023 14:17
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it can be frustrating when it doesn't seem to understand what I'm saying

2	CEG	27/06/2023 14:17
---	-----	------------------

annoying when it doesn't understand your command

3	CEG	27/06/2023 14:18	The benefits outweigh the drawbacks. EXCEPT WHEN IT DOESN'T UNDERSTAND OR HEAR ME. It goes through phases where it doesn't understand me properly, or doesn't hear me. I often enunciate extremely clearly during these phases and it makes no difference!!!
4	CEG	27/06/2023 14:19	And finally the voice recognition is irritatingly erratic.
5	CEG	27/06/2023 14:20	. Draw back is that you have to repeat yourself as it doesn't always respond/understand me and I get irritated by it.
6	CEG	27/06/2023 14:20	My husband shouted at it when it wasn't following his instructions
7	CEG	27/06/2023 14:21	Frustrating not understood
8	CEG	27/06/2023 14:21	Frustration at not being understood sometimes.
9	CEG	27/06/2023 14:21	often doesn't understand what I say, very annoying
10	CEG	27/06/2023 14:22	It's frustrating that it doesn't understand me
11	CEG	27/06/2023 14:22	The disadvantage is the minor annoyance of when it misunderstands.
12	CEG	27/06/2023 14:22	Frustrating when requests not understood.

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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13 CEG 27/06/2023 14:23

Drawbacks annoying when it doesn't understand you or thinks you've said something else.

Codes\\Frustrations\\Not understanding voice commands\\Voice Bias

Dataset

Files\\Qualitative_Only

No 0.0003 4

1 CEG 27/06/2023 14:18

It took Alexa along time to understand my Scottish accent and she doesn't understand my sons Cardie accent.

2 CEG 27/06/2023 14:18

Doesn't aknowledge Welsh, but does other languages!

3	CEG	27/06/2023 14:23
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my voice isn't readily understood but my male visitors are answered immediately.

4	CEG	27/06/2023 14:24
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Hoffwn petain deall a siarad Cymraeg. Dyma prif reswm nad ydwin or hoff ohono.

Codes\\Frustrations\\Responding when not requested

Dataset

Files\\Qualitative_Only

No	0.0001	4
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1	CEG	19/06/2023 14:02
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it would appear to be 'conscious' of what was going on in the household and did on occasion act on what it considered to be instructions

2	CEG	19/06/2023 17:53
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waking up randomly, answering unasked questions.

3	CEG	20/06/2023 17:39
---	-----	------------------

Sometimes the speakers come on randomly when not asked to and say something.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			4		CEG	23/06/2023 12:47
A major disadvantage is when it misinterprets a noise or word as the wake word						

Codes\\Frustrations\\Responding when not requested\\Annoying

Dataset

Files\\Qualitative_Only

No	0.0004	5				
			1		CEG	27/06/2023 14:39
Sometimes activates when it hears speech on the tv, which can be funny but also annoying.						
			2		CEG	27/06/2023 14:34
Also, I wish I could filter out the commands my parakeet gives the Alexa. He has a habit of telling the device to stop or start again.						
			3		CEG	27/06/2023 14:34
. I switch it off when not using it as it annoys me that it responds to things you say even if you haven't used it's name						
			4		CEG	27/06/2023 14:35
Can sometimes speak to me when I am on the phone						

5 CEG 27/06/2023 14:38

Sometimes on a business call alexa may think she's being asked something and turns on

Codes\\Frustrations\\Responding when not requested\Funny

Dataset

Files\\Qualitative_Only

No	0.0001	2	
			1 CEG 27/06/2023 14:33

Sometimes activates when it hears speech on the tv, which can be funny but also annoying.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			2		CEG	27/06/2023 14:38

Makes me laugh when she gives a response 'um I don't understand that' when I am talking to the dog.

Codes\\Frustrations\\Responding when not requested\\Invasive

Dataset

Files\\Qualitative_Only

No	0.0003	5
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1	CEG	27/06/2023 14:33
it does sometimes interject conversation unsolicited which begs the questions as to how much it does 'listen in' to your daily living		

2	CEG	27/06/2023 14:33
On one occasion it ordered an item from Amazon that was mentioned during a conversation that was being held in the room. Definitely an invasion of my privacy so the item was switched off and has not been used since.		

3	CEG	27/06/2023 14:35
Can sometimes speak to me when I am on the phone		

4	CEG	27/06/2023 14:38
I switch it off at source as I do not like it coming on when I have not summoned it		

5	CEG	27/06/2023 14:38
Sometimes on a business call alexa may think she's being asked something and turns on		

Codes\\Frustrations\\Responding when not requested\\Listening to Conversations

Dataset

Files\\Qualitative_Only

No	0.0004	4
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1	CEG	27/06/2023 14:32
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It picks up phrases in conversations and interoperates them as if I was asking the smart speaker for something.

2	CEG	27/06/2023 14:33
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it does sometimes interject conversation unsolicited which begs the questions as to how much it does 'listen in' to your daily living

Formatted Reports\\Coding Summary by Code Formatted Report

Page 74 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			3		CEG	27/06/2023 14:33
On one occasion it ordered an item from Amazon that was mentioned during a conversation that was being held in the room. Definitely an invasion of my privacy so the item was switched off and has not been used since.						
			4		CEG	27/06/2023 14:33
Drawbacks - it sometimes thinks you are speaking to it during a normal conversation with others (I have had my smart speaker start to play music during an online call because it thought someone in the meeting had asked it to play).						

Codes\\Frustrations\\Unnecessary

Dataset

Files\\Qualitative_Only

No		0.0003	2
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1	CEG	19/06/2023 13:57
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I havnt set mine up yet - I dont feel its a priority to do so as it's just extra technology

2	CEG	21/06/2023 11:08
---	-----	------------------

Have not got to grips with it as do not see a need for it.

Codes\\Frustrations\\Unnecessary\\Duplicates other devices

Dataset

Files\\Qualitative_Only

No		0.0016	12
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1 CEG 27/06/2023 12:02

I have more than one smart speaker and similar functionality is available via my mobile phone and android TV

2 CEG 27/06/2023 12:02

It's a handy device but it's nothing I couldn't look up on my phone.

3 CEG 27/06/2023 12:03

Don't see what I gain from a smart speaker that I cannot get from existing tech

4 CEG 27/06/2023 12:04

It is a glorified radio, if you do not have unlimited everything. I have prime TV, but I still have to pay for music , books

Formatted Reports\\Coding Summary by Code Formatted Report

Page 75 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			5	CEG	27/06/2023 13:37	
			See little benefit or added value given alternative technologies already available			
			6	CEG	27/06/2023 13:39	
			Just another form for listening to music/radio			
			7	CEG	27/06/2023 13:39	
			Just another techie device to access music and audiobooks. Not an important or necessary piece of equipment			
			8	CEG	27/06/2023 13:39	
			It's simply an 'add on' . So far haven't discovered anything it can do which can't be done another way.			

Very over rated glorified tadio	9	CEG	27/06/2023 13:41
I struggle to see any benefit of a smart speak over a smart phone/ tablet.	10	CEG	27/06/2023 13:41
I don't think it adds a lot to my life information <input type="checkbox"/> access from the smart speaker I could easily access other ways.	11	CEG	27/06/2023 13:42
I can access all its services from other outlets	12	CEG	27/06/2023 13:42

Codes\\Frustrations\\Unnecessary\\Duplicates other devices\\Prefers other devices

Dataset

Files\\Qualitative_Only

No	0.0012	15
	1	CEG 27/06/2023 12:03
I can see that some people might find it useful but I have other means of getting information that are more comprehensive and if I want to read up on something I like to be able to have a wider range of sources. I can see others might find it useful		
	2	CEG 27/06/2023 12:04
Drawback, I simply forget to use it and rely more on my laptop, desktop and smartphone and even the digital radio in preference to the smart speaker.		

3 CEG 27/06/2023 13:37

I was given it as a present but, given that I have two PCs and an ipad, I see no reason to use it.

Formatted Reports\\Coding Summary by Code Formatted Report

Page 76 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				4	CEG	27/06/2023 13:37
				. I prefer the smartphone. I		
				5	CEG	27/06/2023 13:37
				I can get the info I need from other sources, so don't use it much		
				6	CEG	27/06/2023 13:38
				I found that I didn't need it as I already have a laptop, smart phone, speakers etc which can do all the thinks the smart speaker can		
				7	CEG	27/06/2023 13:39
				I use an iPhone and DAB radio in other rooms.		
				8	CEG	27/06/2023 13:40
				I don't use it much as I tend to look up any information I want on our smart phone or laptop as I would rather see information in a written form or video than hearing it		
				9	CEG	27/06/2023 13:40
				. We have used it to make phone calls but both prefer to use either the mobile phone or landline.		
				10	CEG	27/06/2023 13:40

There is nothing a smart speaker can do that I can't do more simply elsewhere.

11	CEG	27/06/2023 13:40
. I don't bother asking it to find me information as I like to be able to go through the options in a browser.		
12	CEG	27/06/2023 13:41
smart speaker, mainly for music, I use my I phone or I pad to listen to radio or music		
13	CEG	27/06/2023 13:41
I see no benefit to me, everything I require can be done by other means. ie radio, apps or other smart controls.		
14	CEG	27/06/2023 13:41
, a radio is cheaper and easier to use.		
15	CEG	27/06/2023 13:42
I have rarely had a sensible answer to a question and so I use my smartphone		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
Codes\\Frustrations\\Unnecessary\\Gimmicky, a toy, novelty						
Dataset						
Files\\Qualitative_Only						
No		0.0008	7			
				1	CEG	27/06/2023 13:38
Bit of a gimmick						
				2	CEG	27/06/2023 13:38
For me, it's just a toy						
				3	CEG	27/06/2023 13:39
Apart from being a novelty, I can't think of any use for them.						
				4	CEG	27/06/2023 13:39
I find it a bit gimmicky, so doesn't really enhance my life or make things easier.						
				5	CEG	27/06/2023 13:39
FRankly, I thinkit is a bit of a gimmick.						
				6	CEG	27/06/2023 13:40
To be honest by treat it more as an entertainment device than anything serious. It doesn't actually do anything I couldn't do myself.						
				7	CEG	27/06/2023 13:43

There are lots of things that I could use a smart speaker for, but most of them are technological solutions to something I don't really need.

Codes\\Frustrations\\Unnecessary\\Wastes time, rather than being convenience

Dataset

Files\\Qualitative_Only

No	0.0001	2			
			1	CEG	27/06/2023 13:37

Waste of time.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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2	CEG	27/06/2023 13:37
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Can't think of any it's a complete waste of time and money.

Codes\\Who is perceived to benefit most\\Age\\Children

Dataset

Files\\Qualitative_Only

No		0.0019	24
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	1	CEG	20/07/2023 16:20
The children can use them easily, listening to audiobooks (which they love and aren't a substitute for an adult!) also turning lights on and heating			
	2	CEG	19/06/2023 11:23
My step daughter is type 1 diabetic and on an insulin pump and we use ours daily to check the carbs in the foods as were cooking, normally we get her to do it by us when we're cooking for example and because it speaks out loud we know whether she's done it correctly			
	3	CEG	20/07/2023 16:26
Helps the children fact check and access music and audio books			
	4	CEG	19/06/2023 11:48
it's my teenage daughter's			
	5	CEG	20/07/2023 16:52
entertainment for my young granddaughter-'Alexa			
	6	CEG	20/07/2023 16:54
The quirky functions are useful with children,			

7	CEG	20/07/2023 17:07
No benefit to myself but the grandchildren like to ask it to play music .		
8	CEG	19/06/2023 17:59
It allows my children to control the media, such as asking for music or TV shows.		
9	CEG	20/07/2023 17:10
My granddaughter can ask for her favourite songs to be played.		
10	CEG	20/07/2023 17:26
If my child asks me a question whilst I'm in the room with the smart speaker I nearly always say let's ask Google as I do not know.		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				11	CEG	20/06/2023 14:10
My son is autistic and she answers many of his questions						
				12	CEG	20/07/2023 17:58
Benefits- my 3 month old baby loves hearing music from it, its essential for nap time!						
				13	CEG	20/06/2023 15:46
The kids are also able to use it for this purpose						
				14	CEG	20/07/2023 17:59

My 3 yr old granddaughter now uses it when she visits.

15	CEG	21/06/2023 11:34	music system when we play with the children and they are learning how to request songs independently
16	CEG	21/06/2023 11:39	Keeps my grandchildren happy when they visit.
17	CEG	20/07/2023 17:59	Helps my 4 year old speak clearly.
18	CEG	22/06/2023 15:20	It helps with homework for the kids
19	CEG	22/06/2023 15:49	I got it for my son, but he hasn't set it up yet
20	CEG	20/07/2023 18:03	, my granddaughter set it p and showed me how to to use it, she would pick arguments ask for jokes, sing nursery rhymes, then ask for things in Welsh, she shouts at it when she comes in from school
21	CEG	23/06/2023 11:04	It can be fun using it with the grandchildren
22	CEG	20/07/2023 17:59	I bought an Alexa for my 8 year old - she loves it!
23	CEG	23/06/2023 11:35	Amuses the grandchildren

The children can ask questions to the smart speaker

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Who is perceived to benefit most\\Age\\Older Adults

Dataset

Files\\Qualitative_Only

No	0.0011	13
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1	CEG	20/07/2023 16:21
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I can understand if an older person is on their own it being their only companion.

2	CEG	19/06/2023 14:09
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I live in an annexe of my parents home, they have an Echo and it's been helpful for my Mum, she's been shielding and it helps her a lot

3	CEG	19/06/2023 14:09
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I can also see how it could have been useful for my very elderly great Aunt before her dementia progressed- if she could ask it the time or for the radio to be on etc.

4	CEG	20/07/2023 16:57
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eventually increased independence in later years

5	CEG	19/06/2023 17:46
. Will hopefully be more helpful as we age and potentially need more support.		
6	CEG	20/07/2023 17:54
I use it to keep my mind active as i am getting old. I am aiming on keeping upto date incase i need to use the smart devices because i can nolonger turn my light on etc.		
7	CEG	19/06/2023 17:56
I got an echo for my mother in law (87yrs) who has Alzheimer's and got her to use it as a radio and for asking definitions of words , she loves crosswords, news etc. I did not expect her to take to using it.		
8	CEG	20/07/2023 17:08
For the elderly they could be marvellous. Instant information.		
9	CEG	20/07/2023 17:27
Bought to help my blind elderly mother to be able to communicate more easily with me, and to get information, news		
10	CEG	20/06/2023 14:06
As we are older we use the speaker to remind us to take medication at a prescribed time and to remind us of important appointments		
11	CEG	21/06/2023 11:42
Company for older persons		
12	CEG	22/06/2023 15:07
It has the potential of being more useful as I get older.		

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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13 CEG 23/06/2023 11:33

My family bought me the smart speaker as a safety measure because I live on my own and they want me to have a means of contacting them if I have a fall or hurt myself and cannot reach my phone

Codes\\Who is perceived to benefit most\\Impairments\\Cognitive Impairment

Dataset

Files\\Qualitative_Only

No 0.0006 7

1 CEG 19/06/2023 13:58

But the biggest help for me personally is as a reminder for different things, due to 'brain fog' I often forget things, so I always set a reminder for different things I need to remember to do, including taking my medication.

2 CEG 20/07/2023 16:55

I can also see how it could have been useful for my very elderly great Aunt before her dementia progressed- if she could ask it the time or for the radio to be on etc.

3 CEG 20/07/2023 17:07

I have a poor memory thanks to MS.

4	CEG	20/07/2023 17:08
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I got an echo for my mother in law (87yrs) who has Alzheimer's and got her to use it as a radio and for asking definitions of words , she loves crosswords, news etc. I did not expect her to take to using it.

5	CEG	20/07/2023 17:09
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Ensuring that my wife (who has memory loss) can easily switch things off when she leaves the house/goes to bed with a simple phrase

6	CEG	20/06/2023 16:32
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Helps my husband manage dementia

7	CEG	23/06/2023 11:05
---	-----	------------------

As my memory is not so good it reminds me what I'm doing!

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Who is perceived to benefit most\\Impairments\Dyslexics

Dataset

Files\\Qualitative_Only

No	0.0005	4			
			1	CEG	20/06/2023 17:38
Being dislexic it's useful to do things by voice.					
			2	CEG	21/06/2023 11:11
Helps me spell					
			3	CEG	21/06/2023 11:12
I am very poor at spelling so I get it to spell for me.					
			4	CEG	21/06/2023 11:40
i find it great for help with spelling and info					

Codes\\Who is perceived to benefit most\\Impairments\Hearing loss

Dataset

Files\\Qualitative_Only

No0.00013

1CEG20/07/2023 17:09

Stream directly to my wife's hearing aids.

2CEG20/06/2023 14:07

to make announcements to my husband who is hard of hearing when I am in a different part of the house.

3CEG20/07/2023 18:02

Helps when needing to communicate with my daughter in another room as she has loss of hearing

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Who is perceived to benefit most\\Impairments\\Mobility issues

Dataset

Files\\Qualitative_Only

No0.003432

	1	CEG	20/07/2023 16:32
Can control all devices from one place. This is great as I have mobility issues.			
	2	CEG	20/07/2023 16:33
Ime a amputee so I use my Alexa for Turing on and off smart bulbs for cooking recipes time to ask questions ime not sure of answers music			
	3	CEG	20/07/2023 16:54
Should I become less able physically to perform certain tasks, the smart speaker and associated devices can assist. EG unlocking/locking a door; controlling lights; curtains; being able to shout out for help, viewing who is at the door.			
	4	CEG	20/07/2023 16:59
I imagine they can be invaluable for people with debilitating illnesses which prevent them from being as mobile as they'd like or for those who are chair or bed bound.			
	5	CEG	20/07/2023 17:39
, hands-free information which helps with my arthritis hands			
	6	CEG	19/06/2023 17:47
there have been occasions when I have been unable to move very well so it is easier to use alexa			
	7	CEG	20/07/2023 17:02
I can control my house via smart bulbs and smart plugs, and hope to install Alexa-friendly central heating controls this year. This helps me with my physical disability as I don't have to get up to switch things on/off around my house.			
	8	CEG	19/06/2023 17:56
. I am aiming on keeping upto date incase i need to use the smart devices because i can nolonger turn my light on etc.			
	9	CEG	19/06/2023 17:58
Avoids having to reach for switches			
	10	CEG	19/06/2023 18:10

ease of use for those who find a keyboard difficult

11	CEG	20/07/2023 17:27
----	-----	------------------

As a Traumatic Brain Injury Survivor it is invaluable in the case of mobility issues. Everything at your command.

12	CEG	20/07/2023 17:28
----	-----	------------------

, it would be great for people with various physical impairments who may struggle with other non voice activated devices.

13	CEG	20/06/2023 14:03
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Carrying a cup of tea and using a walking stick,I can put the lights on with my voice.

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Page 84 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				14	CEG	20/07/2023 17:42
				Handy if you are disable and have difficulty moving.		
				15	CEG	20/06/2023 16:12
				Useful for those with impaired mobility		
				16	CEG	20/06/2023 16:29
				Useful for disable people since you can use voice commands		
				17	CEG	20/06/2023 17:12
				help those with mobility etc issues		

18	CEG	20/06/2023 17:37	Benifit of switching lights and socks on by voice so I don't have to get up (I have a bad knee).
19	CEG	21/06/2023 11:16	turn on light on the plus side if you have problems moving that is a good thing
20	CEG	21/06/2023 11:19	To turn on kettles, lights etc which saves me getting up as I have mobility issues.
21	CEG	21/06/2023 11:20	Just improves my leisure time as I grow older and become less mobile
22	CEG	21/06/2023 11:31	One of the biggest benefits for me is being able to control lights, electronic devices such as TVs etc through the smart speaker without getting up. As a chornic pain patient it is often hard for me to move around and having the smart speaker mitigates this.
23	CEG	21/06/2023 14:30	It was particularly useful when I was assisting my Niece who had a brain tumour that caused her to fall quite often.
24	CEG	22/06/2023 14:57	Can see it's value as an item of assistive technology for those with disabilities .
25	CEG	22/06/2023 15:07	It can be used to summon help should I have called fall. That's why it was bought for me.
26	CEG	22/06/2023 15:08	It helps me because of my mobility issues.
27	CEG	22/06/2023 15:34	If I became disabled I would purchase other necessities that I could control via my speaker

28 CEG 22/06/2023 15:36

I'm a amputee I had my left leg amputated 3 years ago I use my Alexa to turn on lights it helps me answer my front door because it's connected to my ring doorbell

Formatted Reports\\Coding Summary by Code Formatted Report

Page 85 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			29	CEG	22/06/2023 15:45	
			I use it for use I got the nest heating control when away from the house aswell as in the house.I also use it for turning lights on and off which frees one hand to carry something as I use a walking stick in the other hand.			
			30	CEG	23/06/2023 10:41	
			I am disabled- I can ask the speaker to connect to my other speaker downstairs to ask my partner for help			
			31	CEG	23/06/2023 11:09	
			I think they're absolutely amazing for those who need extra help with things when they're used to their full potential. For example turning heating on and off if they're less mobile			
			32	CEG	23/06/2023 11:33	
			My family bought me the smart speaker as a safety measure because I live on my own and they want me to have a means of contacting them if I have a fall or hurt myself and cannot reach my phone			

Codes\\Who is perceived to benefit most\\Impairments\\Visual-Impairment

Dataset

Files\\Qualitative_Only

No		0.0006	6		
			1	CEG	20/07/2023 16:20
	. I'm also partially sighted due to a neurological condition and I struggle particularly with low lighting so we've programmed all our lamps and lights to be linked to google home so I can turn all the lights on without struggling to find the light switch.				
			2	CEG	19/06/2023 11:42
	voice command in bed especially a sleep-timer on audio books and knowing what time it is because you cannot read a clock when not wearing glasses!				
			3	CEG	20/07/2023 17:27
	Bought to help my blind elderly mother to be able to communicate more easily with me, and to get information, news				
			4	CEG	20/06/2023 16:28
	when my husband is doing DIY. He is totally blind and so it is easy to use to find sport results etc				
			5	CEG	23/06/2023 10:49
	We bought one for my mother in law who has bad eyesight. She uses it to find out the time				
			6	CEG	23/06/2023 11:04
	Good for the those with sight problems,				

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
Codes\\Who is perceived to benefit most\\Lonely people						
Dataset						
Files\\Qualitative_Only						
No		0.0014	14			
				1	CEG	20/07/2023 16:21
I can understand if an older person is on their own it being their only companion.						
				2	CEG	20/07/2023 16:55
they have an Echo and it's been helpful for my Mum, she's been shielding and it helps her a lot						
				3	CEG	20/07/2023 17:48
Feeling of not being alone for some people.						
				4	CEG	20/07/2023 17:48
Also if you live alone I can see that they might provide some company day to day.						
				5	CEG	20/07/2023 17:49
I live alone and listening to music of my choice or the radio helps overcome the ' silence'						
				6	CEG	20/07/2023 17:47
I feel less lonely						
				7	CEG	20/07/2023 17:47

Company for lonely people.

	8	CEG	20/07/2023 17:49
Useful if alone for company			
	9	CEG	20/07/2023 17:50
They help to keep me company as I live alone and are alone most of the time.			
	10	CEG	22/06/2023 15:07
Helps with loneliness			
	11	CEG	22/06/2023 15:34
People living in their own feel less isolated			
	12	CEG	23/06/2023 10:35
Company if alone			
	13	CEG	23/06/2023 10:38
If you live alone, maybe there are some benefits			

Formatted Reports\\Coding Summary by Code Formatted Report

Page 87 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				14	CEG	20/07/2023 17:52
	Quiz or crossword answers when home alone					

Codes\\Who is perceived to benefit most\\Low Digital Skills

Dataset

Files\\Qualitative_Only

No	0.0005	5			
			1	CEG	19/06/2023 11:27
benefits if unable to use other devices.					
			2	CEG	20/06/2023 11:33
Those who left school before Computers were used or a subject in the curriculum struggle with Technology and should have access to education and learning in places like Community Hubs.					
			3	CEG	20/07/2023 17:41
benefits -easy to use for people without digital skills if they have help to set it up -					
			4	CEG	20/07/2023 17:51
Getting information about things. Like a search engine. Playing music.					
			5	CEG	23/06/2023 13:11
Voice control enables those with difficulties using keyboard and mouse to interact with interweb.					

Appendix J: Initial Factor Analysis of All Terms Relating to Social Benefit.

Table 33. *Descriptions of the quantitative variables relating to social benefits.*

Variable	Label	Scoring	Mean	Std. Dev
Contact	The smart speaker helps me keep in touch with my friends and family.	1 = strongly disagree 2= disagree 3 = neither agree or disagree 4 = agree 5 = strongly agree	1.854	1.102
Enjoyment	I enjoy talking and interacting with the smart speaker.		3.329	1.181
Alone	I tend to use the smart speaker more when I'm alone.		2.813	1.327
Company	Even though I know the smart speaker is not real, it provides some company.		1.926	1.183
Calls	Do you use the following function: Making phone and video calls?	0 = no 1 = yes	0.133	0.339
Companion	Do you use the following function: A virtual companion (e.g. someone to say hello to in the morning).		0.075	0.263

Following this, the factor analysis was rerun with only 5 predictor variables. To support conducting a factor analysis, the correlation matrix, anti-image correlations, sampling adequacy, and sphericity were assessed. Four of the 10 correlations were greater 0.3, all of the anti-image correlations were greater than 0.5 (see Table 34. *Correlation Matrix conducted between the variables related to social benefit, reflecting the themes identified in RQ2 of Study 1, as a precursor to factor analysis.*), and the determinant was 0.478, all indicating potential factorability of the matrix.

Table 34. *Correlation Matrix conducted between the variables related to social benefit, reflecting the themes identified in RQ2 of Study 1, as a precursor to factor analysis.*

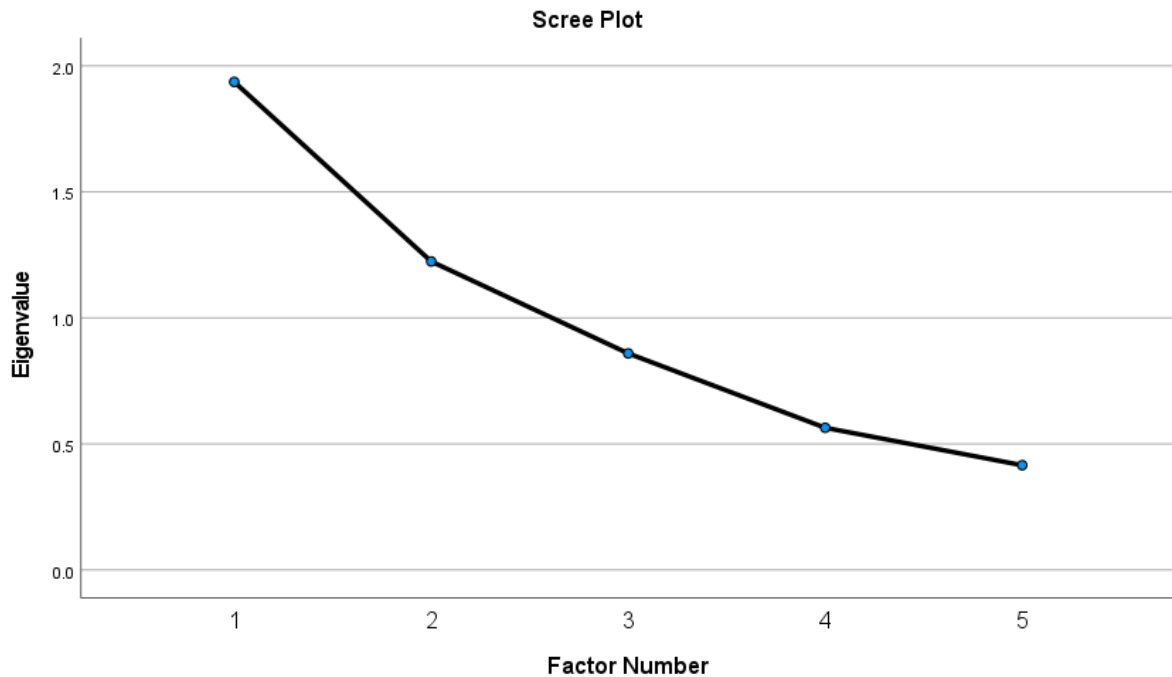
Correlations	Contact	Alone	Company	Calls	Companion
Contact	0.556				
Alone	0.099	0.606			
Company	0.314	0.330	0.575		
Calls	0.531	0.013	0.120	0.526	
Companion	0.178	0.128	0.402	0.125	0.630

Note: lower triangle reflects the correlation matrix, principal correlations (in bold) reflect the anti-image correlations. Determinant = 0.478

Additionally, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy suggested that the items included were adequate and the factorability of the matrix was acceptable (0.569) (Kaiser, 1974). This is further supported by Bartlett's Test of Sphericity (Bartlett, 1951), showing that the correlation matrix differs significantly from an identity matrix and therefore the associations between items are meaningful, $\chi(10) = 928.088, p < 0.001$. Collectively these findings, along with the results of the correlation and anti-image correlation suggests that a factor analysis would be appropriate.

Following this confirmation, a series of investigations to estimate the most appropriate number of factors for the data were conducted. Using principal component analysis, the matrix was found to have only two factors with an Eigenvalue of >1 (1.937 and 1.224) (Kaiser, 1960). These were able to predict 30.4% and 15.5% of the variance, respectively. This was further supported by the scree plot (see Figure 17), which visually suggests that there are two major factors and three minor factors (Cattell, 1966). Therefore, these both suggest that two factors should be extracted.

Figure 17. Scree plot showing the Eigenvalues of proposed components arising from principal component analysis.



However, as the Kaiser criterion of Eigenvalues > 1 is prone to overfactoring, parallel analysis was conducted to validate the suggestion of two factors from the matrix (see Table 35) (Horn, 1965). The 95th percentile simulated Eigenvalues were only smaller than the raw data Eigenvalues for two principal components, further supporting the notion of two factors from the matrix.

Table 35. Parallel analysis and the Eigenvalues from the simulated correlations in comparison to the Eigenvalues of the raw data.

Principal Components	Raw Data Eigenvalue	95 th Percentile Simulated Eigenvalue	Supported for Factorisation
1	1.936	1.078	✓
2	1.224	1.034	✓
3	0.859	0.999	✗
4	0.564	0.965	✗
5	0.416	0.924	✗

Note: Raw data Eigenvalues should be greater than the 95th percentile simulated Eigenvalue to support the principal components inclusion in factorisation.

Based on examining the above Eigenvalues, Scree plot, and the outcome of the parallel analysis, principal axis factoring with two factors was conducted. Oblique rotation, specifically promax rotation, was chosen as the factors are theoretically correlated and so it is unnecessary to constrain the factors to their original orthogonality. This found both factors to have a rotated sum of squared loadings of > 1 , validating them as factors (see Table 36). Additionally, these factors were able to cumulatively explain 45.836% of the variance in the items.

Table 36. *Summary of the two factors produced through principal axis factoring.*

Factor	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	Percentage of Variance	Cumulative Percentage	Total
1	1.519	30.374	30.374	1.317
2	0.773	15.462	45.836	1.210

As only loadings > 0.3 are meaningful to factors (Taherdoost et al., 2014), values below this are not considered. The principal axis analysis produced two factors which seem to reflect offering intrinsic social benefit and facilitating human-human connections, as suggested by the content analysis (see Table 37). Factor 1 related strongly to the smart speaker offering company, with moderate loadings related to preferring to use the device when alone and viewing it as a companion, reflecting the offering intrinsic social value. Conversely, factor 2 has strong loadings from items relating to using the device to contact friends and family, and using it for calls, reflecting the facilitative social value. Finally, the correlation between these factors is 0.319, suggesting there is a moderate level of correlation between using the smart speaker for offering intrinsic and facilitative social purposes, and possibly reflecting a unified social benefit.

Table 37. *Pattern Matrix for the Factors Created from Social Benefit-Related Items.*

Items	Factors	
	1 – Offering Intrinsic Social Value	2 – Facilitating Human-Human Connection
Company	0.944	
Companion	0.396	
Alone	0.361	
Calls		0.722
Contact		0.694

Of the two types of social benefit identified from the content analysis and supported by the factor analysis, the concept of offering intrinsic social benefit was more commonly reported, more specific to smart speakers, and is theoretically more psychologically relevant. For this reason, only offering intrinsic social benefit will be explored further.

5.6.3.2. Predicting Offering Intrinsic Social Benefit

Based on the content analysis in Study 1, some personal traits or characteristics were suggested to predict benefitting from smart speakers offering intrinsic social value and forming a social connection with the smart speaker. To explore this notion further, a multiple regression was conducted with the group traits and factors identified in Study 1 as the independent variables/predictors and a composite factor score of offering intrinsic benefit as the dependent variable.

Firstly, the assumptions of a multiple regression were investigated to ensure this analysis was appropriate. Linearity was acceptable, as assessed by partial regression plots and plotting the studentized residuals against the predicted values. Further, a Durbin-Watson statistic (Draper & Smith, 1998) of 2.036 suggested independence of residuals. Homoscedasticity was assessed by visual inspection of a plot of the unstandardised predicted values against the studentized residuals. Further, a preliminary test indicated some collinearity, so a decision was made to remove WGSS Sum, LSNS Sum, and DJGLS Sum from the model. Without these variables, there was no evidence of multicollinearity, with all VIF being < 1. There were four outliers identified as having studentised deleted residuals ± 3 standard deviations or leverage values

greater than 0.5. These cases were removed from the model. Finally, the assumption of normality was met, as shown by visual inspection of the P-P plot.

The multiple regression model was able to statistically significantly predict the composite score of Offering Intrinsic Benefit, $F(10, 1104) = 5.058, p < .001$. However, no variables made a significant, unique contribution to the model at the Bonferroni corrected level of $p < 0.005$ and the model overall was only able to account for 4.4% of the variance in Offering Intrinsic Benefit (see Table 38). For these reasons, the model is not considered a valuable predictor of Offering Intrinsic Benefit, and the group traits and characteristics identified from the content analysis cannot effectively predict offering intrinsic social benefit as a differential experience.

Table 38. Multiple regression results for offering intrinsic social benefit.

Offering Intrinsic Social Benefit	<i>B</i>	95% Confidence Intervals for <i>B</i>		Standard Error <i>B</i>	β	<i>p</i>	<i>R</i> ²	Adjusted <i>R</i> ²
		Lower	Upper					
Model							0.044	0.035
Constant	1.550	0.722	2.378	0.422				
Age	-0.034	-0.106	0.039	0.037	-0.029	0.361		
WGSS Vision	0.056	-0.149	0.261	0.104	0.017	0.592		
WGSS Hearing	0.180	-0.027	0.388	0.106	0.055	0.088		
WGSS Mobility	0.172	0.035	0.309	0.070	0.080	0.014		
WGSS Cognitive	0.040	-0.150	0.229	0.097	0.014	0.681		
DJGLS Emotional	0.134	0.039	0.229	0.049	0.092	0.006		
DJGLS Social	0.050	-0.033	0.133	0.042	0.044	0.236		
LSNS Family	-0.004	-0.020	0.012	0.008	-0.019	0.582		
LSNS Friends	0.014	0.000	0.027	0.007	0.065	0.056		
EDSF Sum	0.038	-0.003	0.079	0.021	0.057	0.067		

*Note: the model used the “enter” method in SPSS Statistics; B = unstandardised regression coefficient; β = standardised coefficient; *R*² = coefficient of determination; * indicates significance at the Bonferroni corrected level of $p < 0.005$*

5.6.4. RQ3: Limitations

The most frequent limitation identified by the content analysis in Study 1 relates to privacy concerns. Respondents report concerns about always listening microphones, having their personal data gathered and used to build a profile of them, having this data distributed to third parties, feeling that their privacy is being invaded, and not feeling as if they understand the data policies. As with Section 5.6.3. RQ2: Benefits, quantitative items were developed reflecting these subthemes and topics identified through the content analysis of Study 1. These items are detailed in Table 39. The responses to these items were used in a factor analysis to validate the suggestion from Study 1 that they be grouped together as privacy concerns. Again, this follows the best practice for

content analysis which suggests findings should be validated using an alternative method (Krippendorff, 2004).

Table 39. *Descriptions of the quantitative variables relating to privacy concerns.*

Variable	Label	Scoring	Mean	Std. Dev
Invasion	I don't use the smart speaker because it is an invasion of my privacy,	1 = strongly disagree 2= disagree 3 = neither agree or disagree 4 = agree 5 = strongly agree	4.283	1.065
Recording	I am worried that the smart speaker is recording everything I say, even if I haven't said the wake word.		3.715	1.315
Third Parties	I think that the technology companies that make the smart speakers are passing my voice recordings or data on to third parties		2.720	1.185
Knowledge	I would like to know more about how the technology companies that make the smart speakers handle my data and respect my privacy.		2.454	1.163
Personal Data	It worries me that the smart speaker can learn facts about my life, such as my likes and dislikes, when I am typically at home, what food I eat, where I order taxis to, etc.		3.134	1.264

Following the same process as for social benefit, a factor analysis was run using these 5 predictor variables. First, to ensure that a factor analysis would be appropriate, the correlation matrix, anti-image correlations, sampling adequacy, and sphericity were assessed. Six of the 10 correlations were greater 0.3, all of the anti-image correlations were greater than 0.5 (see Table 40), and the determinant was 0.272, all indicating potential factorability of the matrix.

Table 40. *Correlation Matrix conducted between the variables hypothesised to related to privacy, reflecting the themes identified in RQ3 of Study 1, as a precursor to factor analysis.*

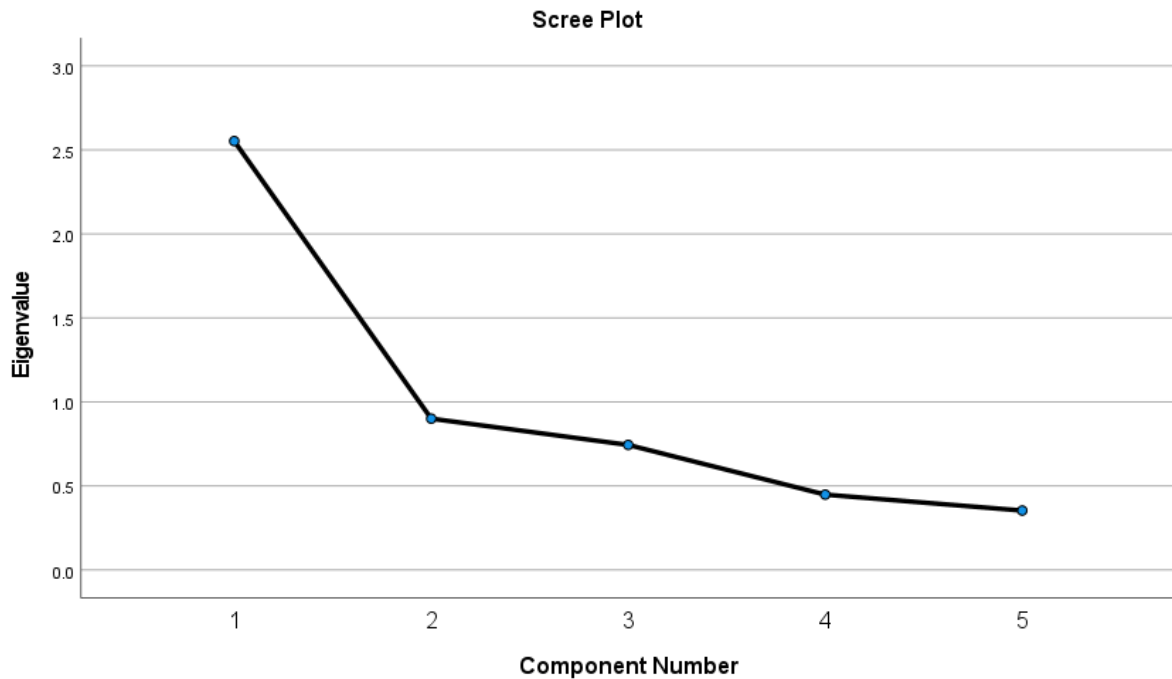
Correlations	Invasion	Recording	Third Parties	Knowledge	Personal Data
Invasion	0.798				
Recording	0.522	0.744			
Third Parties	0.224	-0.372	0.813		
Knowledge	0.238	0.358	0.130	0.737	
Personal Data	0.467	0.610	0.296	0.513	0.726

Note: lower triangle reflects the correlation matrix, principal correlations (in bold) reflect the anti-image correlations. Determinant = 0.272

Additionally, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy suggested that the items included were adequate and the factorability of the matrix was acceptable (0.753) (Kaiser, 1974). This is further supported by Bartlett's Test of Sphericity (Bartlett, 1951), showing that the correlation matrix differs significantly from an identity matrix and therefore the associations between items are meaningful, $\chi(10) = 1630.387$, $p < 0.001$. Collectively these findings, along with the results of the correlation and anti-image correlation suggests that a factor analysis would be appropriate.

Following this confirmation, a series of investigations to estimate the most appropriate number of factors for the data were conducted. Using principal component analysis, the matrix was found to have only 1 component with an Eigenvalue of >1 (2.553) (Kaiser, 1960), which was able to account for 51.054% of the variance. This was further supported by the scree plot (see Figure 18), which clearly shows an elbow at two components, suggesting that there is 1 major component and four minor components (Cattell, 1966). Therefore, these both suggest that two components should be extracted.

Figure 18. Scree plot showing the Eigenvalues of proposed components arising from principal component analysis.



However, as the Kaiser criterion of Eigenvalues > 1 is prone to overfactoring, parallel analysis was conducted to validate the suggestion of one factor from the matrix (see Table 41) (Horn, 1965). The 95th percentile simulated Eigenvalues were only smaller than the raw data Eigenvalues for one principal component, further supporting the notion that one factor be extracted from the matrix.

Table 41. Parallel analysis and the Eigenvalues from the simulated correlations in comparison to the Eigenvalues of the raw data.

Principal Components	Raw Data Eigenvalue	95 th Percentile Simulated Eigenvalue	Supported for Factorisation
1	2.553	1.117	✓
2	0.901	1.061	✗
3	0.744	1.020	✗
4	0.449	0.987	✗
5	0.354	0.951	✗

Note: Raw data Eigenvalues should be greater than the 95th percentile simulated Eigenvalue to support that principal components inclusion in factorisation.

Based on the above Eigenvalues, Scree plot, and the outcome of the parallel analysis, principal axis factoring using promax rotation with one factor was conducted. This found one factor to have a rotated sum of squared loadings of 2.052, validating it as a factor. Additionally, this factor was able to explain 41.031% of the variance in the items. All items had a non-trivial loading of greater than 0.3 on the one factor produced (see Table 42). This suggests that all of the items identified reflect a single, unified concept of privacy concerns as predicted. It was thought that the comparative strength of loadings may reflect the frequency with which the items were identified in the content analysis, fearing the collection of personal data being the most common concern and the smart speaker developing a profile of the user being the least common. However, this was not the case. This suggests that the frequency of individual privacy concerns (identified through the content analysis in Study 1) may not translate directly to the strength of privacy concerns identified through this factor analysis; issues such as worrying the smart speaker is building a profile of user are less common than other issues but seem to be strongly associated with the overall privacy concern factor. The strength of privacy concerns does not seem to equate to the frequency of privacy concerns.

Table 42. *Factor matrix for the Factors Created from Privacy Related Items.*

Items	Factor Loadings
Personal Data	0.819
Recording	0.799
Invasion	0.589
Knowledge	0.497
Third Parties	0.387

5.7. Study 2 Discussion

5.7.1. Overview

This study aimed to offer validity to some of the key findings from Study 1 by conducting follow-up analyses to replicate the construction of themes from the content analysis. This was done through a series of factor analyses and regressions. Section 5.6.2. shows that smart speaker ownership is able to be partially predicted by some of the traits identified by Study 1. Further, Section 5.6.3. RQ2: Benefits found that the social

subthemes and topics identified through the content analysis do factorise to two latent factors which seem to represent human-human connections and offering intrinsic social benefit, as suggested in Study 1. However, the quantitative construction of offering intrinsic social value from this section was not able to be predicted by the characteristics identified in Study 1. Finally, subthemes suggested as being related to privacy concerns in Study 1 were validated as being relevant to a latent factor of Privacy concerns. The findings from these quantitative analyses are explored and evaluated below.

5.7.2. Evaluation of the Findings

5.7.2.1. RQ1: Group Traits and Differential Experience

As an attempt to validate the findings for RQ1, several traits identified by the content analysis were found to be successfully predictive of smart speaker ownership: mobility issues, emotional loneliness, isolation from family members, and digital skills. Mobility issues were found to be positively predictive of smart speaker ownership, with people with greater mobility issues being more likely to own a smart speaker. This predictive power expands upon findings from the content analysis which find that people with physical disabilities view their smart speaker as a valuable piece of assistive technology. Similarly, previous research suggests that people with mobility issues and physical disabilities benefit from owning a smart speaker because of the easy, hands-free control of their environment that it offers (Morris & Thompson, 2020; Pradhan et al., 2018).

Further, emotional loneliness was found to be positive predictive of owning a smart speaker. This could support the finding from the content analysis that people who are lonely feel they are more likely to own a smart speaker and/or differentially experience their interactions with it. There is some related evidence from previous research to support this interpretation. For example, feeling lonely was a strong predictor of using a smart speaker (Choi & Drumwright, 2021). However, there is an absence of previous research examining traits/characteristics that are likely to predict smart speaker ownership with the appropriate controls groups needed to support these claims, making it difficult currently to validate this interpretation. Alternatively, this finding

could be interpreted as contradicting a further finding from the content analysis; people report feeling less lonely as a result of interactions with the smart speaker. Therefore, the finding that people who are more emotionally lonely are more likely to own a smart speaker would contradict this suggestion of using smart speakers for company to remedy loneliness. This interpretation would be in contradiction to findings from previous research suggesting that interactions with a smart speaker are effective for reducing feelings of loneliness (Jones et al., 2021; O'Brien et al., 2022).

High ratings of isolation from family were found to predict not owning a smart speaker. This finding, again, could have conflicting interpretations. One suggestion would be that this quantitative finding contradicts the qualitative suggestion that people who are more isolated experience a greater social benefit from their smart speaker, implying that those who are more isolated are more driven to buy a smart speaker. Conversely, it could be interpreted that this quantitative finding supports the findings from the content analysis; qualitative findings suggest that the smart speaker can be valuable for facilitating human-human connections, thereby reducing smart speaker owners' isolation. Further, it is noteworthy that only family isolation, not isolation from friends, is negatively predictive of smart speaker ownership. This may relate to the body of work emphasising the importance of supportive familial relations on promoting the adoption of new technologies and the offering support through the skill acquisition period that is highly predictive of success (Chang et al., 2015; Chopik, 2016; Fischl et al., 2017; Wang et al., 2011). Therefore, preexisting familial closeness may underpin the adoption of smart speakers and explain the differences in familial isolation as a predictor of smart speaker ownership seen in this study.

The final factor found to be significantly predictive of smart speaker ownership was digital skills; individuals with higher digital skills were more likely to own a smart speaker. As with the above findings, this could be interpreted in multiple ways. One interpretation would be that this supports the findings from the content analysis as owning a smart speaker provides an accessible way to complete digital tasks that users with low digital skills may otherwise struggle with. In this way, individuals with low digital skills are being supported through accessible technology to overcome the barriers to engagement. Conversely, this finding could be interpreted to contradict the

content analysis; people who are highly digitally skilled and engaged may be more drawn to purchasing a smart speaker as they find it easier to use or enjoy keeping up to date with modern technology. As this was a cross-sectional analysis, neither of these suggested interpretations can be validated. Future research may wish to examine the effect of accessible, off-the shelf technology (such as smart speakers) on users' digital skills over a longitudinal period to provide greater clarity.

Overall, this model was able to significantly predict smart speaker ownership based on variables reflecting the themes identified in the content analysis from Study 1. However, many of these factors did not significantly regress onto the variable of smart speaker ownership and the model was only able to explain a low proportion of the variance (13%). Particularly, as only a small proportion of the variance can be accounted for, this implies that relevant variables are missing from the model or that the pre-existing measures selected were not the most appropriate choice to reflect the extracted themes. Overall, this suggests that the model is not as comprehensive as intended and highlights the discrepancy between the qualitative findings from the content analysis of Study 1 and the quantitative findings from Study 2. This discrepancy may be due to differences in the subjectivity of smart speaker owners perception versus the comparative objectivity of the quantitative data, or due to differences in the measured variable; participant responses could place more emphasis on the differential benefit they experienced as a result of their traits/characteristics, rather than the quantitative analysis which is focussed on using these factors to predict ownership.

5.7.2.2. RQ2: Benefits

The key finding within RQ2 was that the proposed division of social benefit into offering intrinsic social value and facilitating human-human connections was supported by the factor analysis. Taking a data driven approach, two factors were shown to exist amongst items reflecting the subthemes from Study 1: One clearly related to company and receiving social benefit directly from the smart speaker, and the other reflecting use of the smart speaker to facilitate contact with friends and family. Additionally, a moderate, positive correlation was seen between these two factors, suggesting that those

who benefit from smart speakers facilitating human-human connections benefit are also likely to experience an offered intrinsic social benefit, and vice versa.

The offered intrinsic benefit was the subject of further analysis as it was felt to have more psychosocial relevance. Through a multiple regression to predict offered intrinsic benefit, emotional loneliness was found to be the only significant predictor. This is in keeping with the findings from Study 1, which found that a large subset of people who experienced offered intrinsic social benefit felt they did so because they were lonely. Additionally, previous research suggests that loneliness could be associated with developing companionship or experiencing comfort from a smart speaker. Older adults who reported high baseline loneliness went on to view their smart speaker as a companion (Duque et al., 2021). Similarly, experimentally introducing smart speakers to lonely individuals resulted in a reduction in their loneliness ratings, suggesting that they are deriving a level of social benefit that causes this reduction (Jones et al., 2021). This also reflects a proposal by the ASAP pathway in Chapter 4, which suggests that loneliness reflects an increased sociality motivation, and this promotes anthropomorphism, perception of a social agent, and finally the development of a parasocial relationship with a smart speaker. While this finding cannot suggest that smart speakers offering intrinsic social benefit is unique to those who are emotionally lonely, the magnitude of this benefit does seem to be greater for this group.

Surprisingly, age was not found to predict offering intrinsic social benefit. This is noteworthy as older age arose from the content analysis in Study 1 as a factor that users felt underpinned their companionship from their smart speaker. Further, there is previous research to suggest that smart speakers are particularly valuable for lonely older adults (Kim & Choudhury, 2021). However, as discussed in the introduction, there is evidence to show that the benefits related to older adults in the literature are experienced by users of all ages (Brause & Blank, 2023; Cho et al., 2019; McLean & Osei-Frimpong, 2019), which may underpin this null finding within the study.

5.7.2.3. RQ3: Limitations

A factor analysis was conducted to validate the findings of Study 1 in relation to RQ3: Limitations. This factor analysis involved items that quantitatively reflected the topics identified through the content analysis. These were proposed to be related to a latent variable of privacy concerns to reflect the thematic construction presented in Study 1. The finding that all 5 items converged on a single factor suggests that the categorisation from Study 1 was valid; fears about personal data being gathered and used, fear of being recorded, feeling one's privacy is being invaded, feeling knowledge about privacy policies are limited, and fear of data being shared to third parties all relate to a common, underlying factor. It was proposed that this factor reflects privacy concerns as an umbrella term, covering multiple, distinct concerns and fears. This supports the construction of privacy concerns as a top-level theme comprised of multiple subthemes from the content analysis of Study 1.

However, much research effort has been spent constructing comprehensive measures of privacy concerns that can be applied to users generally, and the finding from this factor analysis should not be interpreted as contradicting this. For example, the Information Privacy Instrument developed by Smith et al. (1996) both overlaps with the findings of this chapter and proposed additional factors. This measure targets both concerns of large amounts of personal data being collected and the fear of unauthorised secondary use by external parties. These themes reflect the fear of data being gathered and the fear of data being shared to third parties identified by the content analysis in this chapter. However, this measure includes additional privacy issues that were not identified in this chapter, such as concerns that data-related errors are not suitably protected against and decision making for the user will be undesirably automated. This could be due to differences in scope. Smith et al. (1996) aimed to develop a comprehensive measure of privacy concerns relating to organisational practices broadly. In contrast, this chapter reports on the privacy concerns that are salient to smart speaker users. Upon searching, no overview of privacy concerns specific to smart speakers seems to exist. It may be this difference in scope of privacy concern mapping that underpins the differences seen when constructed privacy. By the nature of the study's design (asking an open-ended question and allowing users to

identify what is important to them), it is impossible to claim these are all the factors that may relate to smart speakers' privacy concerns. It is assumed that the privacy concerns raised are the most important ones to smart speaker users, as they freely chose to report them without prompting. Further research may wish to conduct more in-depth semi-structured qualitative research with smart speaker owners to probe about other potentials based on adjacent literature if the aim is to comprehensively map all possible privacy concerns relating to smart speakers. Follow-up, quantitative research could then measure the comparative strength or salience of these concerns.

The finding that the construction of privacy concerns relating to smart speaker use from Study 1 can be validated has implications for broader research. Much previous research uses with smart speakers considers privacy concerns. For example, Cha et al. (2021) and Han and Yang (2018) created models to predict smart speaker adoption and continuance intention respectively, whereby privacy concerns were the only negatively weighted item. These studies added value to the field by showing the impact that privacy concerns can have on adoption and continuance intention and this conceptualisation of privacy concerns is supported by the findings from the second factor analysis of this chapter. However, they lack the nuance that could be achieved by considering the distinct topics that exist under the umbrella of privacy concerns. By stratifying the latent variable of privacy concerns into the distinct topics that it represents, as shown by the factor analysis in Study 2, future research may better identify which aspects of privacy concern are influential on different outcomes.

5.7.3. Summary

Study 2 aimed to validate and offer support to some of the key findings from the content analysis in Study 1 through follow-up analyses. This aim was achieved, primarily, by the findings from factor analyses and regressions. Firstly, four of the traits identified through the content analysis as predicting group ownership or a differential experience were supported by the study, with increased mobility issues, emotional loneliness, connectedness with family, and digital skills positively predicting owning a smart speaker. Secondly, a factor analysis supported the distinction of smart speakers' social

benefit into two factors of offering intrinsic social benefit and facilitating human-human connections. Thirdly, and similarly, a further factor analysis showed that the subthemes from the content analysis all converged on a unified factor of privacy concerns, supporting this thematic construction.

5.8. General Discussion

5.8.1. Overview

Overall, this chapter aimed to fill the gaps in the literature and redress possible imbalances in the emphasis placed on certain groups and outcomes from the previous literature. To do this, Study 1 conducted a large-scale content analysis of over 1200 smart speaker owners' responses to an open-ended question. This allowed the participants to identify factors that they felt were most important to them and their experiences, without the constraints of researchers' presumptions. A deductive approach was initially taken to extract themes from participants responses that aligned with the framework of the three research questions: group traits/characteristics users feel are relevant to their ownership and experience (RQ1), benefits experienced (RQ2), and limitations (RQ3). Within these 3, top-level categories, inductive coding was then carried out to produce the final thematic construction and an indication of their relative frequencies from the corpus. In relation to RQ1, novel group characteristics were identified by users as influencing their smart speaker experience, such as having dyslexia or a hearing impairment. Additionally, support is offered to previous research by replicating findings that older age, being lonely, or having a visual or mobility impairment may relate positively to engaging with a smart speaker. For RQ2, social benefit was identified as the most common theme, and it was suggested that this is constructed of smart speakers' ability to offer intrinsic social value and facilitate human-human connections. Finally, in relation to RQ3, privacy concerns were found to be the most common limitations of owning a smart speaker by far. However, these concerns were not often reported to relate to enhanced privacy behaviour, highlighting a disconnect between cognition and behaviour.

Following these findings, Study 2 aimed to validate and support some of the most psychologically relevant findings from the content analysis. It did this by offering an alternative, quantitative approach to the research questions to replicate their findings (Krippendorff, 2004). In doing so, Study 2 offered support to key findings from all three research questions. Some of the factors from the content analysis were able to positively predict owning a smart speaker (mobility impairments, emotional loneliness and digital skills), whereas isolation from one's family negatively predicted owning a smart speaker, in relation to RQ1. Further, factor analyses based on the topics identified from the content analysis supported the proposed thematic construction of social benefit (RQ2) and privacy concerns (RQ3).

5.8.2. Examination of the Research

The ASAP pathway, presented in Chapter 4, proposed a mechanism through which parasocial relationships with smart speakers may form, the psychosocial outcomes associated with this formation, and factors about the user that may facilitate this process. This model was proposed based on findings from a scoping review of users' experiences with smart speakers. Two key issues were identified from this research that went on to inform this chapter. Firstly, there was a potential for substantial gaps to exist in the previous literature. Secondly, there was a general lack of control or comparison groups in previous research to support the suggestion that certain groups would show quantitative or qualitative differences in experiences with their smart speaker. From these issues, there was a concern that a confirmation bias cycle was occurring, whereby previously researched groups and outcomes would serve as a foundation for replication in future research, limiting the opportunities to investigate novel and untested groups and/or outcomes. As an attempt to overcome these issues, this study provided a large scale, participant-driven analysis. This offered an indication of the frequency and saliency of different groups and outcomes. This was done in the hopes of redressing possible imbalances in the field's current emphasis on certain groups or outcomes. In addition to this, Study 1 was able to identify novel moderators, benefits, and barriers. This suggests that there are some aspects salient to smart speaker users that have not been identified by previous research.

The most common benefit identified from Study 1, and further explored in Study 2, was the social benefit provided by smart speakers. A novel conceptualisation was proposed, dividing overall social benefit into offering intrinsic social value, reflecting smart speakers' ability to act as a social presence and provide company, and facilitating human-human connections, reflecting using smart speakers as an easier means of contacting friends and family. This suggestion, arising from the content analysis, was supported by the factor analysis, further validating this construction of social benefit. This suggests that future research should be aware of the duality of social benefit offered by smart speakers and seek to stratify the overall concept of social benefit into its two factors where appropriate for the research question.

A further novel finding was that smart speakers can trigger a fear of becoming "lazy" or developing an increasingly sedentary lifestyle, potentially leading to a fear of negative health consequences and arising from the assistive and home-automatising features of smart speakers is seldom identified in the research. There is very little research (at the time of writing) that explores or focusses on this negative self-perception and health fear arising from smart speaker use, suggesting that there is a gap in the literature. Research into how this acts a barrier or influences continuance intention may be pertinent for groups that are particularly health conscious and may be a relevant future consideration.

5.8.3. Limitations and Future Research

A limitation of Study 1 within this chapter was the variation in response quality from the participants, with 401 smart speaker owners choosing not to respond to the open-ended question at all. Brief answers are not necessarily an issue for content analysis, as it was possible to identify the participants' most salient opinions from monolexical or very brief responses. However, the opportunity for other types of qualitative analyses were more limited. Therefore, while this study provides a useful overview of the relative frequency of relevant traits, benefits, and limitations to using a smart speaker, a deeper understanding of why these were felt to be particularly salient was not able to be consistently gathered from the qualitative responses. This issue could have been

overcome by more detailed questions, providing structure and further prompts to encourage participants to write more detailed answers. However, this option was considered and disregarded during the conceptualisation of the study as precedence was given to unguided, participant-led responses.

Similarly, a further limitation is that content analyses and open-ended questioning may have led to an underrepresentation of frequencies reported. For example, quantitative data shows that 599 older adults owned a smart speaker and completed the survey, however, only 13 reported their age as being relevant to their smart speaker use. If this group was directly asked about the potential for their age to impact their smart speaker use, or benefits arising from their use, more may have reported as such. However, again the focus of this study was to use open-ended questions to gather a holistic map of factors salient to users. As such, this would have been heavily compromised by attempting to gain potentially more representative numbers for each finding reported.

A final limitation is that some of the findings may be region-specific. The respondents were primarily located across South Wales and are likely to have regional accents that reflect this. This may lead to more issues with speech recognition being experienced, as smart speakers are well-documented to experience issues with regional accents. Therefore, the frequency of speech-recognition issues and perceived accent bias reported in this study may not reflect the extent of these issues amongst populations from other regions. Additionally, many of the participants are likely to live in rural locations, which may lead to an over-reporting of issues linked to internet and power outages compared to other regions. As such, these findings should be interpreted with caution if seeking to generalise beyond this sample/region.

5.8.4. Conclusion

This chapter conducted a content analysis on responses to an open-ended survey question about smart speaker users' experiences and opinions. This was done to overcome potential publishing bias, or the "file drawer problem", that was highlighted by the scoping review in Chapter 4. As predicted, novel traits not previously explored in the literature were identified that users felt influenced their smart speaker experience, such

as being dyslexic or having hearing issues. Additionally, novel psychologically relevant outcomes from interacting with a smart speaker were identified, such as fear of becoming lazy or physically dependent on the smart speaker. Psychosocially, the social benefit of smart speakers was suggested to arise through two distinct mechanisms based on users' responses; the ability to facilitate communication with friends and relatives, and the ability to act as a social agent and offer a level of social connection. This construction was supported by a factor analysis of items relating to the topics identified in the content analysis. The findings from this chapter, in conjunction with those from Chapter 4, speak to the importance of accessible design for facilitating engagement with technology. Additionally, psychosocial benefits that can arise from anthropomorphic technology, such as smart speakers, are emphasised.

Chapter 6. General Discussion

6.1. Summary

We live in an increasingly digital world; it is becoming progressively unfeasible to disentangle one's life from the requirement to be online. As society becomes more and more digitised, this brings both requirements to be digitally engaged and the assumption of ubiquitous access (Sparks, 2013). However, the persistent existence of the digital divide is contrary to both this requirement and assumption. As efforts to narrow the digital divide continue, much of the research focusses on the broader, associated factors. For example, the digital divide can both reflect and influence social potential. The presence of social connections can promote the initial uptake of novel, digital technologies and guide new users through the essential skills acquisition phase, overall supporting digital inclusion (Chang et al., 2015; Chopik, 2016; Fischl et al., 2017; Wang et al., 2011). Conversely, digital exclusion can compound isolation and loneliness by barring individuals from virtually contacting their social connections or developing new ones (Genoe et al., 2018; Hill et al., 2015). This highlights the mutually compounding effect of digital exclusion and isolation, exemplifying fears around digital inequalities compounding broader inequalities and leading to the development of a "digital underclass" (Helsper & Reisdorf, 2017).

There are two primary perspectives on the root of the issue that maintains the digital divide that are presented in this thesis. Firstly, there is the perspective that an individual's digital skills are the primary determinant of their digital inclusion. Therefore, by examining an individual's level of digital skills, predictions could be made about their psychosocial outcomes. This reflects Section 1 of this thesis. Secondly, an alternative perspective views the complex and inaccessible design of digital technology as the cause of the digital divide. To reflect this perspective, Section 2 of this thesis focusses on smart speakers as an example of accessible, mainstream technology. Overall, this thesis approaches the implications of digital engagement from these two perspectives, with a primary focus on the psychosocial outcomes associated with digital skills or engaging with accessible technology.

6.1.1. Chapter 2: The Mediated Effect of Digital Skills on Psychosocial Outcomes: A Relationship with Age, Gender, and Education

Chapter 2 presented the successful development of a structural equation model that linked digital skills to wellbeing via the mediators of isolation and loneliness based on data from a large, general population sample. This model achieved all of the required quality and validity checks to ensure it sufficiently fit the data. The overall indirect pathway was shown to be statistically significant, while the direct pathway from digital skills to wellbeing was not. This indicates that the mediator of isolation and loneliness are beneficial to the model and explain a substantial proportion of the covariance between digital skills and wellbeing.

Following the development of this model, it was compared amongst subgroups from the overall sample to investigate potential differences driven by demographic factors (i.e., age, gender, and education). When only one demographic variable was considered, significant differences were found for age, but not for gender or education. When dividing the sample into “younger” and “older” with age 65 as the cut-off, the model was found to be a significantly stronger predictor of wellbeing for the younger group than the older group. However, it is worth noting that the model still fit well and was a significant predictor of wellbeing for all groups examined, indicating the model is robust and replicable.

When examining the intersection of two of these demographic variables together, further differences were found. The most substantial differences were found at the intersection of age and gender. Firstly, the indirect pathway from digital skills to wellbeing, considering both mediators, was the strongest for the younger men in the sample. This group was significantly stronger than the three other groups in the comparison. Secondly, the pathway between digital skills and isolation was significantly stronger for the younger men than the other three groups. Finally, the pathway between isolation and loneliness was significantly weaker, although still significant as predicted, for the older men in the sample than all other groups. These findings, in addition to the slight differences seen for the other intersectional comparisons supported the hypothesis that demographic differences would drive differences in the model.

6.1.2. Chapter 3: Replicating the Mediated Effect of Digital Skills on Psychosocial Outcomes: A Digitally Excluded Sample of Older Adults in Social Housing

Chapter 3 expanded upon the findings from Chapter 2 and overcome its main limitation. To do this, Chapter 3 aimed to replicate the model developed in Chapter 2 with data from digitally excluded older adults living in social housing. This group is highly at risk of digital exclusion and loneliness, making them common targets for digital interventions in previous literature. Additionally, by targeting this population, Chapter 3 was able to overcome the sampling bias introduced by the online survey from Chapter 2 that had excluded individuals with low digital skills.

Chapter 3 was able to successfully replicate the model from Chapter 2 with appropriate quality and validity to be considered a good fit for the data. Upon examining the model further, it was found that each of the pathways behaved as expected and closely replicated the pathways found in Chapter 2. However, the overall indirect pathway, from digital skills to wellbeing via the mediators of isolation and loneliness, was found to be non-significant. This indicates that, for this sample, isolation and loneliness were unable to significantly mediate the relationship between digital skills and wellbeing. Interestingly, two smaller mediation pathways within the model were significant: isolation was able to significantly mediate the relationship between digital skills and loneliness, and loneliness was able to significantly mediate the relationship between isolation and wellbeing.

6.1.3. Section 1 Summary

Chapter 2 and Chapter 3 comprise Section 1 of this thesis. This section focussed on the power of digital skills in predicting psychosocial outcomes of interest, specifically loneliness and wellbeing. Both samples were able to replicate the model in terms of fit, quality, and the overall pattern of the pathways, evidencing its robustness and replicability. These chapters draw upon the body of literature that focusses on the role of digital skills in the digital divide. They also place a focus on the socio-facilitative capabilities of technology by examining how psychosocial outcomes can be predicted by digital skills.

6.1.4. Chapter 4: “Alexa, what do you mean to me?”: A scoping review and model of parasocial relationship formation with smart speakers

Chapter 4 focussed on smart speakers as an example of socially capable, accessible, and off-the-shelf technology and reviewed what is currently known about how and why people form social relationships with these devices. This scoping review focussed on the outcomes arising from socially interacting with a smart speaker and the user attributes that have been reported in association with social perception of smart speakers. Social value was a key outcome described, with many papers discussing how smart speakers offer a sense of comfort and are able to reduce users’ feelings of loneliness. User attributes that have been previously investigated in relation to social perception and interactions with smart speakers included living alone and being isolated and being an older adult.

From the literature reviewed, a pathway through which parasocial relationships may form with smart speakers was proposed; the Anthropomorphic-Social Agent – Parasocial (ASAP) pathway. This pathway suggests that the deliberately anthropomorphic design of smart speakers underpins the formation of parasocial relationships. Being designed to have a name, synthesise a human-like voice, have features that imply gender, etc. triggers anthropomorphisation of smart speakers; the perception that the device possesses some human-like qualities. This anthropomorphic perception triggers the activation of related social schemata, leading to the belief that the smart speaker holds deeper human-like capabilities. In this way, smart speakers can become perceived as social actors. When technology is perceived as a social actor, our mental scripts for social interactions are activated leading to the mindless application of social heuristics and the presentation of socially normative behaviour. As the smart speaker is an artificial entity, these can be considered as parasocial interactions. The likelihood of engaging in these parasocial interactions seems to vary considerably between users, with previous literature suggesting that personal factors such as sociality motivation, age, and personality may be influential. Through repeated parasocial interactions, this pathway proposes that parasocial relationships may form. From the literature reviewed, there is considerable diversity in the ways people describe

their parasocial relationships with their smart speakers; some consider them assistants and display minimal warmth towards them, whereas others describe perceptions of a romantic or sexual relationship. It is unclear what causes these differences, and it is suggested that this may be one fruitful avenue for future research. Finally, this model suggests that developing a parasocial relationship creates a positive feedback mechanism, as it increases the frequency of interaction which can strengthen the perception of a relationship and lead to positive outcomes: reduced loneliness, emotional support, reduced ratings of depression, increased trust of and satisfaction with the smart speaker, etc.

Additional factors were hypothesised to be relevant to the ASAP Pathway. For example, additional user features such as attachment style, gender, and curiosity were hypothesised to influence propensity towards parasocial interactions, based on research from other sources of parasocial relationships. Similarly, additional outcomes from developing a parasocial relationship, such as increased loyalty towards and expectations of the smart speaker, were proposed based on broader research. However, these cannot be validated in relation to smart speakers as these factors are not yet examined in any available research. To develop this model further, future research may wish to investigate these factors in relation to parasocial interactions or relationships with smart speakers.

6.1.5. Chapter 5: Smart Speaker Users: Who and Why? An Open-Ended, Data-Driven Content Analysis and Validation of Users Experiences

A substantial issue with Chapter 4, as with any review, was the reliance on the quality of published literature. Two main issues with the methods and findings of published research were identified while conducting the scoping review. Firstly, many assumptions are made in the literature when considering who may differentially experience smart speakers, and the benefits and limitations they may experience. There is a lack of control groups to support the suggestion that the groups studied, or outcomes documented are unique. In fact, examples are presented in the introduction of Chapter 5 that contradict some of the most common assumptions. The second issue relates to the narrow scope of interest in the literature. This arises from the narrow

scope of measures used and lack of qualitative data gathered. From this, it is likely that groups of potential importance or salient outcomes are missed from the literature because there has been no opportunity for participants to freely express themselves. Both of these issues may contribute to a compounding effect, whereby the same groups and measures are replicated because there is evidence available that a significant outcome is found (despite a lack of evidence that these findings are unique). This may lead to further issues with the field, whereby the importance of some groups or outcomes are overrepresented in the literature while other findings of significance are absent.

To combat these issues and provide a more holistic overview of the psychological implications of smart speakers, Chapter 5 conducted a large scale and broad-scoped investigation into the personal traits and outcomes associated with smart speaker use. Over 1200 responses to an open-ended question were inductively coded within a top-level analytical framework of group characteristics, benefits, and limitations. Initial findings from the content analysis suggested many group characteristics that may be relevant to owning a smart speaker or having a differential experience with it. However, a binomial regression found that only mobility issues, emotional loneliness and digital skills were positively associated with owning a smart speaker. Further findings included the two ways that smart speakers can offer social benefit, in terms of facilitating social connections with other people and acting as a social agent and companion in users' homes. This was replicated by a factor analysis in Study 2. Additionally, privacy concerns were the most common fear expressed by users, with the key issues raised from the content analysis converging on a single factor of privacy, validating this thematic construction.

6.1.6. Section 2 Summary

Chapters 4 and 5 comprise the second section of this thesis with an alternative approach to Section 1, Section 2 reflects the body of literature that focusses on the design of technology when considering the digital divide. Through engaging with accessible technology, such as smart speakers, digital engagement and the associated

psychosocial benefits can be achieved. Additionally, this section moves away from the purely socio-facilitative capabilities of technology to reflect modern trends of designing and treating technology as a social entity in its own right (Voit et al., 2020).

6.2. Evaluation of the Main Findings

The main findings of this thesis reflect the two most prevalent modern perspectives towards the cause of the digital divide: differences in digital skills and differences in the accessibility of technology. By examining the psychosocial implications of digital skills and accessible technology, the capacity for technology to facilitate human-human interactions and increasingly the potential of technology as an agent and companion is highlighted. The two perspectives on the digital divide are driven by a policy's focus on reducing the compounding effects of digital exclusion on other social factors, aiming to avoid a 'digital underclass' (European Commission, 2010; Helsper & Reisdorf, 2017). Early interventions to minimise the digital divide were focussed on access to mainstream technology as the driving issue. For example, the UK government invested £1 billion to extend superfast internet connection as part of their digital inclusion strategy (Maude, 2014). Further, charitable donations were made of dozens of computers to schools in Africa (James, 2008). However, such interventions were not found to be perfect solutions to the issue as access to technology alone is insufficient (James, 2008). Further research showed that digital skills are the strongest factor associated with digital inclusion and the strongest predictor for the efficacy of digital interventions (Dogruel et al., 2015; Friemel, 2016; James, 2008; Martins Van Jaarsveld, 2020). For these reasons, this thesis focusses on digital skills as the primary barrier to digital inclusion. The two perspectives relating to the barrier of digital skills are reflected in this thesis; Section 1 examines the importance of digital skills in influencing psychosocial outcomes, whereas Section 2 explores smart speakers as an example of accessible speech-based technology by examining the psychosocial outcomes that can arise when the barrier of digital skills are reduced. These perspectives also reflect two common types of interventions commonly seen in the literature and in practice, and this thesis aims to offer a theoretical background and greater understanding to underpin them.

Further, there is an increasing focus in research and practice on the role of technology as a social aid. This seems to be in response to the rising rates of loneliness amongst the general population, with rates of loneliness currently higher than during the first part of the COVID-19 pandemic (Campaign to End Loneliness, 2023), and the epidemic this represents among certain at risk populations (e.g. older adults in social care (Gardiner et al., 2020)). Living in an increasingly digital age, we often turn to technology as a solution for loneliness; the World Health Organisation actively recommends digital communication to tackle the loneliness crisis (World Health Organisation, 2022). Therefore, this thesis also focusses on the social potential of technology, finding two prominent routes to social benefit; facilitating social contact with other humans and, increasingly, acting as a social agent and target itself (Voit et al., 2020).

6.2.1. Digital Skills

Section 1 of this thesis focusses on the influence of digital skills on psychosocial outcomes, reflecting the perspective that individuals' digital skills are the primary cause of the digital divide. It does not aim to examine how digital skills can be changed through interventions and the subsequent impact on a variety of factors, as there is already substantial evidence in this area. Rather, Section 1 focusses on how an individual's existing and unaltered level of digital skills relates to their psychosocial outcomes. It does this to understand how outcomes such as loneliness and wellbeing are related to an individual's digital skills at any level or time. Additionally, it examines how these relations may differ for different groups of interest to reflect the literature focussing on demographic differences in rates of digital exclusion. Chapter 2 primarily finds that the relationship between digital skills and wellbeing can be mediated by isolation and loneliness. Additionally, it finds that this model is stronger for younger adults (under age 65) than older adults, but finds no substantial differences based on gender or education. Further, some intersectional differences were found which are discussed at length in Chapter 2. With these findings, this thesis offers theoretical support for the use of interventions to improve digital skills as it shows that high digital skills are associated with lower levels of isolation and loneliness, and higher levels of wellbeing. While it does support targeting older adults, as the mediated relationship

between digital skills and wellbeing was significant for this group, it suggests that digitally excluded younger adults may be a better target as the relationship between digital skills and psychosocial outcomes are stronger for this group. In these ways, Chapter 2 of this thesis offers a theoretical contribution to the existing body of literature that targets digital skills to reduce the digital divide, particularly to improve psychosocial outcomes.

The finding that higher digital skills are associated with more positive psychosocial outcomes compliments the literature focussing on digital upskilling. This school of thought views the digital skills of the individual, or lack thereof, as the main barrier and therefore the target for interventions. This perspective is adopted by much previous research, such as Miwa et al. (2017) who found that a semester-long digital training course run by the Open University in Japan was successful in increasing over 1000 users perceived digital skills, which were then largely retained and applied beyond the training sessions. Similarly, Castilla et al. (Castilla et al., 2018) showed that only eight sessions of digital training was sufficient to significantly increase older adults digital skills, while White et al. (2002) found a significant increase after only nine hours of training across a 2 week period which translated to proficient and independent use of the internet beyond the training sessions by the older adults. As summarised by Ibarra et al. (2020) in a systematic review, digital training for older adults can be highly effective in enhancing their digital skills and providing them with the confidence to apply the skills they've learned beyond the confines of the training environment. Amongst a different population, a London university found that an essential digital skills course to support students to engage with online learning was effective at increasing digital skills (Raji et al., 2023). This training was particularly beneficial for BAME and international students, who felt that the training course resulted in substantial behavioural changes and improvements in their digital skills. While this study did not have data relating to students' academic achievements over time, there is evidence from other interventions to suggest that digital skills training for university students can enhance their attainment (Youssef et al., 2022).

As the skills of the digitally excluded individual is the focus of these interventions, identifying appropriate candidates for digital upskilling programmes is essential. One

way to approach this is to consider which groups are likely to be digitally excluded and therefore have the most to gain in terms of digital inclusion from an upskilling programme (Gutierrez et al., 2017; Isaacson et al., 2019). In a study comparing the predictive power of different factors on the likelihood of digital exclusion, a short experience with formal education was found to be the strongest factor, followed by older age (Helsper & Reisdorf, 2017). Both of these findings are consistently replicated. A positive correlation was found between engagement with the internet and length of formal education, specifically with each additional year of formal education conveying an additional 33% chance increase in being digitally engaged (Czaja et al., 2006; Yu et al., 2016). Similarly, older age is consistently found to be a risk factor for digital exclusion across a range of studies (Aston, 2023; Prescott, 2021; Yu et al., 2016). Gender is also commonly researched in relation to the digital divide, however it's effect lacks consensus. It seems that women may be more likely to be digitally engaged than men, and a distinct difference in the type of digital activities engaged in is consistently found (Ihm & Hsieh, 2015; Yu et al., 2016). Such research offers suggestions for groups that may be reasonable to target through digital upskilling interventions as they are at increased risk of digital exclusion and, therefore, stand the most to gain.

6.2.2. Accessible technology

The second perspective towards the digital divide focusses not on the deficits of the user, but the design of the technology they aim to interact with as the main barrier. Rather than training users to overcome the barrier to digital inclusion, this strand of research focuses on technology that is designed to be more accessible and therefore have a lower barrier to inclusion, making it easier for more users to engage with it. To reflect this, Section 2 of this thesis focusses on the implication of smart speakers as an accessibly designed, mainstream technology that has previously been used in the research to support digitally excluded individuals. Smart speakers were chosen as they are increasingly ubiquitous, widely available, affordable (with low purchase costs and no required on-going costs), and are already popular as a research target. Chapter 4 speaks to the importance of accessible design for smart speaker users; many studies reviewed discuss the low digital skills of the participants as being relevant to benefitting

from smart speakers. In Chapter 5, low digital skills are explicitly identified by smart speaker owners; users report that they appreciate how easy to navigate their smart speaker is compared with other forms of technology. This accessibility can lead to additional benefits of increased confidence with technology and broader self-efficacy. In this way, Section 2 of this thesis supports smart speakers being classed as an accessible form of technology that supports engagement from users with low digital skills who may otherwise face digital exclusion.

More broadly in the literature, accessible technology has been shown to be effective for supporting digital engagement and enhancing psychosocial outcomes. As far back as the 1990's, there was already an awareness that the complexity of some technology was acting as a barrier to engagement. Czaja et al. (1993) reported on the introduction of a simplified desktop computer to support digital communication and engagement amongst a sample of women over age 50. The computer was limited to basic text-editing, email, and access to news, weather, movie reviews, and health information. Overwhelmingly, the participants liked using the system, found they could use it easily, and suggested that it was able to accessibly support social interaction and mental stimulation. As technology has progressed in terms of complexity and variety, so too have the considerations for accessibility. For example, the increasing capabilities of smartphones and the social reliance on them has driven an increasing number of interventions to simplify smartphones for digitally excluded users. Yadav (2017) reported on the use of SimpleTech, an android application to provide a simplified calling interface for compatible smartphones, as an accessible addition to mainstream smartphones. Through this application, users are able to contact one of three preset contacts or the local emergency services with one tap. 80% of the sample reported that the intervention made making calls easier and they felt more confident using their smartphone as a result. Similarly, Austad et al. (2017) investigated a simplified interface alongside the Ezi-Pad as a simplified external keyboard to support navigation of standard smartphones. Again, the majority of the sample found it easy to use and engaged with it throughout the 2-month study period. Beyond smartphones, similar interventions have been used with tablets to support user engagement. Neves et al. (2019) designed a novel, accessible table for older adults with low digital skills. The

simplified interface and commands required were found to be successful in creating a highly usable device that was valued as a means to communicate with distant family members. Similarly, Gutierrez et al. (2017) designed a different tablet with a simplified interface that relied on limited touch and voice inputs to send messages or make calls. This device was also found to be well accepted and effective for reducing isolation by promoting communication. This evidence presented is just a sample of the wealth of research investigating the role of accessible technology in supporting individuals with low digital skills by lowering the barrier to engagement.

Within Chapter 5 and the broader research, some design specificities are suggested that provide smart speakers with their enhanced accessibility for digitally excluded users. Particularly, the voice driven interface is consistently highly valued, preferred over touchscreens or mice/keyboards, as it allows users to draw on existing conversation skills to fluidly control their smart speaker. Speech controls also promote social perception of smart speakers for the same reasons; speech control allows users to draw on previous experience and schemas relating to speech to be able to intuitively control the device, while conversing with the device triggers broader social schema and promotes social perception. This reflects the underpinnings of one way in which smart speakers offer social benefit. The two-fold social benefit of technology, with smart speakers as an example, is discussed in more detail below.

6.2.3. Digital Technology and Loneliness

As discussed, the potential for technology to bring us closer together and even, increasingly, to act as a friend and companion grows ever more important in light of rising loneliness levels (Campaign to End Loneliness, 2023; Voit et al., 2020; World Health Organisation, 2022). The social potential of technology is contains two factors, and this division is represented in this thesis: Technology is able to facilitate and ease communication between humans, but it is also increasingly able to be a social entity for us to intentionally interact directly with.

6.2.3.1. Facilitative Social Connections

The more traditional way in which technology can provide social benefit and reduce loneliness is through facilitating communication and connections between humans. Technology offers a means to strengthen existing social connections with friends and family, thereby increasing receipt of social support and decreasing feelings of loneliness (European Commission, 2010; Genoe et al., 2018; Nimrod, 2011; Şar et al., 2012). Additionally, the internet can be effectively used to seek out new individuals and communities that share similar interests to facilitate the formation of meaningful social relationships (European Commission, 2010; Genoe et al., 2018; Nimrod, 2011; Sum, Mathews, Pourghasem, et al., 2008). E-communication is generally felt to be more cost-effective, convenient, and quicker than other means of communication (Genoe et al., 2018). Additionally, it is particularly useful for dispersed social connections (Genoe et al., 2018). Collectively, using technology in this way (to maintain and develop new social connections) can increase individuals' social capital, effectively reducing feelings of loneliness (Genoe et al., 2018; Sum, Mathews, Pourghasem, et al., 2008). This facilitative capacity of technology can be particularly valuable for certain groups. For example, digitally engaged older adults are able to use technology to compensate for the loss of mobility and other lifestyle changes that are can be associated with aging and may lead to isolation (Hill et al., 2015). This allows older adults to maintain their social roles and purpose.

Findings from Chapter 5 of this thesis echo these sentiments. The content analysis of over 1000 smart speaker owners open-ended comments found that smart speakers were a valued tool for facilitating communication, particularly amongst existing social connections, such as family. Smart speakers were felt to be an accessible and easy way to initiate or receive communication and were preferred over other technology capable of making/receiving calls. Additionally, the family of smart speaker users appreciated knowing their relatives were consistently contactable. Smart speakers were also felt to be more cost-effective than other methods of contacting family, which was particularly valuable when family lived internationally. In this way, smart speakers reflect the findings from many other forms of technology; they are a valuable, and accessible,

means of facilitating social communication between people to support social integration and potentially reduce isolation/loneliness.

6.2.3.2. Offering Intrinsic Social Value

The other way in which smart speakers can provide social benefit is by acting as a social agent. Section 2 of this thesis focusses heavily on this offered intrinsic social benefit. Chapter 4 reports on formation and outcomes of parasocial relationships with smart speakers, arising from their perceived sociality. This Chapter proposes a process of parasocial relationship formation with smart speakers in the ASAP (anthropomorphic – social actor – parasocial) pathway. It suggests that anthropomorphic design features, such as producing a synthesised, feminine voice are key to triggering related social schemas, leading to perception of the smart speaker as a social agent. This then encourages users to interact parasocially. The ability to vocally converse with the smart speaker, an interaction that is largely exclusive to human-human interactions, seems to act as a powerful social trigger and underpins the development of parasocial relationships. From the literature reviewed in this chapter, the relationships can be classified by their intimacy ranging from assistant to lover. The three most parasocial of these (friend, companion, lover) clearly portray the smart speaker as a social agent and the target of parasocial interactions and reflect the social benefit that is received. The social value that is conferred by smart speakers manifests as reduced feelings of loneliness and receipt of emotional support and comfort. These findings are echoed by Chapter 5, adding robustness. Chapter 5 finds the social value of smart speakers to be the most commonly reported benefit by far. This social benefit, as mentioned, stratifies into facilitating and offering social connection both from the content analysis and a confirmatory factor analysis. Users reported that the companionship offered by their smart speaker was able to partially compensate for the perceived lack of social interactions with other humans. From these findings in Section 2, we see that smart speakers are sometimes viewed as social agents that users find comfort and companionship in interacting with directly.

These interactions are explored in detail in the scoping review of Chapter 4. In summary, smart speakers have been found to act as a social presence that can be effective in

reducing loneliness. Repeated interactions with a smart speaker can lead to increased feelings of familiarity and comfort with users perceiving it as a companion, which drives their reduced feelings of loneliness (Kim & Choudhury, 2021; Yan et al., 2024).

Parasocial interactions and relationships with smart speakers have both been associated with decreased depression and increased receipt of comfort and emotional support (Kim & Choudhury, 2021; O'Brien et al., 2022; S. Park & Kim, 2022).

6.3. Theoretical Implications

The findings of this thesis can be interpreted through many lenses. Broader, relevant social theories are introduced in Chapter 1 and some interpretations of the findings are made through these lenses in Chapter 2-5. However, as this field often lacks a theoretical perspective/drive, it is worth examining how the overarching findings of this thesis relate to pertinent social theories.

The Social Productive Functions Theory was put forth by Ormel et al. (1999) and proposes that humans two ultimate goals are to optimise social and physical wellbeing. These two goals are achieved through instrumental aims of stimulation, comfort, affection, behavioural confirmation, and social status. The focus of this thesis relates to the goal of social wellbeing and the underpinning aims of affection, behavioural confirmation, and social status. This theory posits that we are driven to develop and maintain a sufficient quantity and quality of social bonds as a means of fulfilling these instrumental aims and, ultimately, our goal of social wellbeing (Baumeister et al., 1995; Ormel et al., 1999). The findings of this thesis can be interpreted through the lens of the Social Productive Functions Theory. Chapter 2 finds a pathway through which digital skills influences wellbeing via the mediators of isolation and loneliness. It may be suggested that this mediated pathway supports the Social Productive Functions theory. High digital skills are associated with low levels of isolation; digital skills may be a way for users to socially engage to prevent isolation, as is suggested by previous research (e.g. Ballantyne et al., 2010; European Commission, 2010; Shapira et al., 2007). In this way, users may be using their digital skills to engage socially and fulfil the instrumental aims of affection, behavioural confirmation, and social status through the connections

maintained and developed online. This manifests as low levels of loneliness and may lead to the increased levels of wellbeing represented by the mediated pathway of the structural equation model in Chapter 1. Additionally, Chapter 4 proposes the ASAP pathway which involves sociality motivation, in the form of isolation and loneliness, increasing the likelihood of parasocially interacting with a smart speaker. Isolation and loneliness may be associated with a deficit of the three instrumental aims within the Social Productive Functions Theory, caused by a social deficit, and the resultant drive to rectify this through any means necessary to improve one's state of wellbeing, including parasocial interactions with a smart speaker.

An alternative interpretation of the findings from this thesis would be through the lens of Social Capital Theory. This theory was proposed by Bourdieu (1985) and suggests that social networks and connections influence wellbeing through the provision of emotional and practical support. This is empirically supported by research showing that high quality social connections are associated with positive mental and physical health and wellbeing outcomes (Berkman & Glass, 2000; Coleman, 1990). The findings from the structural equation models of Section 1 may be interpreted in relation to this theory. Digital skills association with low isolation suggests that people who are more digitally capable and engaged are likely to have more frequent social interactions. Further, those who interact more frequently are also likely to have deeper and higher quality social interactions and connections, represented by associated low levels of loneliness. Social Capital Theory would then suggest that people who have high quality social connections are likely to receive provision of emotional and practical support through these connections, and this may explain the very strong path coefficient found between loneliness and wellbeing seen in all iterations of the structural equation model in both Chapter 2 and 3.

Further, the theme of technology providing two types of social benefit runs throughout this thesis can be related to Social Capital Theory. The socio-facilitative potential of technology that is highlighted in Section 1 and Chapter 5 reflects the use of technology to easily maintaining human-human connections. In this way, digital engagement may facilitate the high-quality social connects that provide the support emphasised by Social Capital Theory. The alternative focus on technology offering an offering intrinsic

social benefit/being a social target may also relate to Social Capital Theory. While the theory was proposed to reflect relationships between humans, it was proposed at a time when technology lacked many of the capabilities we see today. Therefore, it may also be applicable to some of the pro-social technology currently available, despite this not having been the original application. With this focus, Social Capital Theory may reflect the benefits of interacting with technology, such as smart speakers, as social agents. Section 2 reports extensively on users' feelings of emotional support arising from repeated smart speaker interactions; Chapter 4 integrates it as a key outcome of the ASAP pathway based on literature covered in the scoping review, while Chapter 5 reports it as the most common benefit that arose from the content analysis. This finding that smart speakers are able to provide emotional support raises questions about the theoretical exclusivity of emotional support as an outcome from high-quality human connections. The findings from this thesis would suggest that smart speakers, and potentially social technology more broadly, are able to fulfil some of the socially supportive roles that were thought to be exclusive to human-human interactions. This reflects broader reports of the transition from technology as a tool to communicate with other humans (amongst other facilities), to technology as a social target in and of itself (Voit et al., 2020). As technology and research into this area continues to develop, it will be interesting to see how the social role of technology unfolds and continues to grow.

6.4. Limitations and Future Research

The findings from this thesis give rise to further questions and highlight possibilities that could be valuable to explore through future research projects. An overview of some of these possibilities are presented here.

While a mixed methods approach was used to the advantage of Chapter 5, this technique would be beneficially applied to future research stemming from the findings of other chapters. Notably, the findings from the structural equation model in Section 1 could benefit from further, qualitative investigation. For example, groups such as older adults are at an increased risk of digital exclusion (Genoe et al., 2018; Hill et al., 2015) and, therefore, are often targets for digital upskilling programmes (Hogeboom et al.,

2010; Winstead et al., 2013). Conducting interviews with these groups about how they experience the pathways in the model (e.g. their perspective on the relationship between their digital skills/engagement and isolation) would offer three, key benefits. Firstly, it would overcome a deficit in this field of research; qualitative data, particularly that which is gathered in participant led and largely open-ended interviews, is sparse in this area. Conducting qualitative research in an area that is lacking may serve to normalise this practice and encourage others to follow suit, leading to richer data for the field more broadly. Secondly, this qualitative data may provide explanations for the pathways in this model that are lacking from the quantitative-only approach taken in Section 1. Through the interviewing process, for example, we may better understand why digital engagement is linked to isolation for particular groups of interest. Thirdly, it is through this further understanding that digital skills interventions, which are fairly common, may be more evidence informed in their design. To understand what the pathways of the structural equation model mean to individuals of interest may underpin an understanding of how best to support them through interventions. For these reasons, further qualitative or mixed-methods research relating to the structural equation model from Section 1 may offer research, theoretical, and practical benefits.

The field would also benefit from further research into the ASAP Pathway proposed in Chapter 4. This research could take two approaches: validating/falsifying the pathway and trying to expand upon the pathway. To validate/falsify this proposed pathway, qualitative interviews could be conducted with individuals who report having a parasocial relationship with their smart speaker. This could ask them to recall how their feelings and perceptions of the smart speaker progressed from the point of purchase to the current date to see if it aligns with the proposed progression of the ASAP pathway. An alternative method would be a longitudinal, quantitative study to measure each stage of the ASAP pathway (anthropomorphic perception, perception as a social actor, parasocial interactions and relationships, and outcomes). This could be done using measures such as the Multiple Parasocial Relationships Scale, which measures the presence but also type of parasocial relationships present (Tukachinsky, 2010). Doing so would allow users engagement with each stage of the ASAP Pathway to be quantified over time, producing a way to measure potential progression along the pathway. Either

of these methods could offer validity to the model. An additional option for future research would be to try to expand the range of factors and outcomes that are related to the model. When it was proposed, some factors and outcomes were hypothesised as being relevant to the pathway based on previous research into other targets of PSRs. This included hypothesising that attachment style (Cole & Leets, 1999) and technology use patterns (Tsay & Bodine, 2012) influence the likelihood of parasocial interactions based on research relating to PSRs with television personalities. Additionally, increased loyalty (Chandler & Schwarz, 2010) and expectations (Fink, 2012; Puzakova et al., 2013) of the smart speaker were hypothesised to result from forming a parasocial relationship. Researching the factors shown to relate to parasocial relationships with other targets may prove to be a fruitful way to expand the ASAP Pathway and make it more comprehensive.

6.5. Conclusion

The central premise of this thesis is that loneliness and the digital divide are highly topical social issues with complex and far-reaching implications, and that these two concepts are interconnected. The thesis examines the issue of the digital divide from two approaches; focussing on users' digital skills as the barrier to engagement and cause of subsequent psychosocial issues, and alternatively focussing on the use of smart speakers as an example of accessibly designed technology that lowers the barriers to engagement. Additionally, the role of digital technology on psychosocial outcomes, including loneliness, is viewed from two perspectives; the ability to maintain and form new connections with other humans and, increasingly, the role of certain technologies as social companions. This thesis contributes to the ongoing work surrounding the psychosocial benefits of technology, particularly for socially at-risk groups, for example those who are already socially isolated, digitally excluded, or living in social housing. It is hoped that this work will contribute to evidence-supported digitisation and the associated psychosocial benefits, leading towards more equitable access for all.

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Appendices

Appendix A: Information sheet, consent form, and survey tools administered to all HWW participants.

Confidential

Page 1 of 7

Smart Speaker devices in everyday life

This study investigates perceptions and opinions of smart speaker devices (e.g. Amazon Alexa, Google Home) and their impact on daily life. We are interested in finding out more about the characteristics of people who use or don't use smart speakers, including factors such as wellbeing, loneliness, and challenges in daily living.

We are interested in hearing from people who both own and do not own smart speaker devices.

You must be 18 years or older to take part.

This study is being carried out by Dr Georgina Powell, School of Psychology, Cardiff University (powellg7@cardiff.ac.uk).

This survey is not associated with any technology companies that make or sell smart speaker devices. The researchers are Psychologists who are interested in the use of smart speaker devices in health and social care.

The study has received ethical approval from Cardiff University, School of Psychology ethics committee (psychethics@cardiff.ac.uk)

The survey is WCAG 2.0 AA compliant in terms of accessibility and can be completed with screen readers such as JAWS.

What does the study involve?

Taking part involves completing an online survey and answering multi-choice questions about these topics:

- Basic information about you (e.g. age, education)
- Challenges in daily living and disabilities
- Mood, feelings, likes and dislikes
- Perceptions and opinions about smart speakers

The survey takes around 20 minutes to complete (although this may vary between individuals).

What are the benefits and risks of taking part?

The results of this study will increase our understanding of the potential uses of smart speakers in health and social care.

There are no major risks to taking part. All data will be securely stored and confidential, meaning that it will only be accessible to the researchers in this study. It will not be shared or sold to any third parties. Any presentation or publication of the data will be completely anonymous, which means it will not be possible to personally identify you. The data will be retained for 10 years and then destroyed.

Can I change my mind about taking part?

Participants have the right to withdraw from the study at any point without giving a reason, even once the study has started. You just need to close your internet page. If participants decide to withdraw, their data will be destroyed.

You can also omit any questions you do not want to answer.

If you have any queries about the research, please email the lead researcher, Dr Georgina Powell at powellg7@cardiff.ac.uk

You can download a copy of this information below.

[Attachment: "Information Sheet.docx"]

To make sure you have understood the information above, please answer this question.

What does this study involve?

- ☐ Taking part in a telephone interview about smart speakers
- ☐ Answering multiple-choice questions about smart speakers
- ☐ Answering multiple-choice questions about mobile phone use
- ☐ I don't know

You did not answer the previous questions correctly, please go back to the previous page to re-read the instructions and change your answer.

To make sure you have understood the information above, please answer this question.

What does this study involve?

- ☐ Taking part in a telephone interview about smart speakers
- ☐ Answering multiple-choice questions about smart speakers
- ☐ Answering multiple-choice questions about mobile phone use
- ☐ I don't know

Please click the boxes below if you agree with the statements

- ☐ I understand that I can withdraw from the survey at any time without giving a reason (and any answers I have given will not be used in the research).
- ☐ I understand that my data will be processed in accordance with the terms of the UK Data Protection Act.
- ☐ I understand that confidentiality and anonymity will be maintained and it will not be possible to identify me in any publications or presentations of this data.

You did not answer the previous questions correctly, please go back to the previous page to re-read the instructions and change your answer.

Please click 'yes' below to confirm that you consent to take part in this study.

☐ Yes
☐ No

Consent is required for you to continue with the survey. If you consent, please return to the previous page and check "yes". If you do not consent, please click submit to end the survey.

Start time

How would you describe your gender?

- ☐ Male
- ☐ Female,
- ☐ Other
- ☐ Prefer not to specify

How would you describe your gender?

How old are you?

- ☐ 18 - 24
- ☐ 25 - 34
- ☐ 35 - 44
- ☐ 45 - 54
- ☐ 55 - 64
- ☐ 65 and over
- ☐ Prefer not to specify

What is your first language

- ☐ Arabic
- ☐ Assamese
- ☐ Azeri/Azerbaijani (Latin Script)
- ☐ Belarusian
- ☐ Bulgarian
- ☐ Bengali
- ☐ Bosnian
- ☐ Catalan
- ☐ Cebuano
- ☐ Czech
- ☐ Welsh
- ☐ Danish
- ☐ German
- ☐ Greek
- ☐ English (US)
- ☐ English (UK)
- ☐ Esperanto
- ☐ Spanish (Latin America)
- ☐ Spanish
- ☐ Estonian
- ☐ Persian
- ☐ Finnish
- ☐ French
- ☐ French (Canada)
- ☐ Gujarati
- ☐ Hebrew
- ☐ Hindi
- ☐ Ilonggo/Hiligaynon
- ☐ Croatian
- ☐ Hungarian
- ☐ Armenian
- ☐ Bahasa Indonesian
- ☐ Icelandic
- ☐ Italian
- ☐ Japanese
- ☐ Kannada
- ☐ Georgian
- ☐ Kazakh (Cyrillic)
- ☐ Khmer
- ☐ Korean
- ☐ Lithuanian
- ☐ Latvian
- ☐ Malayalam
- ☐ Marathi
- ☐ Macedonian
- ☐ Mongolian
- ☐ Bahasa Malaysia
- ☐ Myanmar/Burmese
- ☐ Dutch
- ☐ Norwegian
- ☐ Odia/Oriya
- ☐ Punjabi
- ☐ Polish
- ☐ Portuguese
- ☐ Brazilian Portugese
- ☐ Romanian
- ☐ Russian
- ☐ Sinhalese
- ☐ Slovak
- ☐ Slovenian
- ☐ Albanian
- ☐ Serbian
- ☐ Montenegrin
- ☐ Swedish
- ☐ Swahili
- ☐ Tamil
- ☐ Telugu
- ☐ Tagalog
- ☐ Thai

- ☐ Turkish
- ☐ Ukrainian
- ☐ Urdu
- ☐ Vietnamese
- ☐ Chinese (Simplified)
- ☐ Chinese (Traditional)

Please indicate your occupation

- ☐ Management, professional and related
- ☐ Service
- ☐ Sales and Office
- ☐ Farming, fishing and forestry
- ☐ Construction, extraction and maintenance
- ☐ transportation and material moving
- ☐ Government
- ☐ Retired
- ☐ Unemployed
- ☐ Student
- ☐ Other

If other, please specify

What is the highest level of education you have completed?

- ☐ No qualification
- ☐ GCSE/O level
- ☐ A level/BTEC
- ☐ Undergraduate degree
- ☐ Postgraduate degree
- ☐ Other

If other, please specify

How are you completing this survey?

- ☐ On my own, independently
- ☐ With the help of a friend or family member
- ☐ With the help of a support worker or carer

Do you live:

- ☐ Alone
- ☐ With friends/housemates
- ☐ With a partner/family

Do you have a diagnosis of Autism OR self-identify as autistic?

- ☐ Yes
- ☐ No

The next questions ask about difficulties you may have doing certain activities because of a health problem.

	No - no difficulty	Yes - some difficulty	Yes - a lot of difficulty	Cannot do at all
1) Do you have difficulty seeing, even if wearing glasses?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2) Do you have difficulty hearing, even if using a hearing aid?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3) Do you have difficulty walking or climbing steps?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4) Do you have difficulty remembering or concentrating?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5) Do you have difficulty with self-care, such as washing all over and dressing?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6) Using your usual (customary) language, do you have difficulty communicating, for example understanding or being understood?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7) Do you receive any help in carrying out daily tasks?

☐ Yes, from friends and family ☐ Yes, from paid carers/support staff ☐ No

8) Do you live in supported or sheltered accommodation?

☐ Yes ☐ No

9) Do you have a diagnosis of mild cognitive impairment or dementia?

☐ Yes ☐ No

10) Does anyone you live with have a diagnosis of mild cognitive impairment or dementia?

☐ Yes ☐ No

11) Does anyone who lives with you have a learning or intellectual disability?

☐ Yes ☐ No

12) Do you provide unpaid care or support for a friend or family member?

☐ Yes - significant support role ☐ Yes - occasional support ☐ No

Below are some statements about feelings and thoughts. Please tick the statement that best describes your experience of each over the last two weeks.

	None of the time	Rarely	Some of the time	Often	All of the time
1) I've been feeling optimistic about the future	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2) I've been feeling useful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3) I've been feeling relaxed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4) I've been feeling interested in other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5) I've had energy to spare	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6) I've been dealing with problems well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7) I've been thinking clearly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8) I've been feeling good about myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9) I've been feeling close to other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10) I've been feeling confident	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11) I've been able to make up my own mind about things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12) I've been feeling loved	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13) I've been interested in new things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14) I've been feeling cheerful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please consider how well the following statements describe your behaviour and actions.

	Does not describe me at all	Does not describe me	Neutral	Describes me	Describes me very well
1) I look for creative ways to alter difficult situations	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2) Regardless of what happens to me, I believe I can control my reaction to it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3) I believe I can grow in positive ways by dealing with difficult situations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4) I actively look for ways to replace the losses I encounter in life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please take a break if you need to, and then reconfirm that you are happy to continue taking part in the study.

Remember that:

You can withdraw from the study at anytime, without giving a reason, and your data will not be used in the research.

You can omit any questions you don't want to answer

Your data will be processed in accordance with the UK Data Protection Act

Your confidentiality and anonymity will be maintained and it will not be possible to identify you in any publications or presentations of the data.

I continue to consent to take part in this study.

☐ Yes

☐ No

Consent is required for you to continue with the survey. If you consent, please return to the previous page and check "yes". If you do not consent, please click submit to end the survey.

When answering the following questions, please take account of the following:

There are no right or wrong answers.

We would like you to be completely honest.

In answering the questions, it is best to think of your life as it generally is now (we all have some good or bad days).

	Yes	More or less	No
1) I experience a general sense of emptiness.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2) There are plenty of people I can rely on when I have problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3) There are many people I can trust completely.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4) I miss having people around me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5) There are enough people I feel close to.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6) I often feel rejected.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Family: considering the people to whom you are related by birth, marriage, adoption, etc.

- 1) How many relatives do you see or hear from at least once a month?
- ☐ None ☐ One ☐ Two ☐ Three or four ☐ Five to eight ☐ Nine or more
-
- 2) How often do you see or hear from the relative with whom you have the most contact?
- ☐ Less than monthly ☐ Monthly ☐ A few times per month ☐ Weekly ☐ A few times per week
☐ Daily
-
- 3) How many relatives do you feel at ease with that you can talk about private matters?
- ☐ None ☐ One ☐ Two ☐ Three or four ☐ Five to eight ☐ Nine or more
-
- 4) How many relatives do you feel close to such that you could call on them for help?
- ☐ None ☐ One ☐ Two ☐ Three or four ☐ Five to eight ☐ Nine or more
-
- 5) When your relatives have an important decision to make, how often do they talk to you about it?
- ☐ Never ☐ Seldom ☐ Sometimes ☐ Often ☐ Very often ☐ Always
-
- 6) How often is one of your relatives available for you to talk to when you have an important decision to make?
- ☐ Never ☐ Seldom ☐ Sometimes ☐ Often ☐ Very often ☐ Always

Friendships: considering all of your friends, including those who live in your neighbourhood.

- 7) How many of your friends do you see or hear from at least once a month?
- ☐ None ☐ One ☐ Two ☐ Three or four ☐ Five to eight ☐ Nine or more
-
- 8) How often do you see or hear from the friend with whom you have the most contact?
- ☐ Less than monthly ☐ Monthly ☐ A few times per month ☐ Weekly ☐ A few times per week
☐ Daily
-
- 9) How many friends do you feel at ease with that you can talk about private matters?
- ☐ None ☐ One ☐ Two ☐ Three or four ☐ Five to eight ☐ Nine or more
-
- 10) How many friends do you feel close to such that you could call on them for help?
- ☐ None ☐ One ☐ Two ☐ Three or four ☐ Five to eight ☐ Nine or more

11) When one of your friends has an important decision to make, how often do they talk to you about it?

☐ Never ☐ Seldom ☐ Sometimes ☐ Often ☐ Very often ☐ Always

12) How often is one of your friends available for you to talk to when you have an important decision to make?

☐ Never ☐ Seldom ☐ Sometimes ☐ Often ☐ Very often ☐ Always

In this section, you will see 28 statements. Please read each statement carefully and rate how strongly you agree or disagree with it.

	Definitely agree	Slightly agree	Slightly disagree	Definitely disagree
1) I prefer to do things with others rather than on my own	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2) I prefer to do things the same way over and over again	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3) Trying to imagine something, I find it easy to create a picture in my mind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4) I frequently get strongly absorbed in one thing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5) I usually notice car number plates or similar strings of information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6) Reading a story, I can easily imagine what the characters might look like	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7) I am fascinated by dates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8) I can easily keep track of several different people's conversations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9) I find social situations easy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10) I would rather go to a library than to a party	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11) I find making up stories easy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12) I find myself drawn more strongly to people than to things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13) I am fascinated by numbers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14) Reading a story, I find it difficult to work out the character's intentions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15) I find it hard to make new friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16) I notice patterns in things all the time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17) It does not upset me if my daily routine is disturbed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18) I find it easy to do more than one thing at one	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19)				

- | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| I enjoy doing things spontaneously | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 20) I find it easy to work out what someone is thinking or feeling | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 21) If there is an interruption, I can switch back very quickly | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 22) I like to collect information about categories of things | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 23) I find it difficult to imagine what it would be like to be someone else | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 24) I enjoy social occasions | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 25) I find it difficult to work out people's intentions | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 26) New situations make me anxious | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 27) I enjoy meeting new people | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 28) I find it easy to play games with children that involves pretending | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

In the next section, please read each of the following statements carefully. They refer to thoughts and feelings you may have had about others over the last month. Think about the last month and indicate the extent of these feelings from 1 (Not at all) to 5 (Totally). (N.B. Please do not rate items according to any experiences you may have had under the influence of drugs.)

	1 (Not at all)	2	3	4	5 (Totally)
1) I spent time thinking about friends gossiping about me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2) I often heard people referring to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3) I have been upset by friends and colleagues judging me critically	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4) People definitely laughed at me behind my back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5) I have been thinking a lot about people avoiding me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6) People have been dropping hints for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7) I believed that certain people were not what they seemed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8) People talking about me behind my back upset me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please take a break if you need to, and then reconfirm that you are happy to continue taking part in the study.

Remember that:

You can withdraw from the study at anytime, without giving a reason, and your data will not be used in the research.

You can omit any questions you don't want to answer

Your data will be processed in accordance with the UK Data Protection Act

Your confidentiality and anonymity will be maintained and it will not be possible to identify you in any publications or presentations of the data.

I consent to continuing to take part in the study

☐ Yes

☐ No

Consent is required for you to continue with the survey. If you consent, please return to the previous page and check "yes". If you do not consent, please click submit to end the survey.

-
- 1) Do you own a smart speaker (e.g. Amazon Echo, Google Home, Sonos One, Apple HomePod, JBL Link Portable)? ☐ Yes ☐ No

Please read the following statements and rate how much you agree or disagree with them

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
The smart speaker helps me keep in touch with friends and family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't enjoy talking and interacting with the smart speaker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to use the smart speaker when I'm alone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Even though I know the smart speaker is not real, the voice provides me some company	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
The main reason I use the smart speaker is to access entertainment, such as the radio, music audio books and trivia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would be able to access entertainment, such as music, as easily without a smart speaker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My daily well-being is improved by using the smart speaker to access entertainment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
The smart speaker usually understands me when I speak to it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I need help getting the smart speaker to understand my commands, e.g. someone else has to ask for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The smart speaker encourages me to speak more slowly and clearly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I often forget to say the wake word (e.g. 'Alexa' or 'Google') before asking a question or making a command	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I rarely use the smart speaker because it doesn't understand me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
The smart speaker gives me more control over my environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The smart speaker allows me to do things by myself that I would not be able to do without it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The smart speaker has not made me more independent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I need help to use the smart speaker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
I don't use the smart speaker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I understand what to use the smart speaker for and what it can do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I need more help/training to understand how to use the smart speaker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
I don't use the smart speaker because it is an invasion of my privacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am worried that the smart speaker is recording everything I say, even if I haven't said the wake word (e.g. 'Alexa', 'Google')	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not think that the technology companies that make the smart speakers are passing my voice recordings or data on to third parties	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would like to know more about how the technology companies that make the smart speakers handle my data and respect my privacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It worries me that the smart speaker can learn facts about my life, such as my likes and dislikes, when I am typically at home, what food I eat, where I order taxis to, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How much do you know about smart speaker devices?

☐ Quite a bit ☐ A little bit ☐ Nothing at all

Smart speakers and what they can be used for

Smart speakers allow you to access multi-media, make phone calls, and control aspects of your home environment by making verbal requests to a 'virtual assistant'. Using Amazon Alexa as an example, you might say 'Alexa, play Mozart' and the smart speaker device would play a song by Mozart. Or you might say 'Alexa, turn my light on', and the smart speaker would send a signal to an adapted plug socket to turn the light on.

You can ask smart speakers what the weather is, to tell you facts about things, and even tell you jokes. You can also ask the smart speaker to set alarms and timers for you ('Alexa, set a timer for 5 minutes'). The virtual assistant will also respond to social questions like 'Alexa how are you today?' or 'Alexa, good night'.

Would you like to own a smart speaker?

☐ Yes ☐ Maybe ☐ No

What do you think you would use a smart speaker for? (tick all that apply)

- ☐ Accessing multi-media (music, radio, audiobooks)
- ☐ Accessing information (e.g. the weather, facts, trivia)
- ☐ Setting timers and alarms
- ☐ Making phone calls or video calls
- ☐ As a virtual companion (e.g. someone to say hello to in the morning)
- ☐ Controlling home environment (e.g. switching lights on/off, controlling central heating)
- ☐ I would not use the smart speaker

The following questions will ask whether you think that a smart speaker would make carrying out certain activities and functions easier, harder, or about the same, compared to how you would normally do these activities without a smart speaker

	Harder	About the same	Easier
Keep entertained (e.g. by listening to music)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Finding out information about things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Remembering to do things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Keeping in touch with friends and family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Turning on and off electrical equipment in the house	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Do you think owning a smart speaker would make you more independent, less independent or about the same?

☐ More
☐ Less
☐ About the same

Do you think owning a smart speaker would make you more able to do things for yourself, less able, or about the same?

- ☐ More
- ☐ Less
- ☐ About the same

Do you think the smart speaker would have problems understanding your voice and requests?

- ☐ Yes
- ☐ No
- ☐ Maybe

Do you think the smart speaker would encourage you to speak more slowly and clearly?

- ☐ Yes
- ☐ No
- ☐ Maybe

Do you think you would need help to use the smart speaker (e.g. from friends and family)?

- ☐ Yes
- ☐ No
- ☐ Maybe

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
The main reason I don't own a smart speaker is because I think it would be an invasion of my privacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I owned a smart speaker, I would be worried that it is recording everything I say, even if I haven't said the wake word (e.g. 'Alexa', 'Google')	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not think that the technology companies that make the smart speakers are passing peoples' voice recordings or data on to third parties	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would like to know more about how the technology companies that make the smart speakers handle peoples' data and respect their privacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I owned a smart speaker, I would be worried that it can learn facts about my life, such as my likes and dislikes, when I am typically at home, what food I eat, where I order taxis to, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Earlier in the survey, you said that you provided care or support to a friend or family member. Do/does any of the individual/s you support own a smart speaker?

- ☐ Yes
- ☐ No

Which of the following smart speaker functions do they use?

- ☐ Accessing multi-media (music, radio, audiobooks)
- ☐ Accessing information (e.g. the weather, facts, trivia)
- ☐ Setting timers and alarms
- ☐ Making phone calls or video calls
- ☐ As a virtual companion (e.g. someone to say hello to in the morning)
- ☐ Controlling home environment (e.g. switching lights on/off, controlling central heating)
- ☐ I would not use the smart speaker

Do you think that the smart speaker improves their ability to live independently?

- ☐ Yes
- ☐ Maybe
- ☐ No

Do you think that the smart speaker improves their well-being?

- ☐ Yes
- ☐ Maybe
- ☐ No

Do you think that if the individuals you support owned a smart speaker, this would improve their ability to live independently?

- ☐ Yes
- ☐ Maybe
- ☐ No

Do you think that if the individual/s you support owned a smart speaker, this would improve their well-being?

- ☐ Yes
- ☐ Maybe
- ☐ No

If you would like to take part in future studies, please enter your details below.

Any details you provide will be stored securely. Your personal details will be stored separately from your responses to the survey, and only the lead researcher (Dr Georgina Powell) will be able to match up your personal details with your survey data.

You can request for your contact details and data to be removed at any time by contacting Georgie on powellg7@cardiff.ac.uk

1) First name

2) Email address

3)

Appendix B: Single Variable Comparison of Age

Table 1. MICOM Step 2 Assessing Compositional Invariance.

Latent Variable	Original correlation	Correlation Permutation Mean	Permutation P value
Digital Skills	0.991	0.981	0.781
Isolation	1.000	0.999	0.582
Loneliness	1.000	1.000	0.137
Wellbeing	1.000	1.000	0.142

Note: lack of significance indicates that there are no significant differences between the constructions of the latent variables from the Younger and Older groups.

Table 2. MICOM Step 3a Assessing Variance of the Latent Variable Means Between the Younger and Older Groups.

Latent Variable	Original difference	Permutation Mean Difference	Permutation P value
Digital Skills	0.203	0.001	<0.001
Isolation	0.044	-0.001	0.217
Loneliness	0.089	-0.001	<0.001
Wellbeing	-0.464	0.001	<0.001

Table 3. MICOM Step 3b Assessing Variance within the Construction of the Latent Variables Between the Younger and Older Groups.

Latent Variable	Original difference	Permutation Mean Difference	Permutation P value
Digital Skills	-0.562	-0.005	<0.001
Isolation	0.080	-0.003	0.093
Loneliness	0.198	-0.002	<0.001
Wellbeing	0.270	-0.003	<0.001

Table 4. Internal consistency of the latent variables for the Younger and Older groups data, alongside comparisons of the differences.

Latent Variable	Cronbachs α		Original Difference	Permutation Mean Difference	Permutation <i>P</i> Value
	Younger Group	Older Group			
Digital Skills	0.783	0.791	-0.008	-0.001	0.518
Isolation	0.877	0.865	0.012	<0.001	0.101
Loneliness	0.791	0.736	0.055	-0.001	<0.001
Wellbeing	0.953	0.940	0.013	<0.001	<0.001

Table 5. Convergent validity of the latent variables for the Younger and Older groups data, alongside comparisons of the differences.

Latent Variable	Average Variance Explained (AVE)		Original Difference	Permutation Mean Difference	Permutation <i>P</i> Value
	Younger Group	Older Group			
Digital Skills	0.318	0.332	-0.014	-0.002	0.613
Isolation	0.428	0.405	0.023	<0.001	0.093
Loneliness	0.545	0.489	0.057	-0.001	<0.001
Wellbeing	0.625	0.565	0.060	<0.001	<0.001

Table 6. Composite reliability of the latent variables for the Younger and Older groups data, alongside comparisons of the differences.

Latent Variable	Rho a					Rho c				
	Younger	Older	Original Difference	Permutation Mean Difference	Permutation <i>P</i> Values	Younger	Older	Original Difference	Permutation Mean Difference	Permutation <i>P</i> Values
Digital Skills	0.772	0.820	-0.049	-0.004	0.409	0.817	0.827	-0.009	-0.002	0.667
Isolation	0.886	0.876	0.010	<0.001	0.123	0.899	0.890	0.009	<0.001	0.095
Loneliness	0.792	0.739	0.053	<0.001	<0.001	0.857	0.825	0.032	<0.001	<0.001
Wellbeing	0.959	0.947	0.012	<0.001	<0.001	0.959	0.948	0.011	<0.001	<0.001

Table 7. Variance explained of the latent variables for the Younger and Older groups data, alongside comparisons of the differences.

Latent Variable	R ² adj		Original Difference	Permutation Mean Difference	Permutation P Value
	Younger Group	Older Group			
Isolation	0.056	0.045	0.010	<0.001	0.415
Loneliness	0.408	0.307	0.101	-0.001	<0.001
Wellbeing	0.447	0.408	0.040	<0.001	0.128

Table 8. Assessment of the construct and indicator variable loadings for the Younger and Older groups, and an analysis of the differences between the groups.

Construct	Indicator Variables	Younger		Older		Original Difference	Permutation Mean Difference	Permutation P Value
		Outer Loading	Average Loading	Outer Loading	Average Loading			
Digital Skills	EDSF1	0.717	0.552	0.754	0.565	-0.038	<0.001	0.397
	EDSF3	0.700		0.717		-0.017	-0.002	0.677
	EDSF5	0.695		0.643		0.052	-0.001	0.407
	EDSF6	0.600		0.646		-0.045	-0.002	0.442
	EDSF8	0.564		0.460		0.104	-0.003	0.091
	EDSF9	0.478		0.424		0.054	-0.005	0.413
	EDSF11	0.417		0.415		0.003	-0.003	0.970
	EDSF13	0.432		0.539		-0.107	-0.001	0.200
	EDSF14	0.490		0.526		-0.036	-0.003	0.720
	EDSF15	0.428		0.521		-0.092	-0.005	0.388
Isolation	LSNS1	0.626	0.650	0.667	0.632	-0.041	<0.001	0.123
	LSNS2	0.489		0.487		0.002	-0.002	0.951
	LSNS3	0.699		0.725		-0.026	<0.001	0.215
	LSNS4	0.727		0.727		<0.001	<0.001	0.986
	LSNS5	0.617		0.600		0.017	<0.001	0.556
	LSNS6	0.687		0.669		0.018	-0.001	0.447
	LSNS7	0.686		0.619		0.068	<0.001	0.010
	LSNS8	0.531		0.509		0.023	-0.001	0.516
	LSNS9	0.693		0.646		0.046	<0.001	0.060
	LSNS10	0.745		0.707		0.037	<0.001	0.076

Construct	Indicator Variables	Younger		Older		Original Difference	Permutation Mean Difference	Permutation P Value
		Outer Loading	Average Loading	Outer Loading	Average Loading			
	LSNS11	0.614		0.585		0.029	-0.001	0.313
	LSNS12	0.685		0.648		0.037	-0.001	0.149
Loneliness	DJGLS1	0.706	0.738	0.617	0.695	0.089	<0.001	<0.001*
	DJGLS2	0.777		0.789		-0.012	-0.001	0.481
	DJGLS3	0.735		0.738		-0.003	<0.001	0.866
	DJGLS5	0.757		0.744		0.014	-0.001	0.507
	DJGLS6	0.715		0.585		0.129	-0.001	<0.001*
Wellbeing	WEMWBS1	0.747	0.788	0.727	0.749	0.020	<0.001	0.344
	WEMWBS2	0.800		0.730		0.069	-0.001	<0.001*
	WEMWBS3	0.760		0.765		-0.004	-0.001	0.794
	WEMWBS4	0.766		0.671		0.095	<0.001	<0.001*
	WEMWBS5	0.705		0.661		0.044	<0.001	0.041
	WEMWBS6	0.793		0.776		0.016	<0.001	0.364
	WEMWBS7	0.789		0.737		0.052	<0.001	0.004
	WEMWBS8	0.885		0.849		0.036	<0.001	<0.001*
	WEMWBS9	0.813		0.765		0.048	<0.001	<0.001*
	WEMWBS10	0.865		0.847		0.019	<0.001	0.065
	WEMWBS11	0.690		0.668		0.021	<0.001	0.376
	WEMWBS12	0.734		0.700		0.034	-0.001	0.080
	WEMWBS13	0.810		0.725		0.084	<0.001	<0.001*
	WEMWBS14	0.881		0.865		0.016	<0.001	0.060

Note: * indicates significance at the $p<0.05$ threshold.

Appendix C: Single Variable Comparison of Gender

Table 1. MICOM Step 2 Assessing Compositional Invariance.

Latent Variable	Original correlation	Correlation Permutation Mean	Permutation P value
Digital Skills	0.992	0.980	0.852
Isolation	0.999	0.999	0.228
Loneliness	1.000	1.000	0.561
Wellbeing	1.000	1.000	0.519

Note: lack of significance indicates that there are no significant differences between the constructions of the latent variables from the Men and Women.

Table 2. MICOM Step 3a Assessing Variance of the Latent Variable Means Between the Men and Women.

Latent Variable	Original difference	Permutation Mean Difference	Permutation P value
Digital Skills	-0.007	<0.001	0.578
Isolation	0.322	-0.002	<0.001
Loneliness	0.022	-0.001	0.200
Wellbeing	0.160	0.003	<0.001

Table 3. MICOM Step 3b Assessing Variance within the Construction of the Latent Variables Between the Men and Women.

Latent Variable	Original difference	Permutation Mean Difference	Permutation P value
Digital Skills	0.044	<0.001	0.438
Isolation	0.133	-0.002	0.009
Loneliness	-0.086	-0.001	0.011
Wellbeing	0.017	-0.002	0.757

Table 4. Internal consistency of the latent variables for the Men and Women's data, alongside comparisons of the differences.

Latent Variable	Cronbachs α		Original Difference	Permutation Mean Difference	Permutation <i>P</i> Value
	Men	Women			
Digital Skills	0.808	0.800	0.008	0.000	0.513
Isolation	0.872	0.864	0.008	0.000	0.261
Loneliness	0.753	0.773	-0.020	0.000	0.150
Wellbeing	0.950	0.950	0.000	0.000	0.980

Table 5. Convergent validity of the latent variables for the Men and Women's data, alongside comparisons of the differences.

Latent Variable	Average Variance Explained (AVE)		Original Difference	Permutation Mean Difference	Permutation <i>P</i> Value
	Men	Women			
Digital Skills	0.344	0.336	0.007	-0.003	0.794
Isolation	0.419	0.405	0.014	-0.001	0.296
Loneliness	0.504	0.525	-0.021	0.000	0.141
Wellbeing	0.607	0.606	0.001	0.000	0.937

Table 6. Composite reliability of the latent variables for the Men and Women's data, alongside comparisons of the differences.

Latent Variable	Rho <i>a</i>					Rho <i>c</i>				
	Men	Women	Original Difference	Permutation Mean Difference	Permutation <i>P</i> Values	Men	Women	Original Difference	Permutation Mean Difference	Permutation <i>P</i> Values
Digital Skills	0.818	0.792	0.026	-0.010	0.677	0.834	0.830	0.004	-0.003	0.851
Isolation	0.882	0.875	0.007	0.000	0.293	0.895	0.889	0.006	0.000	0.282

Loneliness	0.754	0.773	-0.019	0.000	0.175	0.835	0.846	-0.011	0.000	0.149
Wellbeing	0.955	0.955	0.000	0.000	0.995	0.956	0.955	0.000	0.000	0.951

Table 7. Variance explained of the latent variables for the Men and Women's data, alongside comparisons of the differences.

Latent Variable	R ² adj		Original Difference	Permutation Mean Difference	Permutation P Value
	Men	Women			
Isolation	0.046	0.047	0.000	0.001	0.987
Loneliness	0.345	0.367	-0.022	-0.001	0.416
Wellbeing	0.452	0.420	0.032	0.001	0.233

Table 8.

Assessment of the construct and indicator variable loadings for the Men and Women's models, and an analysis of the differences between the groups.

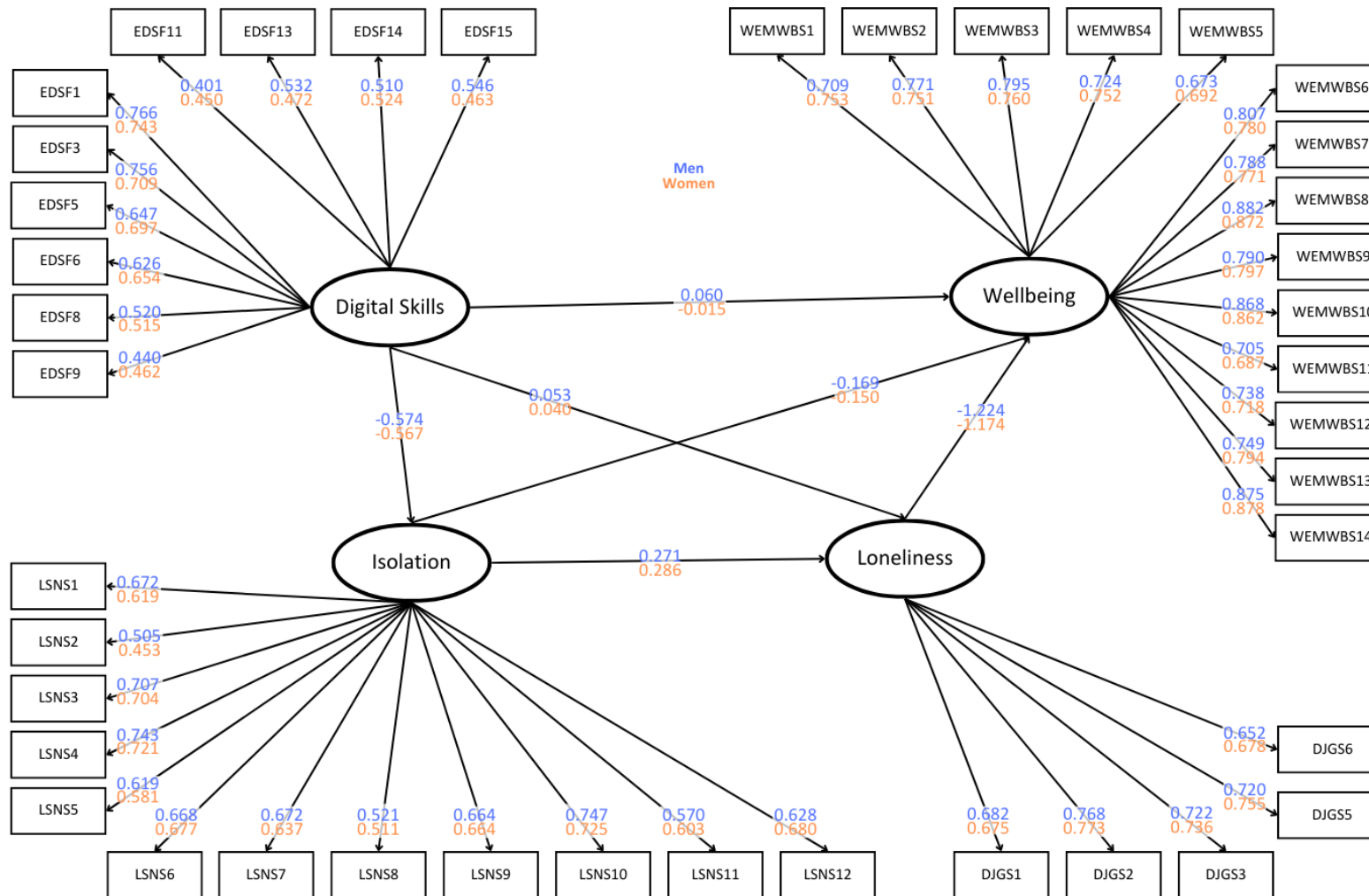
Construct	Indicator Variables	Men		Women		Original Difference	Permutation Mean Difference	Permutation P Value
		Outer Loading	Average Loading	Outer Loading	Average Loading			
Digital Skills	EDSF1	0.766	0.574	0.743	0.569	0.023	-0.003	0.611
	EDSF3	0.756		0.709		0.047	-0.001	0.271
	EDSF5	0.647		0.697		-0.050	-0.004	0.437
	EDSF6	0.626		0.654		-0.028	-0.007	0.622
	EDSF8	0.520		0.515		0.005	-0.004	0.937
	EDSF9	0.440		0.462		-0.022	-0.005	0.774
	EDSF11	0.401		0.450		-0.049	-0.002	0.465
	EDSF13	0.532		0.472		0.060	0.000	0.454
	EDSF14	0.510		0.524		-0.014	-0.008	0.901
	EDSF15	0.546		0.463		0.083	-0.007	0.451
Isolation	LSNS1	0.672	0.643	0.619	0.631	0.054	0.000	0.050
	LSNS2	0.505		0.453		0.052	0.001	0.153

Construct	Indicator Variables	Men		Women		Original Difference	Permutation Mean Difference	Permutation P Value
		Outer Loading	Average Loading	Outer Loading	Average Loading			
	LSNS3	0.707		0.704		0.003	-0.001	0.872
	LSNS4	0.743		0.721		0.022	0.000	0.282
	LSNS5	0.619		0.581		0.038	0.000	0.214
	LSNS6	0.668		0.677		-0.009	0.000	0.715
	LSNS7	0.672		0.637		0.034	-0.002	0.212
	LSNS8	0.521		0.511		0.009	-0.001	0.793
	LSNS9	0.664		0.664		0.000	-0.002	0.994
	LSNS10	0.747		0.725		0.023	-0.001	0.303
	LSNS11	0.570		0.603		-0.033	-0.001	0.271
	LSNS12	0.628		0.680		-0.052	0.000	0.041
Loneliness	DJGLS1	0.682	0.709	0.675	0.723	0.007	0.001	0.745
	DJGLS2	0.768		0.773		-0.006	-0.001	0.772
	DJGLS3	0.722		0.736		-0.014	0.000	0.499
	DJGLS5	0.720		0.755		-0.036	0.001	0.075
	DJGLS6	0.652		0.678		-0.027	0.000	0.301
Wellbeing	WEMWBS1	0.709	0.777	0.753	0.777	-0.044	0.000	0.055
	WEMWBS2	0.771		0.751		0.020	0.000	0.267
	WEMWBS3	0.795		0.760		0.034	0.000	0.061
	WEMWBS4	0.724		0.752		-0.028	0.000	0.162
	WEMWBS5	0.673		0.692		-0.019	-0.001	0.384
	WEMWBS6	0.807		0.780		0.027	0.000	0.147
	WEMWBS7	0.788		0.771		0.017	0.000	0.351
	WEMWBS8	0.882		0.872		0.010	0.000	0.310
	WEMWBS9	0.790		0.797		-0.007	0.000	0.671
	WEMWBS10	0.868		0.862		0.005	0.000	0.656
	WEMWBS11	0.705		0.687		0.019	0.000	0.412
	WEMWBS12	0.738		0.718		0.021	0.000	0.261
	WEMWBS13	0.749		0.794		-0.045	-0.001	0.009

Construct	Indicator Variables	Men		Women		Original Difference	Permutation Mean Difference	Permutation P Value
		Outer Loading	Average Loading	Outer Loading	Average Loading			
	WEMWBS14	0.875		0.878		-0.003	0.000	0.720

Note: * indicates significance at the $p < 0.05$ threshold.

Figure 1. Differences in the loadings and pathways of the structural equation model between the Men and Women.



Note: Blue numbers represent the outer loadings and path coefficients from the Men's Group, orange represents the Women Group. Bold arrows and text indicate statistically significant differences in pathways or loadings ($p < 0.00294$).

Appendix D: Single Variable Comparison of Education with Automatic Weighting for All Latent Variables

Table 1. MICOM Step 2 Assessing Compositional Invariance.

Latent Variable	Original correlation	Correlation Permutation Mean	Permutation P value
Digital Skills	0.967	0.979	0.176
Isolation	1.000	0.999	0.856
Loneliness	1.000	1.000	0.582
Wellbeing	1.000	1.000	0.011*

Note: *indicates the value is statistically significant at the $p < 0.05$ level, showing that there is a significant difference in the construction of Wellbeing between the School and University education groups.

Table 2. MICOM Step 3a Assessing Variance of the Latent Variable Means Between the School and University Groups.

Latent Variable	Original difference	Permutation Mean Difference	Permutation P value
Digital Skills	-0.115	<0.001	<0.001
Isolation	0.217	0.001	<0.001
Loneliness	0.076	<0.001	<0.001
Wellbeing	-0.200	-0.001	<0.001

Table 3. MICOM Step 3b Assessing Variance within the Construction of the Latent Variables Between the School and University Groups.

Latent Variable	Original difference	Permutation Mean Difference	Permutation P value
Digital Skills	0.355	<0.001	<0.001
Isolation	0.064	-0.001	0.195
Loneliness	0.003	-0.001	0.939
Wellbeing	0.191	<0.001	<0.001

Appendix E: Single Variable Comparison of Education with an Equal Weighting of Wellbeing

Table 1. MICOM Step 2 Assessing Compositional Invariance.

Latent Variable	Original correlation	Correlation Permutation Mean	Permutation P value
Digital Skills	0.967	0.979	0.176
Isolation	1.000	0.999	0.859
Loneliness	1.000	1.000	0.600
Wellbeing	1.000	1.000	0.223

Table 2. MICOM Step 3a Assessing Variance of the Latent Variable Means Between the School and University Groups.

Latent Variable	Original difference	Permutation Mean Difference	Permutation P value
Digital Skills	-0.115	<0.001	<0.001
Isolation	0.217	0.001	<0.001
Loneliness	0.076	<0.001	<0.001
Wellbeing	-0.202	-0.001	<0.001

Table 3. MICOM Step 3b Assessing Variance within the Construction of the Latent Variables Between the School and University Groups.

Latent Variable	Original difference	Permutation Mean Difference	Permutation P value
Digital Skills	0.354	<0.001	<0.001
Isolation	0.064	-0.001	0.195
Loneliness	0.003	-0.001	0.931
Wellbeing	0.195	<0.001	<0.001

Table 4. Internal consistency of the latent variables for the School and University data, alongside comparisons of the differences.

Latent Variable	Cronbachs α		Original Difference	Permutation Mean Difference	Permutation <i>P</i> Value
	School	University			
Digital Skills	0.805	0.784	0.021	<0.001	0.098
Isolation	0.873	0.866	0.007	<0.001	0.313
Loneliness	0.758	0.770	-0.011	<0.001	0.415
Wellbeing	0.952	0.948	0.005	<0.001	0.136

Table 5.

Convergent validity of the latent variables for the School and University data, alongside comparisons of the differences.

Latent Variable	Average Variance Explained (AVE)		Original Difference	Permutation Mean Difference	Permutation <i>P</i> Value
	School	University			
Digital Skills	0.298	0.319	-0.021	-0.003	0.505
Isolation	0.420	0.406	0.014	<0.001	0.323
Loneliness	0.509	0.521	-0.012	<0.001	0.380
Wellbeing	0.620	0.599	0.021	<0.001	0.132

Table 6.

Composite reliability of the latent variables for the School and University data, alongside comparisons of the differences.

Latent Variable	Rho a					Rho c				
	School	University	Original Difference	Permutation Mean Difference	Permutation P Values	School	University	Original Difference	Permutation Mean Difference	Permutation P Values
Digital Skills	0.679	0.786	-0.108	-0.011	0.100	0.797	0.816	-0.020	-0.004	0.434
Isolation	0.883	0.877	0.005	<0.001	0.443	0.896	0.890	0.006	<0.001	0.305
Loneliness	0.759	0.770	-0.012	<0.001	0.396	0.838	0.844	-0.006	<0.001	0.413
Wellbeing	0.952	0.948	0.005	<0.001	0.136	0.958	0.954	0.004	<0.001	0.134

Table 7.

Variance explained of the latent variables for the School and University data, alongside comparisons of the differences.

Latent Variable	R ² adj		Original Difference	Permutation Mean Difference	Permutation P Value
	School	University			
Isolation	0.041	0.055	-0.013	0.002	0.318
Loneliness	0.365	0.347	0.017	0.001	0.548
Wellbeing	0.416	0.406	0.010	0.001	0.747

Table 8.

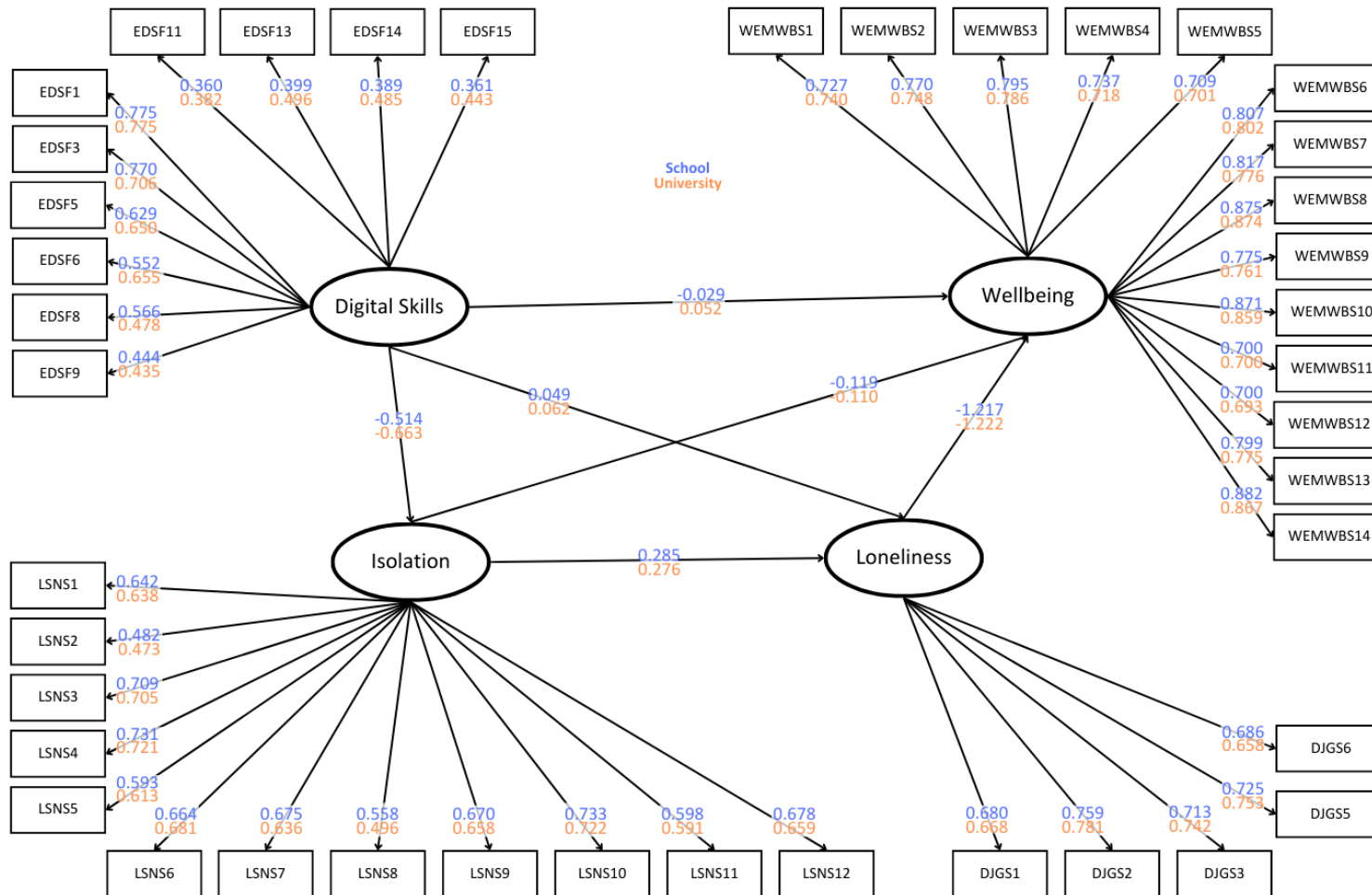
Assessment of the construct and indicator variable loadings for the School and University models, and an analysis of the differences between the groups.

Construct	Indicator Variables	School		University		Original Difference	Permutation Mean Difference	Permutation P Value
		Outer Loading	Average Loading	Outer Loading	Average Loading			
Digital Skills	EDSF1	0.775	0.525	0.775	0.551	0.001	-0.002	0.988
	EDSF3	0.770		0.706		0.064	-0.001	0.170
	EDSF5	0.629		0.650		-0.020	-0.006	0.754
	EDSF6	0.552		0.655		-0.103	-0.004	0.094
	EDSF8	0.566		0.478		0.088	<0.001	0.141
	EDSF9	0.444		0.435		0.009	0.001	0.879
	EDSF11	0.360		0.382		-0.022	-0.001	0.751
	EDSF13	0.399		0.496		-0.096	-0.005	0.268
	EDSF14	0.389		0.485		-0.095	-0.013	0.398
	EDSF15	0.361		0.443		-0.082	-0.012	0.473
Isolation	LSNS1	0.642	0.644	0.638	0.633	0.004	-0.002	0.892
	LSNS2	0.482		0.473		0.008	<0.001	0.836
	LSNS3	0.709		0.705		0.004	<0.001	0.854
	LSNS4	0.731		0.721		0.010	<0.001	0.627
	LSNS5	0.593		0.613		-0.020	-0.001	0.480
	LSNS6	0.664		0.681		-0.018	<0.001	0.470
	LSNS7	0.675		0.636		0.038	<0.001	0.164
	LSNS8	0.558		0.496		0.062	0.001	0.083
	LSNS9	0.670		0.658		0.012	0.001	0.666
	LSNS10	0.733		0.722		0.011	<0.001	0.614
	LSNS11	0.598		0.591		0.008	-0.001	0.823
	LSNS12	0.678		0.659		0.019	-0.001	0.494

Construct	Indicator Variables	School		University		Original Difference	Permutation Mean Difference	Permutation P Value
		Outer Loading	Average Loading	Outer Loading	Average Loading			
Loneliness	DJGLS1	0.680	0.713	0.668	0.720	0.012	<0.001	0.606
	DJGLS2	0.759		0.781		-0.022	<0.001	0.229
	DJGLS3	0.713		0.742		-0.029	0.000	0.155
	DJGLS5	0.725		0.753		-0.028	-0.001	0.192
	DJGLS6	0.686		0.658		0.028	<0.001	0.276
Wellbeing	WEMWBS1	0.727	0.785	0.740	0.771	-0.013	<0.001	0.542
	WEMWBS2	0.770		0.748		0.022	<0.001	0.232
	WEMWBS3	0.795		0.786		0.009	0.000	0.554
	WEMWBS4	0.737		0.718		0.019	<0.001	0.361
	WEMWBS5	0.709		0.701		0.008	-0.001	0.688
	WEMWBS6	0.807		0.802		0.005	-0.001	0.757
	WEMWBS7	0.817		0.776		0.041	<0.001	0.014
	WEMWBS8	0.875		0.874		0.001	-0.001	0.906
	WEMWBS9	0.775		0.761		0.014	<0.001	0.425
	WEMWBS10	0.871		0.859		0.012	<0.001	0.268
	WEMWBS11	0.729		0.700		0.029	<0.001	0.170
	WEMWBS12	0.700		0.693		0.007	0.001	0.786
	WEMWBS13	0.799		0.775		0.024	<0.001	0.126
	WEMWBS14	0.882		0.867		0.016	<0.001	0.103

Note: * indicates significance at the $p < 0.05$ threshold.

Figure 1. Differences in the loadings and pathways of the structural equation model between the School and University groups.



Note: Blue numbers represent the outer loadings and path coefficients from the School Group, orange represents the University Group. Bold arrows and text indicate statistically significant differences in pathways or loadings ($p < 0.00294$).

Appendix F: Information and Consent Form for the Housing Association Study



School of Psychology
Ysgol Seicoleg

Information and Consent Form

What is the study about?



We are researchers from Cardiff University, and we want to find out what people think about new 'smart speaker' devices (like the Amazon Alexa or Google Home). These are small devices that you have in your home, which you can control by speaking to them and asking questions and making requests. The smart speaker has lots of functions. For example, you can ask it to play music, and it can remind you to do things, tell you about the weather, news, and other information. We want to find out what people think about using smart speakers and how they might impact their day-to-day life.

What does the study involve?

As part of the study, you will receive a free smart speaker. Staff at your housing association will set up a [insert model name] smart speaker for you in your home. They will then set up a meeting with a researcher from Cardiff University called [researcher name], who will explain to you how to use the device. The researcher will also ask you to take part in an interview, which will take about an hour, and will ask you questions about your daily life, your thoughts and feelings, the things you find challenging or easy to do, and your technology use.

You will then be given the smart speaker to use at home for four months. If you have any problems using the smart speaker, you can call [researcher name] on [researcher number] or ask one of the staff at your housing association.

At the end of the four months, you'll have another interview with [researcher name], which will take about an hour. They will ask you questions about your experience of using the devices and also repeat some of the questions about your daily life and thoughts and feelings.

The researcher will meet with you once more after 12 months, to interview you again for about an hour and see if anything has changed and what your experience with the devices has been.

Smart speaker information

It is possible to make purchases with smart speakers, but this function will be turned off.

Smart speakers will constantly listen for the wake word [alexa/hey google], but it will not record this information and send it to Amazon/Google. If you say the wake word, the device will start recording any sounds in the room and send these to your amazon/google account.

Good/amazon are able to use the recording to improve their services. If you don't want the device to monitor for the wake word you can switch it off at the plug socket.

We are collecting two types of information from the devices: 1. Activity log and 2. Audio recordings. These recordings will be stored confidentially, only seen/heard by the small research team and recordings will be deleted after the research is completed. If you would prefer not to share this information with us, then you can still participate in the study. If you would like us to delete any or all of the recordings at any point, just get in touch and we will delete them permanently.

1. Activity log: This is a log in your smart speaker app that shows what questions have been asked to the smart speaker and when. It is in text format.

2. Audio recordings: This is the recordings of the verbal interactions with your smart speaker that are stored in your account. The smart speaker only records when it is activated by the wake word. You can see when the smart speaker is recording as the light will be on/flashing when it is activated and recording. There is the potential for the smart speaker to record the voices of people who are visiting you and have not agreed to take part in the research study, therefore we would advise you to ask visitors not to use the smart speaker. The small team of researchers who can access the recordings will also delete any that include unknown voices. All recordings will be stored confidentially and will not be shared or distributed. The only exception to this is if the recordings contain disclosures of certain types of illegal activities (physical or sexual abuse of minors, the physical abuse of vulnerable adults, money laundering, and terrorism), were there is a legal obligation to report them to the local authority or police.

Why do we want to look at this information?

The reason we are collecting this information is so that we can assess what features are used and the amount and type of errors.



What are the benefits and risks of taking part?

The results of this study will help us to find out what people think about using smart speakers, and if they are useful in day-to-day life. One of the benefits of the study is that you get to keep a free smart speaker.

There are no major risks to taking part. All data will be securely stored and confidential, meaning that it will only be accessible to the researchers in this study. It will not be shared or sold to any third parties. Any presentation or publication of the data will be completely anonymous, which means it will not be possible to personally identify you. The data will be retained for 10 years and then destroyed.

Can I change my mind about taking part?

You can withdraw from the study at any point without giving a reason, even once the study has started. To withdraw, simply tell a member of staff at your housing association to call [researcher name] on [researcher phone number].

If you have any questions or worries about the study, please contact [researcher name] on [research number].

If you have any ethical concerns about the research, please contact:

School of Psychology Research Ethics Committee

Cardiff University, 70 Park Place, Cardiff, CF10 3AT

psychethics@cardiff.ac.uk

[029 2087 6707](tel:02920876707)

Please tick the box

if you agree



I am happy to take part in this study	
I am happy to share the activity log from my smart speaker	
I am happy to share the audio recordings from my smart speaker	

Signed.....

Date.....

Appendix G. Interview Schedule for the Housing Association Study

Baseline interview

- Could you tell me about some of your interests and hobbies? What do you like to do in your spare time?
- How has the COVID-19 pandemic affected your life?
- Can you tell me about the devices you use in your daily life? For example, how often do you use them and for what sort of things?
- Do you use any assistive technologies to help you do things in day-to-day life?
- Did you use technology more or less during the pandemic?
- Do you face any barriers to using technology?
 - If you do face barriers, do you receive any help and support to use them?
- If you had a smart speaker, what do you think you would use it for?

T1 and T2 Interviews

- Do you like using the smart speaker?
- What do you like about it?
- What do you use the smart speaker for?
 - Do you use it for making phone calls or video calls?
 - Do you use it like a virtual companion?
 - Do you use it to control the home environment?
- How often do you use smart speaker?
- Do you tend to use the smart speaker when you're alone or when other people are around?
 - Do you find that you use it differently when other people are around?
- Did someone help you to learn to use it?
- Did you have enough training to understand how to use the device?
- Did the smart speaker change how well you could do things for yourself?
- Did the smart speaker ever frustrate you?
- Do you have any concerns about using the device?
- Do you ever worry about privacy or security?
- In what way did you find Alexa similar or different to a real person?
- Does Alexa provide company? E.g. when you're alone?
- Do you ever see the smart speaker as a friend or companion?

Appendix H: Database Search Terms for Scoping Review

Table 1. Databases searched and search strings used on 2nd of February 2024 to identify literature relevant for this scoping review.

Database	Search query	Results
Web of Science	(AB=("google home" OR "google assistant" OR "google nest" OR "amazon Alexa" OR "amazon echo" OR "amazon echo dot" OR "apple Siri" OR "apple Homepod" OR "virtual assistant*" OR "virtual home assistant*" OR "virtual personal assistant*" OR "digital assistant*" OR "voice assistant*" OR "voice enabled assistant*" OR "voice enabled personal assistant*" OR "voice interactive assistant*" OR "voice interactive personal assistant*" OR "voice initiated assistant*" OR "voice initiated personal assistant*" OR "voice powered assistant*" OR "voice powered personal assistant*" OR "voice operated assistant*" OR "voice operated personal assistant*" OR "voice activated assistant*" OR "voice activated personal assistant*" OR "voice controlled assistant*" OR "voice controlled personal assistant*" OR "voice controlled intelligent personal assistant*" OR "voice interactive device*" OR "voice interactive technolog*" OR "voice interactive system*" OR "voice interactive interface*" OR "interactive voice assistant*" OR "interactive voice technolog*" OR "interactive voice system*" OR "interactive voice interface*" OR "artificial intelligen* assistant*" OR "artificial intelligen* powered assistant*" OR "smart speaker*" OR "smart home speaker*" OR "smart assistant*" OR "smart home assistant*" OR "conversational system*" OR "conversational interface*" OR "conversational agent*" OR "conversational device*" OR "conversational technolog*" OR "conversational assistant*" OR "intelligent personal assistant*" OR "intelligent dialogue agent*")) AND AB= (("compan*" NOT "companies") OR "social\$" OR "friend\$" OR "lonel\$" OR "isolat\$" OR "buddy" OR "pal" OR "mate" OR "relat\$"))	813
ACM	[[Abstract: ab=] OR [Abstract: "google home"] OR [Abstract: "google assistant"] OR [Abstract: "google nest"] OR [Abstract: "amazon Alexa"] OR [Abstract: "amazon echo"] OR [Abstract: "amazon echo dot"] OR [Abstract: "apple Siri"] OR [Abstract: "apple Homepod"] OR [Abstract: "virtual assistant*"] OR [Abstract: "virtual home assistant*"] OR [Abstract: "virtual personal assistant*"] OR [Abstract: "digital assistant*"] OR [Abstract: "voice assistant*"] OR [Abstract: "voice enabled assistant*"] OR [Abstract: "voice enabled personal assistant*"] OR [Abstract: "voice interactive assistant*"] OR [Abstract: "voice interactive personal assistant*"] OR [Abstract: "voice initiated assistant*"] OR [Abstract: "voice initiated personal assistant*"] OR [Abstract: "voice powered assistant*"] OR [Abstract: "voice powered personal assistant*"] OR [Abstract: "voice operated assistant*"] OR [Abstract: "voice operated personal assistant*"] OR [Abstract:	1148

Database	Search query	Results
	"voice activated assistant*" OR [Abstract: "voice activated personal assistant*" OR [Abstract: "voice controlled assistant*" OR [Abstract: "voice controlled personal assistant*" OR [Abstract: "voice controlled intelligent personal assistant*" OR [Abstract: "voice interactive device*" OR [Abstract: "voice interactive technolog*" OR [Abstract: "voice interactive system*" OR [Abstract: "voice interactive interface*" OR [Abstract: "interactive voice assistant*" OR [Abstract: "interactive voice technolog*" OR [Abstract: "interactive voice system*" OR [Abstract: "interactive voice interface*" OR [Abstract: "artificial intelligen* assistant*" OR [Abstract: "artificial intelligen* powered assistant*" OR [Abstract: "smart speaker*" OR [Abstract: "smart home speaker*" OR [Abstract: "smart assistant*" OR [Abstract: "smart home assistant*" OR [Abstract: "conversational system*" OR [Abstract: "conversational interface*" OR [Abstract: "conversational agent*" OR [Abstract: "conversational device*" OR [Abstract: "conversational technolog*" OR [Abstract: "conversational assistant*" OR [Abstract: "intelligent personal assistant*" OR [Abstract: "intelligent dialogue agent*"] AND [[Abstract: ab=] OR [[Abstract: "compan*" AND NOT [Abstract: "companies"] OR [Abstract: "social\$"] OR [Abstract: "friend\$"] OR [Abstract: "lonel*" OR [Abstract: "isolat*" OR [Abstract: "buddy"] OR [Abstract: "pal"] OR [Abstract: "mate"] OR [Abstract: "relat\$"]]]	
Scopus	TITLE-ABS-KEY (("google home" OR "google assistant" OR "google nest" OR "amazon Alexa" OR "amazon echo" OR "amazon echo dot" OR "apple Siri" OR "apple Homepod" OR "virtual assistant*" OR "virtual home assistant*" OR "virtual personal assistant*" OR "digital assistant*" OR "voice assistant*" OR "voice enabled assistant*" OR "voice enabled personal assistant*" OR "voice interactive assistant*" OR "voice interactive personal assistant*" OR "voice initiated assistant*" OR "voice initiated personal assistant*" OR "voice powered assistant*" OR "voice powered personal assistant*" OR "voice operated assistant*" OR "voice operated personal assistant*" OR "voice activated assistant*" OR "voice activated personal assistant*" OR "voice controlled assistant*" OR "voice controlled personal assistant*" OR "voice controlled intelligent personal assistant*" OR "voice interactive device*" OR "voice interactive technolog*" OR "voice interactive system*" OR "voice interactive interface*" OR "interactive voice assistant*" OR "interactive voice technolog*" OR "interactive voice system*" OR "interactive voice interface*" OR "artificial intelligen* assistant*" OR "artificial intelligen* powered assistant*" OR "smart speaker*" OR "smart home speaker*" OR "smart assistant*" OR "smart home assistant*" OR "conversational system*" OR	2074

Database	Search query	Results
	"conversational interface*" OR "conversational agent*" OR "conversational device*" OR "conversational technolog*" OR "conversational assistant*" OR "intelligent personal assistant*" OR "intelligent dialogue agent*") AND (("compan*" not "companies") OR "friend\$" OR "lonel*" OR "isolat*" OR "buddy" OR "pal" OR "mate" OR "social\$" OR "relat\$")	
Science direct	("google home" OR "google nest" OR "amazon Alexa" OR "virtual assistant\$" OR "smart speaker") AND ("compan\$" OR "friend\$" OR "lonel\$" OR "isolat\$" OR "social\$" OR "relat\$")	806
Total including duplicates		4841
Number of duplicate articles removed		832
Articles remaining		4009

Appendix I: Coding of the qualitative survey responses as part of the content analysis

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Code

Codes\\Barriers to Use\\New\\Choosing Not to Use

Dataset

Files\\Qualitative_Only

No	0.0006	5			
			1	CEG	28/06/2023 17:10
have a smart speaker and other devices which could voice control but I choose not to use it					
			2	CEG	28/06/2023 17:11
Have not used it since Christmas 2020 because we were given a Dab Radio as a present which we prefer					
			3	CEG	28/06/2023 17:12
I have not used my smart speaker in the last 6 months					
			4	CEG	28/06/2023 17:12
If it would do what I say it'd be useful but as it ignores me I don't use it.					
			5	CEG	28/06/2023 17:13
No use at all to me. It came with my 4k Amazon Firestick as an unwanted addition in the handset					

Codes\\Barriers to Use\\New\\Choosing Not to Use\\Lack of Perceived Benefit

Dataset

Files\\Qualitative_Only

No	0.0007	7
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1	CEG	28/06/2023 17:14
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but of limited use at present

Formatted Reports\\Coding Summary by Code Formatted Report

Page 1 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			2		CEG	28/06/2023 17:11
Mine came as a 'gift' with another item. i have tried it out, but personally I do not think it enhances my life enough to use it. It now lives in a drawer with the other items that fail to live up to their promise.						
			3		CEG	28/06/2023 17:12
No benefit to me , it was a gift.						
			4		CEG	28/06/2023 17:16
My Alexa was a gift ,i would not have bought it myself . It does not add much to my life . I mainly use it to check the weather forecast or to check the time.						

	5	CEG	28/06/2023 17:20
It was free with a tv, I do not feel the need to have one			
	6	CEG	28/06/2023 17:21
It was bundled together with my Hive heating control system and I'm not sure it brings me any benefits			
	7	CEG	28/06/2023 17:13
I was given my smart speaker as a present. I see it up and evaluated it. I did not see it delivering enough benefits to make the security risks worthwhile. Accordingly, I stopped using the smart speaker.			

Codes\\Barriers to Use\\New\\Choosing Not to Use\\Novelty Wearing Off

Dataset

Files\\Qualitative_Only

No	0.0005	4			
	1	CEG	28/06/2023 17:19		
Only really used it the first few months of buying it, as i tend to use it for music i tend to use my phone for everything id use the dot for					
	2	CEG	29/06/2023 11:37		
I don't use it enough as I can't think what use it is apart from listening to music, or asking it random questions which loses its appeal after a bit.					
	3	CEG	28/06/2023 17:19		
Not as useful as I first thought					

Unfortunately I only have one item on the speaker and don't know how to put any others on it. So as you know gets very boring

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Barriers to Use\\New\\Choosing Not to Use\\Privacy Concerns

Dataset

Files\\Qualitative_Only

No	0.0004	4				
			1	CEG	28/06/2023 17:10	very useful item, but I'm worried about my privacy so use it very little.
			2	CEG	28/06/2023 17:11	I do not use it because I do not trust the service provider in terms of security of information.
			3	CEG	28/06/2023 17:11	doesn't trust the device and won't have it on.

4 CEG 28/06/2023 17:13

I was given my smart speaker as a present. I see it up and evaluated it. I did not see it delivering enough benefits to make the security risks worthwhile. Accordingly, I stopped using the smart speaker.

Codes\\Barriers to Use\\New\\Not Knowing How to Use\\Limited Functions Accessed

Dataset

Files\\Qualitative_Only

No 0.0031 22

1 CEG 28/06/2023 17:15

use it mainly to play music & rarely use it for any other purpose- it's something that adds very little to my life.

2 CEG 28/06/2023 17:15

Don't really use it much,it is easy to use though.

3 CEG 28/06/2023 17:15

Can answer questions but don't use much

4 CEG 28/06/2023 17:11

It is an easy way to have access to music and news programmes. I wouldn't use it for much else.

5 CEG 29/06/2023 11:38

Was given as a gift from my daughter. I am still getting used to it. I only use it to access the weather and radio

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			6	CEG	28/06/2023 17:16	I only listen to music on it .
			7	CEG	28/06/2023 17:16	My Alexa was a gift ,i would not have bought it myself . It does not add much to my life . I mainly use it to check the weather forecast or to check the time.
			8	CEG	28/06/2023 17:16	I only switch Alexa on when I have visitors and want to play music on the patio.
			9	CEG	29/06/2023 11:38	I mostly use it as a radio to be moved around the house
			10	CEG	29/06/2023 11:38	I dont feel I use the speaker to it's full potential, mainly use as a speaker for music/radio.
			11	CEG	28/06/2023 17:16	Handy for finding a film or tv programme to watch ,that's all it is used for very occasionally
			12	CEG	28/06/2023 17:17	Used for me only for music and news/weather.
			13	CEG	28/06/2023 17:19	

I only use my Alexa because my partner bought it- I use it for the radio, setting a timer for dinner and asking about the weather forecast.

	14	CEG	29/06/2023 11:39
Only use music			
	15	CEG	28/06/2023 17:20
I mainly use it as a timer, reminder to take medicine etc. It was a preset			
	16	CEG	29/06/2023 11:40
I mainly use it for music and answering questions			
	17	CEG	29/06/2023 11:39
It was a gift to provide voice activated alarm clock, which it does. It also provides easy to access radio and that is all I use it for			
	18	CEG	29/06/2023 11:41
My son gave it me so i can always have latest photos of him and the family. That's about 95% of its use to me!			
	19	CEG	29/06/2023 11:41
Handy for radio and relaxation type stuff (play the sound of waves or play the noise of a crackling fire), that's all i really use it (i have two really) for			
	20	CEG	28/06/2023 17:21
It was a Christmas gift. Use it Saturday/Sunday am .Used to use it as an alarm for outings/trips			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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	21	CEG	29/06/2023 11:41
As I only use it for music and weather, it's just an addition tool for me			

	22	CEG	29/06/2023 11:42
convenient to provide music which is my only need for			

Codes\\Barriers to Use\\New\\Not Knowing How to Use\\Limited Functions Accessed\\Not Knowing What Functions Are Available

Dataset

Files\\Qualitative_Only

No	0.0013	12
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	1	CEG	28/06/2023 17:21
Can be a bit daunting to use at first.			

	2	CEG	29/06/2023 11:35
Difficult to know the full range of commands and features available and when new ones are added.			

	3	CEG	29/06/2023 11:37
I don't see any apart from not using it to it's full capacity-			

	4	CEG	29/06/2023 11:37
I don't use it enough as I can't think what use it is apart from listening to music, or asking it random questions which loses its appeal after a bit.			

5 CEG 29/06/2023 11:37
. I dont really know what to do with it,

6 CEG 29/06/2023 11:37
only use it for radio upstairs as do not know what else I would use it for

7 CEG 29/06/2023 11:38
I can't be bothered to work out what else I can do with it.

8 CEG 28/06/2023 17:12
Was given as a gift from my daughter. I am still getting used to it. I only use it to access the weather and radio

9 CEG 29/06/2023 11:40
I'm still learning what it is capable of.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			10	CEG	29/06/2023 11:39	My main use is to listen to the radio and music but I sometimes struggle as you need to know exactly what to ask for whereas if I were using my phone I would search. I know I don't use them to their full potential but they are handy to have, especially as my husband can send me a voice message when I'm in another room.
			11	CEG	29/06/2023 11:40	Used almost exclusively for listening to radio programmes on DAB. Therefore I realise that I must find out more about other possible uses.

12 CEG 29/06/2023 11:42

I need to do more research on it. I don't use it to it's full capacity.

Codes\\Barriers to Use\\New\\Not Knowing How to Use\\Too Complex

Dataset

Files\\Qualitative_Only

No 0.0006 6

1 CEG 29/06/2023 11:36

My husband deals with settings and apps etc. I would not know what to do.

2 CEG 29/06/2023 11:36

Drawbacks include difficulty configuring htem - my husband did it, and onlyy two of teh three will actually paly BBC radio, he cannot get teh third one to do so. That is very irritating

3 CEG 29/06/2023 11:37

Upgrading software often means changes to general running of applications so each new version could be slightly different with menus and choices changing making it potentially time consuming to find what you want to play.

4 CEG 29/06/2023 11:42

I dont really understand it

5 CEG 29/06/2023 11:42

I am sure they can be more useful but I don't know how to function it

to complex and no instruction manual

Formatted Reports\\Coding Summary by Code Formatted Report

Page 6 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Barriers to Use\\New\\Not Knowing How to Use\\Too Complex\\Lack of Instruction

Dataset

Files\\Qualitative_Only

No 0.0004 5

1 CEG 28/06/2023 17:22

You have to learn to talk to it differently to normal speech so that it does the right thing and understands you i.e. you have to talk simply with clearly defined parameters.

2 CEG 29/06/2023 11:36

These devices should come with instruction book to learn how to use device to its full potential

3 CEG 29/06/2023 11:39

Frustrated I can't do more with it due to lack of easy instructions.

	4	CEG	29/06/2023 11:41
to complex and no instruction manual			
	5	CEG	29/06/2023 11:42
these items should come with written instructions. How are you expected to know how to do things.?			

Codes\\Barriers to Use\\New\\Not Knowing How to Use\\Too Complex\\Need to Learn or be Taught

Dataset

Files\\Qualitative_Only

No	0.0007	6			
	1	CEG	29/06/2023 11:45		
Don't like that they are changing/updating regularly and thus we have to learn how to use all over again.					
	2	CEG	29/06/2023 11:45		
when link is down I sometimes can't restore connex and need to ask my husband for help					
	3	CEG	29/06/2023 11:44		
Only acquired recently my husband is teaching me as he sets it up					
	4	CEG	29/06/2023 11:44		

I haven't learned to use it properly. Because of the covid lock down I've had to try and set it up on my own without help from other people who know more about the smart speaker and it's uses

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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5 CEG 29/06/2023 11:44

I dont have time to learn its different uses.

6 CEG 29/06/2023 11:46

I haven't used it yet even though I've had it for 8 months, I get my entertainment from BBC radio 4. I am not computer literate and don't know how to become so

Codes\\Benefits\\Social Value\\Companionship

Dataset

Files\\Qualitative_Only

No 0.0006 13

1 CEG 19/06/2023 11:26

Company as a benefit

Company	2	CEG	19/06/2023 14:02
company	3	CEG	19/06/2023 15:23
company,	4	CEG	19/06/2023 15:26
Company,	5	CEG	19/06/2023 18:10
It can provide company,	6	CEG	19/06/2023 18:12
, it's company when I'm working and eating there	7	CEG	20/06/2023 15:52
If you need entertainment and company it seems a good idea	8	CEG	21/06/2023 11:13
Company for older persons	9	CEG	21/06/2023 11:42

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				10	CEG	21/06/2023 11:44
	it keeps me company					
				11	CEG	22/06/2023 15:18
	I think it is a good device otherwise and is company for me.					
				12	CEG	23/06/2023 10:35
	Company					
				13	CEG	23/06/2023 10:39
	It is a useful asset to the home and can provide company and support people.					

Codes\\Benefits\\Social Value\\Companionship\\For Lonely or Isolated Individuals

Dataset

Files\\Qualitative_Only

No	0.0010	11				
			1	CEG	27/06/2023 16:04	
It is company when I'm on my own						

2	CEG	27/06/2023 16:04
Feeling of not being alone for some people.		

3	CEG	27/06/2023 16:05
. Also if you live alone I can see that they might provide some company day to day.		

4	CEG	27/06/2023 16:05
I live alone and listening to music of my choice or the radio helps overcome the ' silence'		

5	CEG	27/06/2023 16:05
I feel less lonely.		

6	CEG	27/06/2023 16:05
Company for lonely people.		

7	CEG	27/06/2023 16:05
Useful if alone for company		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				8	CEG	27/06/2023 16:06
				They help to keep me company as I live alone and are alone most of the time.		
				9	CEG	27/06/2023 16:06

Helps with loneliness

	10	CEG	27/06/2023 16:07
People living in their own feel less isolated			
	11	CEG	27/06/2023 16:07
Company if alone			

Codes\\Benefits\\Social Value\\Companionship\\Someone to Talk to

Dataset

Files\\Qualitative_Only

No	0.0002	4			
			1	CEG	27/06/2023 16:05
something to talk to in the morning					
			2	CEG	27/06/2023 16:06
Someone to talk to					
			3	CEG	27/06/2023 16:06
And even the happy Birthday song to just saying Good Morning to Good Night					
			4	CEG	27/06/2023 16:06

It's someone to chat too

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
Codes\\Benefits\\Social Value\\Connecting with Loved Ones						
Dataset						
Files\\Qualitative_Only						
No		0.0005	8			
				1	CEG	19/06/2023 14:05
Biggest benefit is comms with other relatives						
				2	CEG	20/06/2023 11:38

To have contact with my grandchildren and other members of my family

	3	CEG	20/06/2023 14:06
We also use it to speak to relatives,			
	4	CEG	20/06/2023 16:10
Good for communicating with others and sharing via family accounts			
	5	CEG	21/06/2023 11:00
We have used it to make phone calls			
	6	CEG	23/06/2023 10:36
Keeping in touch with family			
	7	CEG	23/06/2023 10:36
Drop in on elderly parents			
	8	CEG	23/06/2023 13:07
to chat to family member in another room			

Codes\\Benefits\\Social Value\\Connecting with Loved Ones\\Being Able to See Loved Ones

Dataset

Files\\Qualitative_Only

No 0.0006 8

1 CEG 27/06/2023 15:57

Visual contact with family members Effective only if they too have the app

Formatted Reports\\Coding Summary by Code Formatted Report

Page 11 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			2	CEG	27/06/2023 15:58	Sing happy birthday to somebody we are FaceTiming on their birthday.
			3	CEG	27/06/2023 15:57	Our children like the idea of using it to get in touch and see us.
			4	CEG	27/06/2023 15:58	I use to FaceTime
			5	CEG	27/06/2023 15:57	video calling aged relatives
			6	CEG	27/06/2023 15:58	and make video calls,
			7	CEG	27/06/2023 15:58	Easy hands free use for phone/video calls

	8	CEG	27/06/2023 15:58
Being able to speak to and see family during lockdown			

Codes\\Benefits\\Social Value\\Connecting with Loved Ones\\Without Cost

Dataset

Files\\Qualitative_Only

No	0.0001	2			
			1	CEG	27/06/2023 15:59
Call mobiles (family members) without having a bill					
			2	CEG	27/06/2023 15:59
It saves money. When keeping in touch with family.					

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Benefits\\Wellbeing\\Emotional Wellbeing

Dataset

Files\\Qualitative_Only

No	0.0001	2				
			1	CEG	27/06/2023 16:05	
I feel less lonely.						
			2	CEG	27/06/2023 16:06	
Helps with loneliness						

Codes\\Benefits\\Wellbeing\\Emotional Wellbeing\\Mental Health

Dataset

Files\\Qualitative_Only

No	0.0002	2				
			1	CEG	28/06/2023 10:21	

I love music and its positive effect on my mental health, the smart speaker can help me access and explore new genres, singers and composers.

	2	CEG	28/06/2023 10:23
, bought one for my mum in law when she was shielding and it improved her mental state significantly in between listening to Cliff Richard			

Codes\\Benefits\\Wellbeing\\Emotional Wellbeing\\Relaxation

Dataset

Files\\Qualitative_Only

No	0.0003	4			
			1	CEG	28/06/2023 10:21
its ok for now helps me relax					

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				2	CEG	28/06/2023 10:21
helps to relax you when going to sleep and waking you up in the morning						

3	CEG	28/06/2023 10:24
relaxation type stuff (play the sound of waves or play the noise of a crackling fire),		

4	CEG	28/06/2023 10:25
My benefits are listening and relaxing to music..		

Codes\\Benefits\\Wellbeing\\Emotional Wellbeing\\Uplifting

Dataset

Files\\Qualitative_Only

No	0.0004	6
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1	CEG	28/06/2023 10:21
I also use my echo spot device in my kitchen to sing-along to music to help improve my mood.		

2	CEG	28/06/2023 10:21
Washandy during my maternity leave to keep spirits up.		

3	CEG	28/06/2023 10:22
MY DAILY SING - A - LONGS WITH ALEXA ARE A FEEL GOOD TREAT		

4	CEG	28/06/2023 10:24
Makes me happy to play music and know the news and weather.		

5 CEG 28/06/2023 10:24

Her cheesy jokes of the day I will sometimes ask just to bring a smile. Her fart and burp sounds apps are hilarious.

6 CEG 28/06/2023 10:25

I love music and it makes me be happier

Formatted Reports\\Coding Summary by Code Formatted Report

Page 14 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Benefits\\Wellbeing\\Independence

Dataset

Files\\Qualitative_Only

No 0.0005 5

1 CEG 19/06/2023 13:48

I can do more things for myself like turning heating up or off.

2	CEG	19/06/2023 15:20
eventually increased independence in later years		
3	CEG	21/06/2023 14:32
She wanted to stay in her own home and this feature provided her with some independence to accomplish this.		
4	CEG	22/06/2023 15:07
It can be used to summon help should I have called fall. That's why it was bought for me.		
5	CEG	23/06/2023 11:33
My family bought me the smart speaker as a safety measure because I live on my own and they want me to have a means of contacting them if I have a fall or hurt myself and cannot reach my phone		

Codes\\Benefits\\Wellbeing\\Physical health

Dataset

Files\\Qualitative_Only

No	0.0002	2
1	CEG	20/06/2023 16:20
This apparatus actually helps with my physical health and gives that extra security if I required urgent support, such as if I had fallen I can ask Alexa to ring a nominated name.		
2	CEG	22/06/2023 15:07
It can be used to summon help should I have called fall. That's why it was bought for me.		

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
Codes\\Fears\\Becoming Dependent						
Dataset						
Files\\Qualitative_Only						
No		0.0002	3			
				1	CEG	19/06/2023 15:29
. A drawback may be the reliance that we put on it.						
				2	CEG	20/06/2023 16:28
To much Reliance on technology						
				3	CEG	23/06/2023 11:10
Drawbacks that you could become dependent on such devices if not careful.						

Codes\\Fears\\Becoming Dependent\\If it stops working

Dataset

Files\\Qualitative_Only

No	0.0002	4
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1	CEG	26/06/2023 13:34
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it would not be good to become dependant on one in case the internet goes down or it goes faulty.

2	CEG	26/06/2023 13:34
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Drawbacks would be becoming reliant on this in case it breaks down or there is a powercut!!!

3	CEG	26/06/2023 13:37
---	-----	------------------

but if there is any interruption in the Internet service then obviously this can have quite an impact expecially if you are relying on it to take medication

4	CEG	26/06/2023 13:39
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relying too much on it when it may fail

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Fears\\Becoming Dependent\\If it stops working\\Taking Medication

Dataset

Files\\Qualitative_Only

No	0.0000	1	1	CEG	26/06/2023 13:37
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but if there is any interruption in the Internet service then obviously this can have quite an impact expecially if you are relying on it to take medication

Codes\\Fears\\Becoming Dependent\\On accuracy of information

Dataset

Files\\Qualitative_Only

No	0.0000	1
		1
	CEG	26/06/2023 13:39

Over reliance that info given is accurate

Codes\\Fears\\Becoming Dependent\\Unable to communicate with people

Dataset

Files\\Qualitative_Only

No	0.0001	1
		1
	CEG	26/06/2023 13:39

I am also careful not to become too reliant on it or allow my children to be (as much as ica n, although they are nearly adults and have their own views!) as I think this generation and the next ones to come are losing the ability to actually communicate person to person which is having a negative effect on the population and society of today.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
Codes\\Fears\\Becoming Lazy						
Dataset						
Files\\Qualitative_Only						
No		0.0012	11			
				1	CEG	20/06/2023 14:19
can make people lazy						
				2	CEG	20/06/2023 15:42
Being lazy and putting a timer on the Xmas tree lights						
				3	CEG	20/06/2023 15:56
for lazy people						
				4	CEG	20/06/2023 17:15
Makes you lazy!						
				5	CEG	20/06/2023 17:18
Can make you lazy for example turning lamps on and off						
				6	CEG	20/06/2023 17:40
are can make people lazy... turn lights on, draw curtains totally unnecessary.						
				7	CEG	21/06/2023 11:06

Can make u lazy using other features ie switching on & off lights

	8	CEG	21/06/2023 11:16
Make you lazy eg turn on light on			
	9	CEG	21/06/2023 11:32
it's just there, it's another reason to make people lazy			
	10	CEG	22/06/2023 14:58
Drawback, it makes me lazy.			
	11	CEG	23/06/2023 10:38
But makes you lazy.			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Fears\\Becoming Lazy\\Negative Health Impact

Dataset

Files\\Qualitative_Only

No 0.0002 3

1 CEG 26/06/2023 13:24

Drawbacks are that it is making me move less and less, which means I'm getting unhealthier

2 CEG 26/06/2023 13:25

I suppose it does stop you physically getting up and turning off the light yourself, which would be better for your health.

3 CEG 26/06/2023 13:26

Gall wneud unigolion yn ddiog, a felly magu gwendidau corfforol.

Codes\\Fears\\Becoming Lazy\\Reducing Movement and Exercise

Dataset

Files\\Qualitative_Only

No 0.0005 8

1 CEG 26/06/2023 13:13

Makes me lazy as I don't have to move around to turn on lights and kettle etc

2 CEG 26/06/2023 13:24

Drawbacks are that it is making me move less and less, which means I'm getting unhealthier

3 CEG 26/06/2023 13:24
Drawbacks: Less exercise.

4 CEG 26/06/2023 13:24
I don't need to leave the sofa to turn the lights on and off, both a benefit and a curse

5 CEG 26/06/2023 13:24
makes me lazy because I can shout instead of getting up to turn a switch.

6 CEG 26/06/2023 13:25
A portal to accessing more expensive equipment to stop me exercising after my stroke.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			7	CEG	26/06/2023 13:25	I suppose it does stop you physically getting up and turning off the light yourself, which would be better for your health.
			8	CEG	26/06/2023 13:26	Smart speakers can make you lazy by encouraging you to ask it to put lights on or off, see who is at the door or turn the TV or radio on. Reducing the times you have to stand up or walk around your home.

Codes\\Fears\\Privacy Concerns

Dataset

Files\\Qualitative_Only

No	0.0019	29			
			1	CEG	19/06/2023 14:01
I intend to use my own internal secure device set up with extra security and firewalls					
			2	CEG	19/06/2023 15:25
Potentially data privacy issues.					
			3	CEG	19/06/2023 17:43
Just concerns about extent of privacy.					
			4	CEG	19/06/2023 18:14
Drawbacks is my personal information inclusive of what is being researched etc is of personal value. Amazon & the like get it for free.... That's completely wrong! Copyright infringements for every single person on the planet would put these companies under. No-one would seriously give their information away without benefit. Problem is we don't benefit. Technology causes more problems than solving them.					
			5	CEG	20/06/2023 11:28
Drawbacks are retention of data snd invasion of privacy					
			6	CEG	20/06/2023 11:29
Small risks about privacy					
			7	CEG	20/06/2023 14:12
I do worry about privacy .					
			8	CEG	20/06/2023 14:27

Big Brother potential

9 CEG 20/06/2023 15:39

drawbacks - lack of privacy

Formatted Reports\\Coding Summary by Code Formatted Report

Page 20 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				10	CEG	20/06/2023 15:44
	I have concerns about privacy and intend to check those settings again.					
				11	CEG	20/06/2023 15:46
	I'm weary of the privacy issues.					
				12	CEG	20/06/2023 16:28
	Privacy -					
				13	CEG	20/06/2023 16:30
	Concerns about what my data is used for					
				14	CEG	20/06/2023 16:30
	privacy is a worry					
				15	CEG	21/06/2023 10:56
	Easily invade privacy if not controlled correctly.					

Privacy	16	CEG	21/06/2023 11:19
drawbacks are concerns about data security	17	CEG	21/06/2023 11:33
: keeping up with privacy,	18	CEG	21/06/2023 14:28
Privacy	19	CEG	22/06/2023 15:01
Mildly concerned about the privacy issues.	20	CEG	22/06/2023 15:08
Bad___privacy issues	21	CEG	22/06/2023 15:13
Privacy	22	CEG	22/06/2023 15:14
Drawback is a nagging doubt about privacy and 'big brother' syndrome happening.	23	CEG	22/06/2023 15:40
Drawbacks PRIVACY	24	CEG	23/06/2023 10:49

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
	privacy			25	CEG	23/06/2023 11:08
	I think it should be clearly explained that you need to agree to certain privacy settings when setting it up.			26	CEG	23/06/2023 11:10
	Data privacy			27	CEG	23/06/2023 11:36
	drawbacks are my privacy/security			28	CEG	23/06/2023 13:10
	Privacy.			29	CEG	23/06/2023 13:12

Codes\\Fears\\Privacy Concerns\\Control of Connected Devices

Dataset

Files\\Qualitative_Only

No	0.0002	3
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	1	CEG	26/06/2023 14:35
I won't buy the lights as I worry Alexa will take over the house like a Sci fi movie but I could be being dramatic			
	2	CEG	26/06/2023 14:41
I worry a bit about privacy issues. If connected to household appliances such as cookers etc I worry it can be hacked and misused.			
	3	CEG	26/06/2023 14:46
Possible security risk, someone could intercept signals to gain access to house.			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
Codes\\Fears\\Privacy Concerns\\Financial exploitation						
Dataset						

Files\\Qualitative_Only

No 0.0011 13

1	CEG	19/06/2023 15:28
. A profile is being captured of my listening habits in preparation of feeding me paid for services		
2	CEG	19/06/2023 17:46
I feel cheated that if you want to fully access music you want played you have to pay monthly, which I won't do!!		
3	CEG	19/06/2023 17:53
Cost of 'add ons' i.e to turn lights etc on & off. The more you want from it the more it costs..i.e I dint think Amazon is a good supplier		
4	CEG	19/06/2023 17:57
over rated use is rather limited very costly if you have to buy extras		
5	CEG	20/06/2023 11:22
I especially dont want to pay monthly charges for music, or whatever else is available. I dont want payments set up using the device because I feel I dont have control or access to altering the payments.		
6	CEG	20/06/2023 11:32
It is a glorified radio, if you do not have unlimited everything. I have prime TV, but I still have to pay for music , books		
7	CEG	20/06/2023 11:34
One of the disadvantages is having to pay extra for access to some music.		
8	CEG	26/06/2023 14:53
I believe that everything the tech companies do is geared to finding out as much as possible about our tastes so we can be encouraged to buy more stuff. I'm not prepared to pay for the Amazon service.		
9	CEG	20/06/2023 14:30

If you are looking for information they can lead to customers using an expensive company rather than the cheapest

	10	CEG	20/06/2023 15:40
Would need to pay a subscription to use it.			
	11	CEG	20/06/2023 16:33
A portal to accessing more expensive equipment to stop me exercising after my stroke.			
	12	CEG	20/06/2023 17:13
expense			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				13	CEG	23/06/2023 11:06
Also the smart speaker is merely another route to get us to buy more services like music subscriptions						

Codes\\Fears\\Privacy Concerns\\Gathering Personal Data

Dataset

Files\\Qualitative_Only

No		0.0009	12		
			1	CEG	26/06/2023 14:53
I dint think Amazon is a good supplier. I dont trust it in relation to what data it gathers about me.					
			2	CEG	26/06/2023 14:33
Drawbacks is my personal information inclusive of what is being researched etc					
			3	CEG	26/06/2023 14:52
Being tied into a company gathering personal information about me.					
			4	CEG	26/06/2023 14:34
but I do worry about what private information it can garner about me and my lifestyle					
			5	CEG	26/06/2023 14:36
drawbacks: may be using information about me					
			6	CEG	26/06/2023 14:37
Might pick up information I don't want shared.					
			7	CEG	26/06/2023 14:39
covert personal information harvesting					
			8	CEG	26/06/2023 14:41
Draw back is that more data is collected on me regardless of security settings					

9 CEG 26/06/2023 14:44

I do not know how much information is kept about me without my knowledge or consent by the smart speaker

10 CEG 26/06/2023 14:48

Possibility of making my private info unsafe

Formatted Reports\\Coding Summary by Code Formatted Report

Page 24 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			11	CEG	26/06/2023 14:49	
			I know the Alexa uses conversations to give you relative advertising to your likes, dislikes and daily life. I know it can be turned off I just can't be bothered.			
			12	CEG	26/06/2023 14:49	
			The fact that it can know about you.			

Codes\\Fears\\Privacy Concerns\\Gathering Personal Data\\Always Recording

Dataset

Files\\Qualitative_Only

No	0.0008	15			
			1	CEG	26/06/2023 14:31
The device can listen in to conversations possibly.					
			2	CEG	26/06/2023 14:32
it's always keeping track of what's said around it					
			3	CEG	26/06/2023 14:35
Bit worried about it possibly 'spying' on conversations.					
			4	CEG	26/06/2023 14:35
I don't like it listening in (and I think it does).					
			5	CEG	26/06/2023 14:37
It becomes part of the furniture, and therefore could monitor my life without me having any idea that it is doing so.					
			6	CEG	26/06/2023 14:37
Drawback unsure if someone can listen ito conversations.					
			7	CEG	26/06/2023 14:39
Not keen on it always listening but at the same time I never mute it.					
			8	CEG	26/06/2023 14:40
Never sure if it's always hearing what's said and using the information in a bad way					
			9	CEG	26/06/2023 14:40
It's a portal so I do worry about the camera . I switch it off.					

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			10	CEG	26/06/2023 14:45	Drawbacks - 'Big Brother' is watching 😬
			11	CEG	26/06/2023 14:46	recording snippets of my conversations
			12	CEG	26/06/2023 14:47	I always switch my Alexa's plug off when not in use so there's no chance of her 'hearing any conversations'
			13	CEG	26/06/2023 14:47	Some concern about it 'listening in' to conversations.
			14	CEG	26/06/2023 14:48	but don't trust the smart speaker as I think that it's listening to everything we are saying.
			15	CEG	26/06/2023 14:49	I recently did a telephone call center job that said we couldn't have the device switched on during working hours, so it makes you wonder what the device can do

Codes\\Fears\\Privacy Concerns\\Gathering Personal Data\\Feels Invasive

Dataset

Files\\Qualitative_Only

No	0.0007	9
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	1	CEG	26/06/2023 14:27
On one occasion it ordered an item from Amazon that was mentioned during a conversation that was being held in the room. Definitely an invasion of my privacy so the item was switched off and has not been used since.			
	2	CEG	26/06/2023 14:27
Invasion of privacy. Big brother at its worst.			
	3	CEG	26/06/2023 14:42
Drawbacks possible invasion of privacy			
	4	CEG	26/06/2023 14:42
I did worry about the invasion of privacy aspect when we first got Alexa but this worry has dw8ndled with time.			
	5	CEG	26/06/2023 14:32
but it is nosey. I think it can be an intrusion into peoples lives.			

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			6	CEG	26/06/2023 14:42	
	Drawbacks are retention of data snd invasion of privacy					
			7	CEG	26/06/2023 14:41	
	It can be intrusive so I don't use it much.					
			8	CEG	26/06/2023 14:45	
	but can be intrusive					
			9	CEG	26/06/2023 14:48	
	I don't like the potential invasion of privacy but have not bothered to do anything about it!					

Codes\\Fears\\Privacy Concerns\\Gathering Personal Data\\Passing Data to 3rd Parties

Dataset

Files\\Qualitative_Only

No	0.0004	5
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1	CEG	26/06/2023 14:26
Mild concerns over privacy and information forwarded to marketeers		
2	CEG	26/06/2023 14:36
Concern about privacy and using my usage to inform 3rd parties.		
3	CEG	26/06/2023 14:39
covert personal information harvesting and dissipation to unknown sources		
4	CEG	26/06/2023 14:54
Drawback is the amount of info built up about my preferences and stored/sold on by tech companies.		
5	CEG	26/06/2023 14:54
Drawbacks are security of the data and what Google does with it, who else can access it.		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Fears\\Privacy Concerns\\Gathering Personal Data\\Passing Data to 3rd Parties\\Suspicious Tailored Advertisements Dataset

Files\\Qualitative_Only

No	0.0004	4			
			1	CEG	26/06/2023 14:26
It definitely listens in and tailors adverts etc to our devices					
			2	CEG	26/06/2023 14:36
I'm suspicious that certain items I mention then appear in adverts, even if I haven't messaged anyone about it.					
			3	CEG	26/06/2023 14:53
Smart speakers often lie dormant, but one has the feeling that discussions can be overheard and filtered back to the manufacturers marketing dept. Pure coincidence could be a reason that my experience of talking about a product that I may purchase, has shown up on the Facebook a social networking site or on my iPhone! I suspect that in reality, this is not the case though, and that the technology I'm using has enabled certain companies to access my data					
			4	CEG	26/06/2023 14:49
It definitely listens and links to other social media. If you mention something to Alexa then adverts for those things will appear on facebook					

Codes\\Fears\\Privacy Concerns\\Lack of Trust\\For Tech Companies

Dataset

Files\\Qualitative_Only

No 0.0013 15

1 CEG 26/06/2023 14:04

hold reservations about the BigTech companies and metadata. For those reasons and others, I have closed my Facebook account for example.

2 CEG 19/06/2023 14:01

Don't wish to subscribe to a media company.

3 CEG 19/06/2023 17:53

I dint think Amazon is a good supplier. I dont trust it in relation to what data it gathers about me.

4 CEG 19/06/2023 17:58

I do not use it because I do not trust the service provider in terms of security of information.

5 CEG 26/06/2023 14:34

Drawbacks is my personal information inclusive of what is being researched etc is of personal value. Amazon & the like get it for free....

Formatted Reports\\Coding Summary by Code Formatted Report

Page 28 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			6	CEG	20/06/2023 11:35	
						Being tied into a company gathering personal information about me.
			7	CEG	20/06/2023 14:04	
						Downside: I think it may intrudes in my privacy, regardless of assurances from the tech companies.

8	CEG	20/06/2023 14:20	I believe that everything the tech companies do is geared to finding out as much as possible about our tastes so we can be encouraged to buy more stuff. I'm not prepared to pay for the Amazon service.
9	CEG	20/06/2023 16:14	data usage by companies, and possible breaches
10	CEG	20/06/2023 17:17	Smart speakers often lie dormant, but one has the feeling that discussions can be overheard and filtered back to the manufacturers marketing dept. Pure coincidence could be a reason that my experience of talking about a product that I may purchase, has shown up on the Facebook a social networking site or on my iPhone! I suspect that in reality, this is not the case though, and that the technology I'm using has enabled certain companies to access my data
11	CEG	21/06/2023 10:55	My data is being logged by tech companies for their own benefit.
12	CEG	21/06/2023 11:38	I don't use it because I frankly do not trust large corporations to use personal information.
13	CEG	22/06/2023 15:47	Drawback is the amount of info built up about my preferences and stored/sold on by tech companies.
14	CEG	23/06/2023 11:03	because I don't trust the product provider I turn the power off to the unit when not in use, so I have to turn it on before using it,
15	CEG	23/06/2023 11:06	Drawbacks are security of the data and what Google does with it, who else can access it.

Dataset

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No	0.0002	4			
			1	CEG	26/06/2023 14:52

I do worry that Google home spies on our conversations!

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				2	CEG	26/06/2023 14:42
						doesn't trust the device and won't have it on.
				3	CEG	26/06/2023 14:38
						do not and never will trust
				4	CEG	26/06/2023 14:48
						but don't trust the smart speaker as I think that it's listening to everything we are saying.

Codes\\Fears\\Privacy Concerns\\Not knowing how data is used

Dataset

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No		0.0004	4			
				1	CEG	26/06/2023 14:26
but unsure how it uses my data.						
				2	CEG	26/06/2023 14:37
More info needed about privacy						
				3	CEG	26/06/2023 14:51
Data held in cloud and used by provider. User agreement means that default permissions are required for use and consent to what your data is used for not always clear.						
				4	CEG	26/06/2023 14:47
I personally worry about invasion of privacy even though I accept I do not know enough						

Codes\\Fears\\Talking to inanimate object

Dataset

Files\\Qualitative_Only

No 0.0001 3

1 CEG 19/06/2023 14:02

feeling stupid speaking to an inanimate object

Formatted Reports\\Coding Summary by Code Formatted Report

Page 30 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			2		CEG	19/06/2023 18:02
I am also careful not to become too reliant on it or allow my children to be (as much as ica n, although they are nearly adults and have their own views!) as I think this generation and the next ones to come are losing the ability to actually communicate person to person which is having a negative effect on the population and society of today.						
			3		CEG	23/06/2023 11:36
to a machine always makes me nervous						

Codes\\Features\\Connectivity

Dataset

Files\\Qualitative_Only

No 0.0061 77

1 CEG 19/06/2023 11:18

linking everything together

2	CEG	19/06/2023 11:18
Voice control of all functions is simpler and more convenient than using a range of devices which need setting up by hand.		
3	CEG	19/06/2023 11:20
Communication around the house between rooms.		
4	CEG	19/06/2023 11:21
(we have one mini in each room and the google home hub in the kitchen		
5	CEG	19/06/2023 11:22
I'm also partially sighted due to a neurological condition and I struggle particularly with low lighting so we've programmed all our lamps and lights to be linked to google home so I can turn all the lights on without struggling to find the light switch		
6	CEG	19/06/2023 11:26
control of remote devices.		
7	CEG	19/06/2023 11:47
Main benefit for me is lighting and heat control via links to Hive.		
8	CEG	19/06/2023 11:48
Can control all devices from one place.		
9	CEG	19/06/2023 11:49
To operate other equipment like radio, TV etc.		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			10	CEG	19/06/2023 11:52	easy to control Hive
			11	CEG	19/06/2023 11:53	I have 3 smart speakers throughout my home which I use to control lighting, TV, Radio etc.
			12	CEG	19/06/2023 13:49	smart heating, lighting, quiz answers, surround sound around home, message us and in another room and the list goes on
			13	CEG	19/06/2023 13:53	good for smart home devices
			14	CEG	19/06/2023 13:55	Things like being able to turn the heating down after I've gone to bed.
			15	CEG	19/06/2023 13:56	I have several smart speakers - I partially like the features that allow me to communicate with my Husband when is in another part of the house
			16	CEG	19/06/2023 13:56	It can be linked to my video doorbell
			17	CEG	19/06/2023 14:06	They are useful for listening to media throughout the house
			18	CEG	19/06/2023 14:08	

Alters the hive heating

	19	CEG	19/06/2023 14:09
Useful for changing heating settings in Hive.			
	20	CEG	19/06/2023 15:19
Enables home automation			
	21	CEG	19/06/2023 15:20
Easy to control my environment when I'm busy elsewhere.			
	22	CEG	19/06/2023 15:20
We have it in the house as it came with the heating system			
	23	CEG	19/06/2023 15:25
So easy and convenient to use for playing music for all situations and moods. No fiddling around with CD's etc.			
	24	CEG	19/06/2023 17:48
I can control my house via smart bulbs and smart plugs, and hope to install Alexa-friendly central heating controls this year			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				25	CEG	19/06/2023 17:49
I like being able to control my lights, heating etc by voice						

controlling lights and heating.	26	CEG	19/06/2023 17:51
Likewise the doorbell. Control heat/water. Timers/reminders, control lights. Intercom.	27	CEG	19/06/2023 17:51
Controlling other smart home devices	28	CEG	19/06/2023 18:00
Love the fact that all my lights and heating come on automatically and I can switch on my electric blanket from my lounge	29	CEG	19/06/2023 18:11
Being able to control your environment.	30	CEG	19/06/2023 18:15
Easier to control home environment using other smart devices.	31	CEG	20/06/2023 11:18
, mostly for turning things on and off	32	CEG	20/06/2023 11:21
Easy to control devices around the house especially if I am in work. I can control things at home remotely on the app which is great	33	CEG	20/06/2023 11:28
It's easy to listen to the radio and turn lights on upstairs.	34	CEG	20/06/2023 11:29
Using it to turn things on and off.	35	CEG	20/06/2023 11:36

	36	CEG	20/06/2023 14:03
if out I can put the heating on before arriving home.			
	37	CEG	20/06/2023 14:05
Being able to control my central heating			
	38	CEG	20/06/2023 14:29
Remote control of house.			
	39	CEG	20/06/2023 14:30
If you have straight forward requests to switch things on or off or change channels etc, fine.			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				40	CEG	20/06/2023 15:37
Security light on/off function when I'm away. Light on/off control before/after entering a room.						
				41	CEG	20/06/2023 15:43
putting a timer on the Xmas tree lights						
				42	CEG	20/06/2023 15:42
Home control great benefit.						
				43	CEG	20/06/2023 15:46

I like the ease if controlling things like lights and heating

	44	CEG	20/06/2023 15:48
Home automation			
	45	CEG	20/06/2023 15:53
Benefits - can carry out tasks like switching lights on/off, opening blinds etc .			
	46	CEG	20/06/2023 16:22
for my ring doorbell			
	47	CEG	20/06/2023 16:29
can operate with various other sound systems around the house.			
	48	CEG	20/06/2023 17:14
Helps my partner control the heating my herself, and we have it automatically turn on lights before getting home in the winter.			
	49	CEG	20/06/2023 17:15
I can control heating and lights when I am not in the house...security			
	50	CEG	20/06/2023 17:16
Useful for remotely controlling devices e.g. lights			
	51	CEG	20/06/2023 17:33
hands-free control of home gadgets			
	52	CEG	20/06/2023 17:36
Beneficial in having a hands free assistant for turning on television, lights and answering doorbell			

53 CEG 20/06/2023 17:37
Benifit of switching lights and socks on by voice so I don't have to get up (I have a bad knee).

54 CEG 21/06/2023 11:01
Control of lighting

Formatted Reports\\Coding Summary by Code Formatted Report

Page 34 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				55	CEG	21/06/2023 11:02
						controlling lights and heating
				56	CEG	21/06/2023 11:31
						One of the biggest benefits for me is being able to control lights, electronic devices such as TVs etc through the smart speaker without getting up
				57	CEG	21/06/2023 11:33
						Virtual control of household items; easy access to media.
				58	CEG	21/06/2023 11:34
						Great to control home controls like lights
				59	CEG	21/06/2023 11:35
						Get it to turn things on and off
				60	CEG	21/06/2023 11:40

Help in home turning lights on off etc

I find it convenient for voice control of lighting and entertainment	61	CEG	21/06/2023 11:43
It's great to control the thermostat, turn on the smart plugs, lights and devices,	62	CEG	22/06/2023 15:03
Excellent for controlling lights and equipment around the house.	63	CEG	22/06/2023 15:05
Benefits it gives me control over smart things I have around my home.	64	CEG	22/06/2023 15:18
It makes it easier to control the home environment	65	CEG	22/06/2023 15:42
I use it for use I got the nest heating control when away from the house aswell as in the house.I also use it for turning lights on and off which frees one hand to carry something as I use a walking stick in the other hand.	66	CEG	22/06/2023 15:45
Connect to hive heating	67	CEG	22/06/2023 15:49
To control software items in my home;	68	CEG	22/06/2023 15:51
I have some dimmer lights set to alexa, really helps when leaving the kitchen at night with my hands full.	69	CEG	23/06/2023 10:37

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			70	CEG	23/06/2023 10:51	just use it as a great quality WiFi speaker with the ability to link to similar devices
			71	CEG	23/06/2023 10:51	Benefits for using are control of cameras lights and tv,
			72	CEG	23/06/2023 10:54	Links to other technology and allows remote activation of devices .eg lights internet radio
			73	CEG	23/06/2023 11:07	control of appliances
			74	CEG	23/06/2023 11:35	Ease of use of heating, radio, timer, access to information, setting alarms, reminders
			75	CEG	23/06/2023 11:35	Just helpful to adjust thermostat without having to go and find phone
			76	CEG	23/06/2023 11:37	The ability to expand to control lights etc is appealing.
			77	CEG	23/06/2023 11:38	

easy to set timers for watering polytunnel etc

Codes\\Features\\Convenience

Dataset

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No	0.0118	111			
			1	CEG	19/06/2023 11:15
It is convenient for music and alarms and information eg weather. I can just tell it to stop the music when the phone goes or someone comes to the door					
			2	CEG	19/06/2023 11:16
get information and entertainment whenever I need it					
			3	CEG	19/06/2023 11:15
It's excellent at being able to quickly check something hands-free, no opening up another tab to Google something.					

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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4	CEG	19/06/2023 11:18
Convenience		

5	CEG	19/06/2023 11:18
Voice control of all functions is simpler and more convenient than using a range of devices which need setting up by hand.		

6	CEG	19/06/2023 11:19
Convenience		

7	CEG	19/06/2023 11:20
makes life easier - automates some tasks that otherwise would take longer & more effort		

8	CEG	19/06/2023 11:20
They just make life easier.		

9	CEG	19/06/2023 11:21
making life easier		

10	CEG	19/06/2023 11:24
It's the simplest way to gain the information or entertainment that I need or want		

11	CEG	19/06/2023 11:25
Helps with small things it might take time to look up.		

12	CEG	19/06/2023 11:26
Convenience - being able to start things like the radio hands free.		

13	CEG	19/06/2023 11:27
Convenient		

	14	CEG	19/06/2023 11:41
Hands-free commands for entertainment, timers, information. Helpful when, cooking or otherwise engaged in an activity.			
	15	CEG	19/06/2023 11:43
Useful for quick fact checking, timers for cooking etc			
	16	CEG	19/06/2023 11:45
Convenience and ease			
	17	CEG	19/06/2023 11:45
It's a convenient radio / music player / timer. Mine is usually set to play Radio 4 all day, but I can change to music if a program bores me, about once or twice a week. I particularly like being able to silence it quickly to answer the phone.			
	18	CEG	19/06/2023 11:46
being hands free			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				19	CEG	19/06/2023 11:48
Its somewhat convenient,						
				20	CEG	19/06/2023 11:49
Convenience and access to information						
				21	CEG	19/06/2023 11:51

Convenience

	22	CEG	19/06/2023 11:53
Makes tasks hands free - turning lights off etc			
	23	CEG	19/06/2023 13:47
makes certain things easier to do			
	24	CEG	19/06/2023 13:53
Convenience,			
	25	CEG	19/06/2023 13:59
It's convenient to access information and set timers and make lists			
	26	CEG	19/06/2023 14:03
Saves me getting up to turn the radio on!			
	27	CEG	19/06/2023 14:08
Convenience			
	28	CEG	19/06/2023 15:21
Convenience, particularly in the kitchen for recipes, timers and music etc.			
	29	CEG	19/06/2023 15:25
Makes life easier, e.g. so quick to boost the hot water without needing to go downstairs to the boiler controls or even open the app			
	30	CEG	19/06/2023 15:26
Convenience - setting timers etc			

	31	CEG	19/06/2023 15:31
convenience in listening to the radio or spotify			

	32	CEG	19/06/2023 17:44
Convenient			

	33	CEG	19/06/2023 17:47
Benefits are that it does make life easier			

Formatted Reports\\Coding Summary by Code Formatted Report

Page 38 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				34	CEG	19/06/2023 17:50
	Convenience					
				35	CEG	19/06/2023 17:54
	Convenience, especially not not to use a keyboard to request information and music					
				36	CEG	19/06/2023 17:57
	Convenience,					
				37	CEG	19/06/2023 18:02
	It can help to speed up or automate tasks in everyday life,					
				38	CEG	19/06/2023 18:10

Convenience

	39	CEG	19/06/2023 18:10
Convenience			
	40	CEG	19/06/2023 18:11
For some things it is more convenient to use than my smart phone.			
	41	CEG	19/06/2023 18:13
Benefits are that it helps preform tasks like turn lights on if hands are full when entering a room			
	42	CEG	19/06/2023 18:13
can save you the time of typing something into Google of you want a quick answer			
	43	CEG	19/06/2023 18:14
I love the choice of radio stations without having to tune the radio in every time one needs a change of programme			
	44	CEG	19/06/2023 18:16
Convenience.			
	45	CEG	19/06/2023 18:17
Access to information and making life easier			
	46	CEG	20/06/2023 11:28
Also able to change radio station without having to stop what I'm doing			
	47	CEG	20/06/2023 11:28
Easy to control devices around the house especially if I am in work. I can control things at home remotely on the app which is great			

48 CEG 20/06/2023 11:34

Voice controlled frees you up when you're already doing something.

Formatted Reports\\Coding Summary by Code Formatted Report

Page 39 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				49	CEG	20/06/2023 11:35
				- it's easier to do things, especially when you have your hands full.		
				50	CEG	20/06/2023 11:37
				Convenient and handy to use.		
				51	CEG	20/06/2023 11:38
				Convenience and availability of music		
				52	CEG	20/06/2023 14:03
				It's convenient.		
				53	CEG	20/06/2023 14:09
				Convenience of accessing some information		
				54	CEG	20/06/2023 14:11
				I don't need to leave the sofa to turn the lights on and off, both a benefit and a curse		
				55	CEG	20/06/2023 14:20

Useful for controlling lights (Hive)

	56	CEG	20/06/2023 14:24
Convenience for listening to music.			
	57	CEG	20/06/2023 14:28
It is an easy way to have access to music and news programmes			
	58	CEG	20/06/2023 15:43
Being lazy and putting a timer on the Xmas tree lights			
	59	CEG	20/06/2023 15:43
It is handy for the radio and finding information off the internet			
	60	CEG	20/06/2023 15:43
I find it useful to have the radio station on that I want while I'm busy and not have to change it myself			
	61	CEG	20/06/2023 15:48
Convenience.			
	62	CEG	20/06/2023 15:52
Convenient for information,			
	63	CEG	20/06/2023 16:02
Convenient			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				64	CEG	20/06/2023 16:21
	Convenience.					
				65	CEG	20/06/2023 16:26
	Makes my life easier e.g. switching on lights, radio etc					
				66	CEG	20/06/2023 16:26
	Convenience to live					
				67	CEG	20/06/2023 16:27
	Convenience +					
				68	CEG	20/06/2023 16:31
	Convenience of attaining answers					
				69	CEG	20/06/2023 17:12
	Potential to simplify complex tasks					
				70	CEG	20/06/2023 17:13
	use it to find things out by my voice instead of my ggogle app on my phone.					
				71	CEG	20/06/2023 17:34
	Convenience					
				72	CEG	20/06/2023 17:44

Convenience (operating lights, accessing music, etc)

	73	CEG	20/06/2023 17:46
Convenience			
	74	CEG	21/06/2023 10:53
Convenience			
	75	CEG	21/06/2023 11:01
Attempts to make life a little easier			
	76	CEG	21/06/2023 11:01
convenient			
	77	CEG	21/06/2023 11:08
Convenience, not having to use keyboard whilst doing another task. I.e. cooking.			
	78	CEG	21/06/2023 11:10
Convenience			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				79	CEG	21/06/2023 11:11
Convenience						

Convenience	80	CEG	21/06/2023 11:11
Convenience	81	CEG	21/06/2023 11:12
Benefits for me is that my smart speaker is very convenient.	82	CEG	21/06/2023 11:38
convenience	83	CEG	21/06/2023 11:41
Use it for news when I'm busy	84	CEG	21/06/2023 11:42
Convenience in using music streaming.	85	CEG	21/06/2023 11:42
speed and convenience of use	86	CEG	21/06/2023 11:44
convenience	87	CEG	21/06/2023 14:29
It makes life easier	88	CEG	21/06/2023 14:29
Benefit, makes life easier	89	CEG	22/06/2023 14:58

Makes life easier	90	CEG	22/06/2023 14:58
It's convenient being voice controlled.	91	CEG	22/06/2023 14:58
convenience	92	CEG	22/06/2023 15:14
Convenient and easy way to set reminders and listen to music	93	CEG	22/06/2023 15:16

Formatted Reports\\Coding Summary by Code Formatted Report

Page 42 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				94	CEG	22/06/2023 15:35
						Super convenient - no rooting around for CD's or searching on phone.
				95	CEG	22/06/2023 15:45
						I use it for use I got the nest heating control when away from the house aswell as in the house.I also use it for turning lights on and off which frees one hand to carry something as I use a walking stick in the other hand.
				96	CEG	22/06/2023 15:51
						Convenience
				97	CEG	23/06/2023 10:36

Convenience

	98	CEG	23/06/2023 10:38
It makes life easier to hear music.			
	99	CEG	23/06/2023 10:40
Convenience			
	100	CEG	23/06/2023 10:55
Saves time looking for information.			
	101	CEG	23/06/2023 11:10
Saves time typing into google			
	102	CEG	23/06/2023 11:10
It's convenient to access music across different rooms			
	103	CEG	23/06/2023 11:34
I find it very convenient when listening to music or radio			
	104	CEG	23/06/2023 11:35
convenient to provide music which is my only need for			
	105	CEG	23/06/2023 13:07
Convenience			
	106	CEG	23/06/2023 13:08
Handy for setting timers when baking			

	107	CEG	23/06/2023 13:09
Convenient			

	108	CEG	23/06/2023 13:10
. Beneficial and time saving			

Formatted Reports\\Coding Summary by Code Formatted Report

Page 43 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				109	CEG	23/06/2023 13:10
	Benefits are for convenience of use					
				110	CEG	23/06/2023 13:12
	convenient					
				111	CEG	23/06/2023 13:12
	Convenience, fast					

Codes\\Features\\Don't need extra devices

Dataset

Files\\Qualitative_Only

No	0.0026	25			
			1	CEG	19/06/2023 14:04
I'm able to listen to music, radio and do a search of some things without having to purchase a larger radio or computer/tablet					
			2	CEG	19/06/2023 14:10
I can set reminders so easily and listen to music and audio books without having to use a gadget.					
			3	CEG	19/06/2023 15:25
So easy and convenient to use for playing music for all situations and moods. No fiddling around with CD's etc.					
			4	CEG	19/06/2023 15:29
I think a smart speaker offers a 'one stop shop' to access a variety of entertainment and information as well as a hub to adjust environmental factors such as lighting.					
			5	CEG	19/06/2023 17:43
So much easier than hunting for CD's etc. Especially when driving.					
			6	CEG	19/06/2023 17:45
, all from one small gadget.					
			7	CEG	19/06/2023 17:56
It is a multi function audio/entertainment system loaded with 60 years worth of my music. Allof my records, tapes and discs have been digitised, loaded on my phone, ipad and laptop so I can play any track any time.					
			8	CEG	19/06/2023 18:11
easier than finding and then playing a cd					

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			9	CEG	20/06/2023 11:17	easier than trawling through channels on the radio
			10	CEG	20/06/2023 11:18	I use it to access digital radio, which is otherwise unavailable to me. It was much cheaper then buying an AV receiver and fits in my kitchen easily.
			11	CEG	20/06/2023 11:37	saves searching through cd's and it's easy to move to any room in the house.
			12	CEG	20/06/2023 15:54	Easy to ask questions like weather without having to pick up my phone
			13	CEG	20/06/2023 17:12	Saves storing CDs, etc.
			14	CEG	21/06/2023 10:55	Not needing lots of other items like timers radios etc at home
			15	CEG	21/06/2023 10:57	Benefits: the ability to access any music without having to purchase a cd or download.
			16	CEG	21/06/2023 11:03	Ease of access to music and information without using a computer or iPad. Also, use it to play DAB radio

	17	CEG	21/06/2023 11:19
Very easy access to music channels without switching on a television radio, other radio or Internet radio. Very easy access to getting answers to questions without checking Wikipedia etc on my phone.			
	18	CEG	22/06/2023 15:08
not needing to retune a radio			
	19	CEG	22/06/2023 15:12
It enables you to do things, have things done and find out information without having to turn on the PC or other devices.			
	20	CEG	22/06/2023 15:13
Less space used			
	21	CEG	22/06/2023 15:30
Less need for buying albums for music			
	22	CEG	23/06/2023 10:51
I use it mostly for information and music. It saves me having to turn on my computer			
	23	CEG	23/06/2023 10:52
It's handier than picking up a device for finding facts and figures.			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				24	CEG	23/06/2023 10:53

I don't have to go on another device where I might end up spending more time on it when I don't want to. It's instant and I might forget to use another device. I can ask questions without going on a device.

25 CEG 23/06/2023 12:49

Some of the benefits include being able to find information when you are unable to use a phone

Codes\\Features\\Ease of use

Dataset

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No 0.0122 119

1 CEG 19/06/2023 11:15

easy to use and play music

2 CEG 19/06/2023 11:21

The children can use them easily,

3 CEG 19/06/2023 11:22

I'm also partially sighted due to a neurological condition and I struggle particularly with low lighting so we've programmed all our lamps and lights to be linked to google home so I can turn all the lights on without struggling to find the light switch

4 CEG 19/06/2023 11:24

Easy access to information and setting reminders

5 CEG 19/06/2023 11:24

It's the simplest way to gain the information or entertainment that I need or want

	6	CEG	19/06/2023 11:25
Simple to us, with verbal comands			
	7	CEG	19/06/2023 11:25
It's easy to use			
	8	CEG	19/06/2023 11:43
Easy to find music or radio stations and change between.			
	9	CEG	19/06/2023 11:45
Convenience and ease			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				10	CEG	19/06/2023 11:51
	ease of use,					
				11	CEG	19/06/2023 11:52
	easy to control Hive					
				12	CEG	19/06/2023 11:52

Ease of use without physical touch.

	13	CEG	19/06/2023 13:52
easier to access radio stations, spotify, my own music, podcasts.			
	14	CEG	19/06/2023 13:59
Easy and instant access to radio and personalised music.			
	15	CEG	19/06/2023 13:59
Ease of music selection: not having to press buttons etc			
	16	CEG	19/06/2023 14:01
Easy access to video calls			
	17	CEG	19/06/2023 14:04
Easy access to vast catalogue of music			
	18	CEG	19/06/2023 14:04
Easy access to music,			
	19	CEG	19/06/2023 14:09
Quick easy access to music playlists and radio,			
	20	CEG	19/06/2023 14:10
easy access to music and films I like			
	21	CEG	19/06/2023 14:10
I can set reminders so easily and listen to music and audio books without having to use a gadget.			

	22	CEG	19/06/2023 14:10
Benefits would be it can make things easier to access			

	23	CEG	19/06/2023 14:10
Amazing range of music so easily obtainable			

	24	CEG	19/06/2023 15:21
Easy and quick to do things, such as ask questions, when you're not near a PC etc.			

Formatted Reports\\Coding Summary by Code Formatted Report

Page 47 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			25	CEG	19/06/2023 15:25	
So easy and convenient to use for playing music for all situations and moods. No fiddling around with CD's etc.						
			26	CEG	19/06/2023 15:28	
Easy acces to internet radio and playback services.						
			27	CEG	19/06/2023 15:29	
Ease of use for music, information and setting timer.						
			28	CEG	19/06/2023 17:43	
Ease of listening to music.						
			29	CEG	19/06/2023 17:43	

Easy control of central heating without needing to get to the Hive hub

30	CEG	19/06/2023 17:47
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Easy to download music & find older groups etc

31	CEG	19/06/2023 17:48
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Easy and useful access to music and information.

32	CEG	19/06/2023 17:51
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Ease of use

33	CEG	19/06/2023 17:54
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Makes everyday tasks quicker and easier and very useful for accessing audio content.

34	CEG	19/06/2023 17:54
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Don't really use it much,it is easy to use though.

35	CEG	19/06/2023 17:57
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Information gained easily. Good

36	CEG	19/06/2023 17:57
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Usefull for music and easy to use.

37	CEG	19/06/2023 18:00
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Easy to use,

38	CEG	19/06/2023 18:01
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Easy to listen to music

39 CEG 19/06/2023 18:10

ease of use for those who find a keyboard difficult

Formatted Reports\\Coding Summary by Code Formatted Report

Page 48 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				40	CEG	19/06/2023 18:11
						easier than finding and then playing a cd
				41	CEG	19/06/2023 18:15
						easy access to information by just asking a question
				42	CEG	19/06/2023 18:15
						Easy access.
				43	CEG	19/06/2023 18:15
						Easy, quick access to music news timers etc
				44	CEG	19/06/2023 18:16
						Was easy to play radio stations
				45	CEG	20/06/2023 11:17
						easier than trawling through channels on the radio
				46	CEG	20/06/2023 11:23

Ease of accessing radio stations and music.

	47	CEG	20/06/2023 11:29
It's easy to listen to the radio and turn lights on upstairs.			
	48	CEG	20/06/2023 11:32
Makes accessing music easier.			
	49	CEG	20/06/2023 11:33
Easy to request music and set a timer when cooking			
	50	CEG	20/06/2023 11:33
Just an easy way of finding facts. Instantaneous access to music.			
	51	CEG	20/06/2023 11:35
- it's easier to do things, especially when you have your hands full.			
	52	CEG	20/06/2023 11:35
Radio/music listening is made easier.			
	53	CEG	20/06/2023 11:35
Easy to use - no keyboard			
	54	CEG	20/06/2023 11:37
It's easy to use			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				55	CEG	20/06/2023 14:04
		Makes changing music and entertainment (audiobooks) access easier,				
				56	CEG	20/06/2023 14:04
		Ease of access - often a great help with crosswords.				
				57	CEG	20/06/2023 14:06
		Easy to use when busy in the kitchen - no hands needed!				
				58	CEG	20/06/2023 14:06
		Hands free, easy.				
				59	CEG	20/06/2023 14:10
		easy to use				
				60	CEG	20/06/2023 14:29
		the benefit is that it's easy to get information, music, radio etc instantly just by speech				
				61	CEG	20/06/2023 15:38
		Easy access to new alert, alarms, music, playlists				
				62	CEG	20/06/2023 15:38
		Easy to gain quick information is a benefit.				
				63	CEG	20/06/2023 15:38

Ease of use and helpful

	64	CEG	20/06/2023 15:38
Easy to use once set up.			
	65	CEG	20/06/2023 15:39
benefits -easy to use for people without digital skills if they have help to set it up -			
	66	CEG	20/06/2023 15:39
Easy access to digital radio			
	67	CEG	20/06/2023 15:40
suppose it is handy and easily used.			
	68	CEG	20/06/2023 15:41
Ease of access to information and services such as accessing music.			
	69	CEG	20/06/2023 15:41
quick and easy to use for every kind of information!			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			70	CEG	20/06/2023 15:42	
It's just so easy to use and has a vast music catalogue						

Ease of use.	71	CEG	20/06/2023 15:47
Ease of us and multi functional	72	CEG	20/06/2023 15:51
Makes it easy to do and know things	73	CEG	20/06/2023 15:59
Easy audio interface and control	74	CEG	20/06/2023 16:00
Can allow hands free instructions while cooking, allow for easy access to music when having a new born baby can help!	75	CEG	20/06/2023 16:01
Easy to use and access info, music instantly	76	CEG	20/06/2023 16:09
Ease of use.	77	CEG	20/06/2023 16:30
Easy access to music, information etc	78	CEG	20/06/2023 16:30
An easy way of playing music	79	CEG	20/06/2023 17:13
Ease of access to radio channels	80	CEG	20/06/2023 17:13

An easy to handle device and allows me access things easily.	81	CEG	20/06/2023 17:16
Ease of using voice commands for information, entertainment and lighting	82	CEG	20/06/2023 17:16
easy to set the timer for cooking	83	CEG	20/06/2023 17:16
Ease of carrying out functions	84	CEG	20/06/2023 17:45

Formatted Reports\\Coding Summary by Code Formatted Report

Page 51 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				85	CEG	20/06/2023 17:45
						Quick access to favourite pieces of music
				86	CEG	21/06/2023 10:56
						Ease of use
				87	CEG	21/06/2023 11:03
						Ease of access to music and information without using a computer or iPad. Also, use it to play DAB radio
				88	CEG	21/06/2023 11:17

Easy access to information, entertainment

	89	CEG	21/06/2023 11:19
Very easy access to music channels without switching on a television radio, other radio or Internet radio. Very easy access to getting answers to questions without checking Wikipedia etc on my phone.			
	90	CEG	21/06/2023 11:41
Easy hands free access to music			
	91	CEG	21/06/2023 11:43
Easy to use and find information			
	92	CEG	21/06/2023 14:22
ease of use			
	93	CEG	22/06/2023 14:57
Its just easier!			
	94	CEG	22/06/2023 15:07
Easy hands free use for phone/video calls			
	95	CEG	22/06/2023 15:11
I like the easy access to music or books			
	96	CEG	22/06/2023 15:11
Easy to access a number of different radio stations.			
	97	CEG	22/06/2023 15:12
Good___ease of use			

	98	CEG	22/06/2023 15:32
Being easy to stream music has enhanced my daily life			

	99	CEG	22/06/2023 15:34
Easy access to information/music			

Formatted Reports\\Coding Summary by Code Formatted Report

Page 52 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				100	CEG	22/06/2023 15:42
						Simple access to radio and music
				101	CEG	22/06/2023 15:42
						It makes it easier to control the home environment
				102	CEG	23/06/2023 10:34
						Easy access to music. Easy access to radio Timer.
				103	CEG	23/06/2023 10:37
						Easy access is a benefit.
				104	CEG	23/06/2023 10:40
						Ease of use,
				105	CEG	23/06/2023 10:40

Ease of use and access to information.

	106	CEG	23/06/2023 10:51
Easy accessibility to variety of music.			
	107	CEG	23/06/2023 10:53
Easy to set reminders, alarms, add to my shopping list, play one song or lots			
	108	CEG	23/06/2023 11:10
Easy to use as voice controlled.			
	109	CEG	23/06/2023 11:10
Easy access to information and entertainment			
	110	CEG	23/06/2023 11:11
Ease of access to different radio channels			
	111	CEG	23/06/2023 11:11
Can easily access radio stations.			
	112	CEG	23/06/2023 11:34
Provides an easy way of providing music particularly around the house.			
	113	CEG	23/06/2023 11:35
easy to listen to my fav radio/ music set alarms reminders etc			
	114	CEG	23/06/2023 11:35
Ease of use of heating, radio, timer, access to information, setting alarms, reminders			

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
	Easy access to music and info			115	CEG	23/06/2023 11:37
	Easy to use			116	CEG	23/06/2023 11:38
	easy to use .			117	CEG	23/06/2023 13:09
	Easy access			118	CEG	23/06/2023 13:11
	Ease of obtaining information			119	CEG	23/06/2023 13:12

[Codes\\Features\\More options](#)

Dataset

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No 0.0036 35

	1	CEG	19/06/2023 18:17
Provides more options.			
	2	CEG	20/06/2023 11:18
I use it to access digital radio, which is otherwise unavailable to me. It was much cheaper then buying an AV receiver and fits in my kitchen easily.			
	3	CEG	20/06/2023 11:28
Able to get a lot of music with subscription			
	4	CEG	20/06/2023 11:29
Cheap access to a wide range of music!!			
	5	CEG	20/06/2023 11:37
the benefit is that I can choose any music that takes my fancy.			
	6	CEG	20/06/2023 14:03
tool to enable me to access information, technology and control equipment in the home.			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				7	CEG	20/06/2023 14:18
						I can access music I don't own already and get ideas of new things to listen to
				8	CEG	20/06/2023 15:37
						The ability to listen to a wider range of radio stations than on a conventional radio,
				9	CEG	20/06/2023 15:40
						I can listen to digital radio stations not available on my other radios
				10	CEG	20/06/2023 15:42
						It's just so easy to use and has a vast music catalogue
				11	CEG	20/06/2023 15:52
						Instant access to unlimited music
				12	CEG	20/06/2023 17:14
						benefits is access to digital radio via wifi as DAB reception is poor
				13	CEG	21/06/2023 10:53
						Can listen to any music by just requesting it
				14	CEG	21/06/2023 11:04
						I can ask for any song i want no matter how old it is and it will play it
				15	CEG	21/06/2023 11:15
						W8de variety of Information easily accessible

16	CEG	21/06/2023 11:20
I can choose what music I want to hear with no ads		

17	CEG	21/06/2023 11:32
Access to all genre of music, facts and podcasts on the radio. Alexa helps me find on the TV many travel documentaries and keep fit for seniors that otherwise I would not know of		

18	CEG	21/06/2023 14:32
I can access digital radio stations which I can't as I only own an analogue radio.		

19	CEG	22/06/2023 15:06
Access to digital radio (no DAB signal here)		

20	CEG	22/06/2023 15:08
Being able to play music and multiple radio stations		

21	CEG	22/06/2023 15:11
Easy to access a number of different radio stations.		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			22	CEG	22/06/2023 15:17	My Google Home gives me hours of entertainment with different sorts of artists and music,
			23	CEG	22/06/2023 15:35	

Super convenient - no rooting around for CD's or searching on phone.

	24	CEG	22/06/2023 15:37
Easy to access lots of radio programmes and podcasts in one place			
	25	CEG	22/06/2023 15:40
music that I generally wouldn't bother to look for			
	26	CEG	22/06/2023 15:47
I can access websites that I use			
	27	CEG	23/06/2023 10:40
wide range of items/music to tap in to			
	28	CEG	23/06/2023 10:50
Hands free access to a wide range of media			
	29	CEG	23/06/2023 10:51
Easy accessibility to variety of music.			
	30	CEG	23/06/2023 10:52
Different radio stations are easy to play			
	31	CEG	23/06/2023 10:56
Vast choice of radio stations			
	32	CEG	23/06/2023 11:07
. being able to listen to several different radio stations, and basically any music I wish to listen to.			

33	CEG	23/06/2023 11:07
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It has enabled us to access a wider range of music than if we had to rely on streaming to the computer

34	CEG	23/06/2023 11:33
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I like to be able to call up pieces of music and songs that I no longer have access to in more traditional ways

35	CEG	23/06/2023 13:08
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Good to have access to a wide range of music

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Features\\Quicker than other devices

Dataset

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No	0.0063	67	1	CEG	19/06/2023 11:17
Speeds up certain activities (setting timers).			2	CEG	19/06/2023 11:19

It's just quicker to turn music/and information services on.

tasks that otherwise would take longer & more effort	3	CEG	19/06/2023 11:20
quick to respond	4	CEG	19/06/2023 11:27
It is quicker at finding certain things than having to type a question	5	CEG	19/06/2023 11:28
Quick access to- My liked music, controlling the lights.	6	CEG	19/06/2023 11:40
Useful for quick fact checking, timers for cooking etc	7	CEG	19/06/2023 11:43
time saving setting a task, quick info without typing	8	CEG	19/06/2023 11:46
Benefits are that it gives instant info	9	CEG	19/06/2023 11:48
is useful got quick information and guidance.	10	CEG	19/06/2023 13:53
Handy to access info quickly and to play music	11	CEG	19/06/2023 13:57

12 CEG 19/06/2023 13:59
Easy and instant access to radio and personalised music.

13 CEG 19/06/2023 14:00
A quick way to listen to music and listen to news

Formatted Reports\\Coding Summary by Code Formatted Report

Page 57 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				14	CEG	19/06/2023 14:03
						Access to music immediately on demand plus access to radio.
				15	CEG	19/06/2023 14:04
						Useful for quick information
				16	CEG	19/06/2023 14:09
						Quick easy access to music playlists and radio,
				17	CEG	19/06/2023 14:11
						quickly accessing information
				18	CEG	19/06/2023 15:21
						Easy and quick to do things, such as ask questions, when you're not near a PC etc.
				19	CEG	19/06/2023 15:22
						Great for music as you can instantly play what you want

quicker information than searching via other sources	20	CEG	19/06/2023 17:44
Great for getting quick answers to questions	21	CEG	19/06/2023 17:45
Quicker than using the control	22	CEG	19/06/2023 17:50
gathering information quickly	23	CEG	19/06/2023 17:50
Makes everyday tasks quicker and easier and very useful for accessing audio content.	24	CEG	19/06/2023 17:54
Quick access to things	25	CEG	19/06/2023 17:56
It can help to speed up or automate tasks in everyday life,	26	CEG	19/06/2023 18:02
I can obtain information very quickly - more speedily than setting up and researching on the computer.	27	CEG	19/06/2023 18:12
Easy, quick access to music news timers etc	28	CEG	19/06/2023 18:15

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				29	CEG	20/06/2023 11:27
	Instant access to information					
				30	CEG	20/06/2023 11:28
	quick fact check					
				31	CEG	20/06/2023 11:29
	Quick access to information and music.					
				32	CEG	20/06/2023 11:33
	Just an easy way of finding facts. Instantaneous access to music.					
				33	CEG	20/06/2023 11:36
	Enjoy being able to request whatever music/ radio and getting information instantly.					
				34	CEG	20/06/2023 14:05
	It's a handy gadget which is quicker to use for some functions such as switching on lights or accessing a search engine.					
				35	CEG	20/06/2023 14:05
	Instant access to news, music and general info					
				36	CEG	20/06/2023 14:19
	Gives quick answers to questions such as weather forecasts and general knowledge crosswords!					

37 CEG 20/06/2023 15:38
Easy to gain quick information is a benefit.

38 CEG 20/06/2023 15:41
quick and easy to use for every kind of information!

39 CEG 20/06/2023 16:09
Easy to use and access info, music instantly

40 CEG 20/06/2023 16:20
If you have a quick question it is quicker to ask Alexa than it is to type it out into your phone.

41 CEG 20/06/2023 17:17
Very quick access to information as in general knowledge

42 CEG 20/06/2023 17:45
and immediate help in researching facts of matters of interest.

43 CEG 21/06/2023 10:56
Instant choice what you want

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				44	CEG	21/06/2023 10:56

Quick access to music and information.

45	CEG	21/06/2023 10:57
Instant access to information without having to scroll through lots of web pages.		
46	CEG	21/06/2023 11:05
quickness to obtain music, latest news etc		
47	CEG	21/06/2023 11:14
Gives information quickly when required		
48	CEG	21/06/2023 11:16
Its handy for finding information quickly		
49	CEG	21/06/2023 11:18
It is a beneficial tool for quickly finding out simple information		
50	CEG	21/06/2023 11:41
Handy to have answers quickly, goodnto access music		
51	CEG	21/06/2023 11:44
speed and convenience of use		
52	CEG	21/06/2023 14:28
speed of reaction		
53	CEG	22/06/2023 14:57
Useful for immediate access to radio, podcasts etc.		

	54	CEG	22/06/2023 14:58
Immediate response for music, trivia and smart devices			

	55	CEG	22/06/2023 15:08
Instant information.			

	56	CEG	22/06/2023 15:18
Access information quicker.			

	57	CEG	22/06/2023 15:37
The benefits are quick access to information,			

	58	CEG	22/06/2023 15:51
Instant access to information			

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				59	CEG	23/06/2023 10:37
Instant response is a benefit.						
				60	CEG	23/06/2023 10:50
It's a quick way to access information						
				61	CEG	23/06/2023 10:50

Speed of access to services

	62	CEG	23/06/2023 10:51
I use it mostly for information and music. It saves me having to turn on my computer			
	63	CEG	23/06/2023 11:03
For me, possibly speed of accessing music, search results etc			
	64	CEG	23/06/2023 11:31
Quick access to information			
	65	CEG	23/06/2023 11:39
Instant information			
	66	CEG	23/06/2023 13:11
it is quicker to ask Alexa something than to type it into a search engine.			
	67	CEG	23/06/2023 13:12
Convenience, fast			

Codes\\Features\\Voice Commands

Dataset

Files\\Qualitative_Only

No 0.0058 60

1 CEG 19/06/2023 13:50
Control if electrical appliance by voice command.

2 CEG 19/06/2023 13:59
Ease of music selection: not having to press buttons etc

Formatted Reports\\Coding Summary by Code Formatted Report

Page 61 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				3	CEG	19/06/2023 15:21
No typing when you've got wet hands!						
				4	CEG	19/06/2023 17:44
hands-free information which helps with my arthritis hands						
				5	CEG	19/06/2023 17:46
Works without physical contact - such as when I am in bed						
				6	CEG	19/06/2023 17:49
I like being able to control my lights, heating etc by voice						
				7	CEG	19/06/2023 17:54
Convenience, especially not not to use a keyboard to request information and music						

	8	CEG	19/06/2023 17:58
. Answering simple questions without having to type into a keyboard, for example: convert measures in the kitchen.			
	9	CEG	19/06/2023 18:11
Hands free aspect			
	10	CEG	19/06/2023 18:15
easy access to information by just asking a question			
	11	CEG	19/06/2023 18:16
It's on hand when I want hands free information			
	12	CEG	20/06/2023 11:33
Benefits: love the hand free access.			
	13	CEG	20/06/2023 11:34
Voice controlled frees you up when you're already doing something.			
	14	CEG	20/06/2023 11:35
- it's easier to do things, especially when you have your hands full.			
	15	CEG	20/06/2023 11:35
Easy to use - no keyboard			
	16	CEG	20/06/2023 11:36
Handy hands free fact checker,			
	17	CEG	20/06/2023 14:03

Carrying a cup of tea and using a walking stick,I can put the lights on with my voice.

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				18	CEG	20/06/2023 14:04
	Benefits - turning on/off stuff without using physical means i.e. speed					
				19	CEG	20/06/2023 14:06
	Easy to use when busy in the kitchen - no hands needed!					
				20	CEG	20/06/2023 14:06
	Hands free, easy.					
				21	CEG	20/06/2023 14:21
	When your hands are tied. e.g. cooking, it is very useful.					
				22	CEG	20/06/2023 14:21
	benefits: playing music handsfree, setting timers handsfree					
				23	CEG	20/06/2023 14:29
	the benefit is that it's easy to get information, music, radio etc instantly just by speech					
				24	CEG	20/06/2023 14:29
	Hands free operation					

25	CEG	20/06/2023 15:37
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, plus the ease of moving from channel to channel by voice not by clicking multiple buttons.

26	CEG	20/06/2023 15:46
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Flexibility and easy access to information without the need to always use a keyboard on a computer or mobile device

27	CEG	20/06/2023 15:59
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Enjoy having hands free access to tv and music

28	CEG	20/06/2023 16:01
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Can allow hands free instructions while cooking, allow for easy access to music when having a new born baby can help!

29	CEG	20/06/2023 16:26
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Benefits are being able to complete tasks hands free - turn on lights/tv/play music, without needing to find the remote!

30	CEG	20/06/2023 16:29
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a hands free hub

31	CEG	20/06/2023 17:12
----	-----	------------------

makes day to day life that but easier by being able to speak to the speaker instead of looking for my phone or laptop to search for the same information or music.

32	CEG	20/06/2023 17:18
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Can sometimes be useful if your hands are busy etc.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				33	CEG	20/06/2023 17:33
	hands-free control of home gadgets					
				34	CEG	20/06/2023 17:36
	Beneficial in having a hands free assistant for turning on television, lights and answering doorbell					
				35	CEG	20/06/2023 17:37
	Handy with a new born for the hands free element.					
				36	CEG	21/06/2023 11:08
	Convenience, not having to use keyboard whilst doing another task. I.e. cooking.					
				37	CEG	21/06/2023 11:41
	Able to play different radio stations using my voice					
				38	CEG	21/06/2023 11:41
	Easy hands free access to music					
				39	CEG	21/06/2023 11:43
	I find it convenient for voice control of lighting and entertainment					
				40	CEG	21/06/2023 14:28
	. No need to go somewhere to type something in.					
				41	CEG	22/06/2023 14:58
	Helps to do things 'hands free',					

42 CEG 22/06/2023 14:58
It's convenient being voice controlled.

43 CEG 22/06/2023 15:07
Easy hands free use for phone/video calls

44 CEG 22/06/2023 15:29
with my voice and from anywhere in the room.

45 CEG 22/06/2023 15:33
Hands free cooking is advantageous.

46 CEG 22/06/2023 15:45
I use it for use I got the nest heating control when away from the house aswell as in the house.I also use it for turning lights on and off which frees one hand to carry something as I use a walking stick in the other hand.

47 CEG 23/06/2023 10:35
I can turn on music or have a book read to me while cooking and I don't have to stop and turn it on, tune it select etc, I can do it all by voice commands

Formatted Reports\\Coding Summary by Code Formatted Report

Page 64 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				48	CEG	23/06/2023 10:39
						Like the Hands free operation.
				49	CEG	23/06/2023 10:49

I like having a hands free option to my phone.

	50	CEG	23/06/2023 10:50
Hands free access to a wide range of media			
	51	CEG	23/06/2023 10:53
Set timers while cooking without having to touch anything.			
	52	CEG	23/06/2023 10:54
it's handy for switching stations or turning it up or down with my voice.			
	53	CEG	23/06/2023 11:03
Benefits can get it to carry out commands whilst I am doing something else			
	54	CEG	23/06/2023 11:03
accessible hands free device			
	55	CEG	23/06/2023 11:08
Good to get radio stations I want by voice			
	56	CEG	23/06/2023 11:10
Easy to use as voice controlled.			
	57	CEG	23/06/2023 11:32
hands free activation if I'm cooking			
	58	CEG	23/06/2023 11:33
Voice activated			

59	CEG	23/06/2023 13:11
Voice control enables those with difficulties using keyboard and mouse to interact with interweb.		

60	CEG	23/06/2023 13:11
Makes life easier when cooking, especially when your hands are covered in ingredients		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Frustrations\\Cannot Complete Desired Tasks

Dataset

Files\\Qualitative_Only

No	0.0004	8				
			1	CEG	19/06/2023 11:50	
They struggle with finding out complex information or when words have multiple spellings						
			2	CEG	19/06/2023 17:52	

Also, stupidity - the news app is too basic, I prefer to read my iPad.

	3	CEG	19/06/2023 18:12
The drawback is simply that it doesn't know everything			
	4	CEG	20/06/2023 16:21
I dislike it when Alexa doesn't know the answer to simple questions or simple instructions eg. Alexa play a Scottish Lament on the bagpipes it plays a vocal Irish jig.			
	5	CEG	20/06/2023 17:17
sometimes have issues with more complicated words and phases.			
	6	CEG	20/06/2023 17:45
it doesn't always understand complex or unusual requests and bombards me with popular music that I find unpleasant			
	7	CEG	22/06/2023 15:20
I would like Alexa to know more answers to the questions I ask.			
	8	CEG	23/06/2023 11:32
Useless at understanding anything slight complex			

Codes\\Frustrations\\Can't connect to other technology\\Connectivity Issues

Dataset

Files\\Qualitative_Only

No 0.0002 4

1 CEG 27/06/2023 13:50

They can only operate the basic functions of our audio systems and sometimes fail to connect

Formatted Reports\\Coding Summary by Code Formatted Report

Page 66 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				2	CEG	27/06/2023 13:52
				Can be frustrating when you can't get her to discover new devices.		
				3	CEG	27/06/2023 13:52
				The main drawback for me was that I can't use it as an external speaker for anything else so still needed speakers for my PC etc.		
				4	CEG	27/06/2023 13:52
				Connection drops BTooth occasionally. Only one device can communicate simultaneously		

Codes\\Frustrations\\Can't connect to other technology\\Lack of Compatible Smart-Tech

Dataset

Files\\Qualitative_Only

No	0.0005	6			
			1	CEG	27/06/2023 13:50
Drawbacks is that other house tech are not connected e.g. heating system. The Government should consider more legislation (Building Regs.) to incorporate technology in new housing/type of accomodation					
			2	CEG	27/06/2023 13:50
some devices in my home are not compatible with google, so i would have to buy a different (another) brand of smart speaker.					
			3	CEG	27/06/2023 13:51
Drawbacks are not having many other smart devices (lights/heating) so I am probably not making the most out of it.					
			4	CEG	27/06/2023 13:51
Will incorporate more smart home devices when things need to be replaced but would not replace something that is working just for the smart function					
			5	CEG	27/06/2023 13:51
. Also would use functions like turn on lights etc except our house isn't wired for it.					
			6	CEG	27/06/2023 13:52
Without the complete 'smart home' it's got limited uses					

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
Codes\\Frustrations\\Internet requirment						
Dataset						
Files\\Qualitative_Only						
No		0.0009	14			
				1	CEG	19/06/2023 13:59
Unfortunately, sometimes the lists are unavailable when shopping if signals are low.						
				2	CEG	19/06/2023 14:01
Don't like the fact it is always connected to the internet.						
				3	CEG	19/06/2023 17:51
but if there is any interruption in the Internet service then obviously this can have quite an impact expecially if you are relying on it to take medication						
				4	CEG	19/06/2023 18:00
Sometimes broadband is unreliable and affects status of relay of programs						
				5	CEG	20/06/2023 11:19
Device still reliant on broadband working well						
				6	CEG	20/06/2023 11:29

. Drawbacks it's temperamental with dropping out of internet connection

	7	CEG	20/06/2023 17:14	
an extra bit of tech that can go wrong or that needs to be reset when the wifi goes down/powercut which happens here frequently				
	8	CEG	21/06/2023 11:33	
Unreliable when no strong internet signal.				
	9	CEG	22/06/2023 14:59	
Can't use when there's a powercut or WiFi goes.				
	10	CEG	22/06/2023 15:03	
When the internet breaks it's obviously useless and irritating,				
	11	CEG	22/06/2023 15:51	
the internet connection must be reliable.				
	12	CEG	23/06/2023 11:05	
The broadband connection here is intermittent and the Alexa kept dropping signal making a pain to use.				
	13	CEG	23/06/2023 11:34	
can be a pain when there are network issues				

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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14 CEG 23/06/2023 13:08

it's also affected by our poor internet in a rural area.

Codes\\Frustrations\\Not understanding voice commands\\Humorous Misunderstandings

Dataset

Files\\Qualitative_Only

No 0.0001 2

1 CEG 27/06/2023 14:18

Drawback is sometimes the device can misunderstand me (although this can be funny at times

2 CEG 27/06/2023 14:23

It can be funny when she misunderstands what yo are saying!

Codes\\Frustrations\\Not understanding voice commands\\Not Working as Desired

Dataset

Files\\Qualitative_Only

No 0.0007 11

1 CEG 27/06/2023 14:19

Drawback is sometimes the device can misunderstand me

2 CEG 27/06/2023 14:19

The drawbacks are when it doesn't quite understand commands and does random stuff.

3 CEG 27/06/2023 14:19

sometimes misunderstands what I have said;

4 CEG 27/06/2023 14:20

I sometimes find it doesn't understand a question

5 CEG 27/06/2023 14:22

They are unable to hear your voice over the sound of the TV.

Formatted Reports\\Coding Summary by Code Formatted Report

Page 69 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				6	CEG	27/06/2023 14:22
But often does not understand, gets it wrong or or wont program.						
				7	CEG	27/06/2023 14:22
Drawbacks.... it doesn't always understand instructions						

But often does not understand, gets it wrong or or wont program.

Drawbacks.... it doesn't always understand instructions

8	CEG	27/06/2023 14:22
Not being able to formulate sentences that are fully understood.		

9	CEG	27/06/2023 14:22
Sometimes doesn't understand what is being asked and has to be rephrased to get the right result.		

10	CEG	27/06/2023 14:23
Occasionally requests have to be repeated is a drawback		

11	CEG	27/06/2023 14:23
It doesn't understand what I'm trying to say and the answers are not relevant.		

Codes\\Frustrations\\Not understanding voice commands\\Not Working as Desired\\Feeling Ignored

Dataset

Files\\Qualitative_Only

No	0.0001	2
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1	CEG	27/06/2023 14:18
When it's not working well, it's utterly horrible. Sometimes it feels like it's ignoring me on purpose, even though I know it's not capable of making such choices about me and has no feelings towards me.		

2	CEG	28/06/2023 17:12
If it would do what I say it'd be useful but as it ignores me I don't use it.		

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Frustrations\\Not understanding voice commands\\Not Working as Desired\\Feelings of Anger

Dataset

Files\\Qualitative_Only

No	0.0008	13
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1	CEG	27/06/2023 14:17
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it can be frustrating when it doesn't seem to understand what I'm saying

2	CEG	27/06/2023 14:17
---	-----	------------------

annoying when it doesn't understand your command

3	CEG	27/06/2023 14:18	The benefits outweigh the drawbacks. EXCEPT WHEN IT DOESN'T UNDERSTAND OR HEAR ME. It goes through phases where it doesn't understand me properly, or doesn't hear me. I often enunciate extremely clearly during these phases and it makes no difference!!!
4	CEG	27/06/2023 14:19	And finally the voice recognition is irritatingly erratic.
5	CEG	27/06/2023 14:20	. Draw back is that you have to repeat yourself as it doesn't always respond/understand me and I get irritated by it.
6	CEG	27/06/2023 14:20	My husband shouted at it when it wasn't following his instructions
7	CEG	27/06/2023 14:21	Frustrating not understood
8	CEG	27/06/2023 14:21	Frustration at not being understood sometimes.
9	CEG	27/06/2023 14:21	often doesn't understand what I say, very annoying
10	CEG	27/06/2023 14:22	It's frustrating that it doesn't understand me
11	CEG	27/06/2023 14:22	The disadvantage is the minor annoyance of when it misunderstands.
12	CEG	27/06/2023 14:22	Frustrating when requests not understood.

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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13 CEG 27/06/2023 14:23

Drawbacks annoying when it doesn't understand you or thinks you've said something else.

Codes\\Frustrations\\Not understanding voice commands\\Voice Bias

Dataset

Files\\Qualitative_Only

No 0.0003 4

1 CEG 27/06/2023 14:18

It took Alexa along time to understand my Scottish accent and she doesn't understand my sons Cardie accent.

2 CEG 27/06/2023 14:18

Doesn't aknowledge Welsh, but does other languages!

3	CEG	27/06/2023 14:23
---	-----	------------------

my voice isn't readily understood but my male visitors are answered immediately.

4	CEG	27/06/2023 14:24
---	-----	------------------

Hoffwn petain deall a siarad Cymraeg. Dyma prif reswm nad ydwin or hoff ohono.

Codes\\Frustrations\\Responding when not requested

Dataset

Files\\Qualitative_Only

No	0.0001	4
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1	CEG	19/06/2023 14:02
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it would appear to be 'conscious' of what was going on in the household and did on occasion act on what it considered to be instructions

2	CEG	19/06/2023 17:53
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waking up randomly, answering unasked questions.

3	CEG	20/06/2023 17:39
---	-----	------------------

Sometimes the speakers come on randomly when not asked to and say something.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			4		CEG	23/06/2023 12:47
A major disadvantage is when it misinterprets a noise or word as the wake word						

Codes\\Frustrations\\Responding when not requested\\Annoying

Dataset

Files\\Qualitative_Only

No	0.0004	5				
			1		CEG	27/06/2023 14:39
Sometimes activates when it hears speech on the tv, which can be funny but also annoying.						
			2		CEG	27/06/2023 14:34
Also, I wish I could filter out the commands my parakeet gives the Alexa. He has a habit of telling the device to stop or start again.						
			3		CEG	27/06/2023 14:34
. I switch it off when not using it as it annoys me that it responds to things you say even if you haven't used it's name						
			4		CEG	27/06/2023 14:35
Can sometimes speak to me when I am on the phone						

Sometimes on a business call alexa may think she's being asked something and turns on

Codes\\Frustrations\\Responding when not requested\Funny

Dataset

Files\\Qualitative_Only

No	0.0001	2			
			1	CEG	27/06/2023 14:33

Sometimes activates when it hears speech on the tv, which can be funny but also annoying.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			2		CEG	27/06/2023 14:38

Makes me laugh when she gives a response 'um I don't understand that' when I am talking to the dog.

Codes\\Frustrations\\Responding when not requested\\Invasive

Dataset

Files\\Qualitative_Only

No	0.0003	5
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1	CEG	27/06/2023 14:33
it does sometimes interject conversation unsolicited which begs the questions as to how much it does 'listen in' to your daily living		

2	CEG	27/06/2023 14:33
On one occasion it ordered an item from Amazon that was mentioned during a conversation that was being held in the room. Definitely an invasion of my privacy so the item was switched off and has not been used since.		

3	CEG	27/06/2023 14:35
Can sometimes speak to me when I am on the phone		

4	CEG	27/06/2023 14:38
I switch it off at source as I do not like it coming on when I have not summoned it		

5	CEG	27/06/2023 14:38
Sometimes on a business call alexa may think she's being asked something and turns on		

Codes\\Frustrations\\Responding when not requested\\Listening to Conversations

Dataset

Files\\Qualitative_Only

No 0.0004 4

1 CEG 27/06/2023 14:32

It picks up phrases in conversations and interoperates them as if I was asking the smart speaker for something.

2 CEG 27/06/2023 14:33

it does sometimes interject conversation unsolicited which begs the questions as to how much it does 'listen in' to your daily living

Formatted Reports\\Coding Summary by Code Formatted Report

Page 74 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			3	CEG	27/06/2023 14:33	
On one occasion it ordered an item from Amazon that was mentioned during a conversation that was being held in the room. Definitely an invasion of my privacy so the item was switched off and has not been used since.						
			4	CEG	27/06/2023 14:33	
Drawbacks - it sometimes thinks you are speaking to it during a normal conversation with others (I have had my smart speaker start to play music during an online call because it thought someone in the meeting had asked it to play).						

Codes\\Frustrations\\Unnecessary

Dataset

Files\\Qualitative_Only

No		0.0003	2
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1	CEG	19/06/2023 13:57
---	-----	------------------

I havnt set mine up yet - I dont feel its a priority to do so as it's just extra technology

2	CEG	21/06/2023 11:08
---	-----	------------------

Have not got to grips with it as do not see a need for it.

Codes\\Frustrations\\Unnecessary\\Duplicates other devices

Dataset

Files\\Qualitative_Only

No		0.0016	12
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1 CEG 27/06/2023 12:02

I have more than one smart speaker and similar functionality is available via my mobile phone and android TV

2 CEG 27/06/2023 12:02

It's a handy device but it's nothing I couldn't look up on my phone.

3 CEG 27/06/2023 12:03

Don't see what I gain from a smart speaker that I cannot get from existing tech

4 CEG 27/06/2023 12:04

It is a glorified radio, if you do not have unlimited everything. I have prime TV, but I still have to pay for music , books

Formatted Reports\\Coding Summary by Code Formatted Report

Page 75 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			5	CEG	27/06/2023 13:37	
			See little benefit or added value given alternative technologies already available			
			6	CEG	27/06/2023 13:39	
			Just another form for listening to music/radio			
			7	CEG	27/06/2023 13:39	
			Just another techie device to access music and audiobooks. Not an important or necessary piece of equipment			
			8	CEG	27/06/2023 13:39	
			It's simply an 'add on' . So far haven't discovered anything it can do which can't be done another way.			

Very over rated glorified radio	9	CEG	27/06/2023 13:41
I struggle to see any benefit of a smart speaker over a smart phone/ tablet.	10	CEG	27/06/2023 13:41
I don't think it adds a lot to my life information <input type="checkbox"/> access from the smart speaker I could easily access other ways.	11	CEG	27/06/2023 13:42
I can access all its services from other outlets	12	CEG	27/06/2023 13:42

Codes\\Frustrations\\Unnecessary\\Duplicates other devices\\Prefers other devices

Dataset

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No	0.0012	15	
	1	CEG	27/06/2023 12:03
I can see that some people might find it useful but I have other means of getting information that are more comprehensive and if I want to read up on something I like to be able to have a wider range of sources. I can see others might find it useful			
	2	CEG	27/06/2023 12:04
Drawback, I simply forget to use it and rely more on my laptop, desktop and smartphone and even the digital radio in preference to the smart speaker.			

3 CEG 27/06/2023 13:37

I was given it as a present but, given that I have two PCs and an ipad, I see no reason to use it.

Formatted Reports\\Coding Summary by Code Formatted Report

Page 76 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				4	CEG	27/06/2023 13:37
				. I prefer the smartphone. I		
				5	CEG	27/06/2023 13:37
				I can get the info I need from other sources, so don't use it much		
				6	CEG	27/06/2023 13:38
				I found that I didn't need it as I already have a laptop, smart phone, speakers etc which can do all the thinks the smart speaker can		
				7	CEG	27/06/2023 13:39
				I use an iPhone and DAB radio in other rooms.		
				8	CEG	27/06/2023 13:40
				I don't use it much as I tend to look up any information I want on our smart phone or laptop as I would rather see information in a written form or video than hearing it		
				9	CEG	27/06/2023 13:40
				. We have used it to make phone calls but both prefer to use either the mobile phone or landline.		
				10	CEG	27/06/2023 13:40

There is nothing a smart speaker can do that I can't do more simply elsewhere.

11	CEG	27/06/2023 13:40
. I don't bother asking it to find me information as I like to be able to go through the options in a browser.		
12	CEG	27/06/2023 13:41
smart speaker, mainly for music, I use my I phone or I pad to listen to radio or music		
13	CEG	27/06/2023 13:41
I see no benefit to me, everything I require can be done by other means. ie radio, apps or other smart controls.		
14	CEG	27/06/2023 13:41
, a radio is cheaper and easier to use.		
15	CEG	27/06/2023 13:42
I have rarely had a sensible answer to a question and so I use my smartphone		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
Codes\\Frustrations\\Unnecessary\\Gimmicky, a toy, novelty						
Dataset						
Files\\Qualitative_Only						
No		0.0008	7			
				1	CEG	27/06/2023 13:38
Bit of a gimmick						
				2	CEG	27/06/2023 13:38
For me, it's just a toy						
				3	CEG	27/06/2023 13:39
Apart from being a novelty, I can't think of any use for them.						
				4	CEG	27/06/2023 13:39
I find it a bit gimmicky, so doesn't really enhance my life or make things easier.						
				5	CEG	27/06/2023 13:39
FRankly, I thinkit is a bit of a gimmick.						
				6	CEG	27/06/2023 13:40
To be honest by treat it more as an entertainment device than anything serious. It doesn't actually do anything I couldn't do myself.						
				7	CEG	27/06/2023 13:43

There are lots of things that I could use a smart speaker for, but most of them are technological solutions to something I don't really need.

Codes\\Frustrations\\Unnecessary\\Wastes time, rather than being convenience

Dataset

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No	0.0001	2			
			1	CEG	27/06/2023 13:37

Waste of time.

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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2CEG27/06/2023 13:37

Can't think of any it's a complete waste of time and money.

Codes\\Who is perceived to benefit most\\Age\\Children

Dataset

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No	0.0019	24
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	1	CEG	20/07/2023 16:20
The children can use them easily, listening to audiobooks (which they love and aren't a substitute for an adult!) also turning lights on and heating			
	2	CEG	19/06/2023 11:23
My step daughter is type 1 diabetic and on an insulin pump and we use ours daily to check the carbs in the foods as were cooking, normally we get her to do it by us when we're cooking for example and because it speaks out loud we know whether she's done it correctly			
	3	CEG	20/07/2023 16:26
Helps the children fact check and access music and audio books			
	4	CEG	19/06/2023 11:48
it's my teenage daughter's			
	5	CEG	20/07/2023 16:52
entertainment for my young granddaughter-'Alexa			
	6	CEG	20/07/2023 16:54
The quirky functions are useful with children,			

7	CEG	20/07/2023 17:07
No benefit to myself but the grandchildren like to ask it to play music .		
8	CEG	19/06/2023 17:59
It allows my children to control the media, such as asking for music or TV shows.		
9	CEG	20/07/2023 17:10
My granddaughter can ask for her favourite songs to be played.		
10	CEG	20/07/2023 17:26
If my child asks me a question whilst I'm in the room with the smart speaker I nearly always say let's ask Google as I do not know.		

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				11	CEG	20/06/2023 14:10
My son is autistic and she answers many of his questions						
				12	CEG	20/07/2023 17:58
Benefits- my 3 month old baby loves hearing music from it, its essential for nap time!						
				13	CEG	20/06/2023 15:46
The kids are also able to use it for this purpose						
				14	CEG	20/07/2023 17:59

My 3 yr old granddaughter now uses it when she visits.

15	CEG	21/06/2023 11:34
music system when we play with the children and they are learning how to request songs independently		
16	CEG	21/06/2023 11:39
Keeps my grandchildren happy when they visit.		
17	CEG	20/07/2023 17:59
Helps my 4 year old speak clearly.		
18	CEG	22/06/2023 15:20
It helps with homework for the kids		
19	CEG	22/06/2023 15:49
I got it for my son, but he hasn't set it up yet		
20	CEG	20/07/2023 18:03
, my granddaughter set it p and showed me how to to use it, she would pick arguments ask for jokes, sing nursery rhymes, then ask for things in Welsh, she shouts at it when she comes in from school		
21	CEG	23/06/2023 11:04
It can be fun using it with the grandchildren		
22	CEG	20/07/2023 17:59
I bought an Alexa for my 8 year old - she loves it!		
23	CEG	23/06/2023 11:35
Amuses the grandchildren		

The children can ask questions to the smart speaker

Formatted Reports\\Coding Summary by Code Formatted Report

Page 80 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Who is perceived to benefit most\\Age\\Older Adults

Dataset

Files\\Qualitative_Only

No	0.0011	13
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1	CEG	20/07/2023 16:21
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I can understand if an older person is on their own it being their only companion.

2	CEG	19/06/2023 14:09
---	-----	------------------

I live in an annexe of my parents home, they have an Echo and it's been helpful for my Mum, she's been shielding and it helps her a lot

3	CEG	19/06/2023 14:09
---	-----	------------------

I can also see how it could have been useful for my very elderly great Aunt before her dementia progressed- if she could ask it the time or for the radio to be on etc.

4	CEG	20/07/2023 16:57
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eventually increased independence in later years

5	CEG	19/06/2023 17:46
. Will hopefully be more helpful as we age and potentially need more support.		
6	CEG	20/07/2023 17:54
I use it to keep my mind active as i am getting old. I am aiming on keeping upto date incase i need to use the smart devices because i can nolonger turn my light on etc.		
7	CEG	19/06/2023 17:56
I got an echo for my mother in law (87yrs) who has Alzheimer's and got her to use it as a radio and for asking definitions of words , she loves crosswords, news etc. I did not expect her to take to using it.		
8	CEG	20/07/2023 17:08
For the elderly they could be marvellous. Instant information.		
9	CEG	20/07/2023 17:27
Bought to help my blind elderly mother to be able to communicate more easily with me, and to get information, news		
10	CEG	20/06/2023 14:06
As we are older we use the speaker to remind us to take medication at a prescribed time and to remind us of important appointments		
11	CEG	21/06/2023 11:42
Company for older persons		
12	CEG	22/06/2023 15:07
It has the potential of being more useful as I get older.		

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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13 CEG 23/06/2023 11:33

My family bought me the smart speaker as a safety measure because I live on my own and they want me to have a means of contacting them if I have a fall or hurt myself and cannot reach my phone

Codes\\Who is perceived to benefit most\\Impairments\\Cognitive Impairment

Dataset

Files\\Qualitative_Only

No 0.0006 7

1 CEG 19/06/2023 13:58

But the biggest help for me personally is as a reminder for different things, due to 'brain fog' I often forget things, so I always set a reminder for different things I need to remember to do, including taking my medication.

2 CEG 20/07/2023 16:55

I can also see how it could have been useful for my very elderly great Aunt before her dementia progressed- if she could ask it the time or for the radio to be on etc.

3 CEG 20/07/2023 17:07

I have a poor memory thanks to MS.

4	CEG	20/07/2023 17:08
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I got an echo for my mother in law (87yrs) who has Alzheimer's and got her to use it as a radio and for asking definitions of words , she loves crosswords, news etc. I did not expect her to take to using it.

5	CEG	20/07/2023 17:09
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Ensuring that my wife (who has memory loss) can easily switch things off when she leaves the house/goes to bed with a simple phrase

6	CEG	20/06/2023 16:32
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Helps my husband manage dementia

7	CEG	23/06/2023 11:05
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As my memory is not so good it reminds me what I'm doing!

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Who is perceived to benefit most\\Impairments\Dyslexics

Dataset

Files\\Qualitative_Only

No	0.0005	4			
			1	CEG	20/06/2023 17:38
Being dislexic it's useful to do things by voice.					
			2	CEG	21/06/2023 11:11
Helps me spell					
			3	CEG	21/06/2023 11:12
I am very poor at spelling so I get it to spell for me.					
			4	CEG	21/06/2023 11:40
i find it great for help with spelling and info					

Codes\\Who is perceived to benefit most\\Impairments\Hearing loss

Dataset

Files\\Qualitative_Only

No0.00013

1CEG20/07/2023 17:09

Stream directly to my wife's hearing aids.

2CEG20/06/2023 14:07

to make announcements to my husband who is hard of hearing when I am in a different part of the house.

3CEG20/07/2023 18:02

Helps when needing to communicate with my daughter in another room as she has loss of hearing

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Who is perceived to benefit most\\Impairments\\Mobility issues

Dataset

Files\\Qualitative_Only

No0.003432

1	CEG	20/07/2023 16:32	Can control all devices from one place. This is great as I have mobility issues.
2	CEG	20/07/2023 16:33	I'm an amputee so I use my Alexa for turning on and off smart bulbs for cooking recipes time to ask questions I'm not sure of answers music
3	CEG	20/07/2023 16:54	Should I become less able physically to perform certain tasks, the smart speaker and associated devices can assist. EG unlocking/locking a door; controlling lights; curtains; being able to shout out for help, viewing who is at the door.
4	CEG	20/07/2023 16:59	I imagine they can be invaluable for people with debilitating illnesses which prevent them from being as mobile as they'd like or for those who are chair or bed bound.
5	CEG	20/07/2023 17:39	, hands-free information which helps with my arthritis hands
6	CEG	19/06/2023 17:47	there have been occasions when I have been unable to move very well so it is easier to use alexa
7	CEG	20/07/2023 17:02	I can control my house via smart bulbs and smart plugs, and hope to install Alexa-friendly central heating controls this year. This helps me with my physical disability as I don't have to get up to switch things on/off around my house.
8	CEG	19/06/2023 17:56	. I am aiming on keeping up to date in case I need to use the smart devices because I can no longer turn my light on etc.
9	CEG	19/06/2023 17:58	Avoids having to reach for switches
10	CEG	19/06/2023 18:10	

ease of use for those who find a keyboard difficult

11	CEG	20/07/2023 17:27
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As a Traumatic Brain Injury Survivor it is invaluable in the case of mobility issues. Everything at your command.

12	CEG	20/07/2023 17:28
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, it would be great for people with various physical impairments who may struggle with other non voice activated devices.

13	CEG	20/06/2023 14:03
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Carrying a cup of tea and using a walking stick,I can put the lights on with my voice.

Formatted Reports\\Coding Summary by Code Formatted Report

Page 84 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				14	CEG	20/07/2023 17:42
				Handy if you are disable and have difficulty moving.		
				15	CEG	20/06/2023 16:12
				Useful for those with impaired mobility		
				16	CEG	20/06/2023 16:29
				Useful for disable people since you can use voice commands		
				17	CEG	20/06/2023 17:12
				help those with mobility etc issues		

18	CEG	20/06/2023 17:37	Benifit of switching lights and socks on by voice so I don't have to get up (I have a bad knee).
19	CEG	21/06/2023 11:16	turn on light on the plus side if you have problems moving that is a good thing
20	CEG	21/06/2023 11:19	To turn on kettles, lights etc which saves me getting up as I have mobility issues.
21	CEG	21/06/2023 11:20	Just improves my leisure time as I grow older and become less mobile
22	CEG	21/06/2023 11:31	One of the biggest benefits for me is being able to control lights, electronic devices such as TVs etc through the smart speaker without getting up. As a chornic pain patient it is often hard for me to move around and having the smart speaker mitigates this.
23	CEG	21/06/2023 14:30	It was particularly useful when I was assisting my Niece who had a brain tumour that caused her to fall quite often.
24	CEG	22/06/2023 14:57	Can see it's value as an item of assistive technology for those with disabilities .
25	CEG	22/06/2023 15:07	It can be used to summon help should I have called fall. That's why it was bought for me.
26	CEG	22/06/2023 15:08	It helps me because of my mobility issues.
27	CEG	22/06/2023 15:34	If I became disabled I would purchase other necessities that I could control via my speaker

28 CEG 22/06/2023 15:36

I'm a amputee I had my left leg amputated 3 years ago I use my Alexa to turn on lights it helps me answer my front door because it's connected to my ring doorbell

Formatted Reports\\Coding Summary by Code Formatted Report

Page 85 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
			29	CEG	22/06/2023 15:45	
			I use it for use I got the nest heating control when away from the house aswell as in the house.I also use it for turning lights on and off which frees one hand to carry something as I use a walking stick in the other hand.			
			30	CEG	23/06/2023 10:41	
			I am disabled- I can ask the speaker to connect to my other speaker downstairs to ask my partner for help			
			31	CEG	23/06/2023 11:09	
			I think they're absolutely amazing for those who need extra help with things when they're used to their full potential. For example turning heating on and off if they're less mobile			
			32	CEG	23/06/2023 11:33	
			My family bought me the smart speaker as a safety measure because I live on my own and they want me to have a means of contacting them if I have a fall or hurt myself and cannot reach my phone			

Codes\\Who is perceived to benefit most\\Impairments\\Visual-Impairment

Dataset

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No		0.0006	6		
			1	CEG	20/07/2023 16:20
	. I'm also partially sighted due to a neurological condition and I struggle particularly with low lighting so we've programmed all our lamps and lights to be linked to google home so I can turn all the lights on without struggling to find the light switch.				
			2	CEG	19/06/2023 11:42
	voice command in bed especially a sleep-timer on audio books and knowing what time it is because you cannot read a clock when not wearing glasses!				
			3	CEG	20/07/2023 17:27
	Bought to help my blind elderly mother to be able to communicate more easily with me, and to get information, news				
			4	CEG	20/06/2023 16:28
	when my husband is doing DIY. He is totally blind and so it is easy to use to find sport results etc				
			5	CEG	23/06/2023 10:49
	We bought one for my mother in law who has bad eyesight. She uses it to find out the time				
			6	CEG	23/06/2023 11:04
	Good for the those with sight problems,				

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
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Codes\\Who is perceived to benefit most\\Lonely people

Dataset

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No	0.0014	14				
			1	CEG	20/07/2023 16:21	
I can understand if an older person is on their own it being their only companion.						
			2	CEG	20/07/2023 16:55	
they have an Echo and it's been helpful for my Mum, she's been shielding and it helps her a lot						
			3	CEG	20/07/2023 17:48	
Feeling of not being alone for some people.						
			4	CEG	20/07/2023 17:48	
Also if you live alone I can see that they might provide some company day to day.						
			5	CEG	20/07/2023 17:49	
I live alone and listening to music of my choice or the radio helps overcome the ' silence'						
			6	CEG	20/07/2023 17:47	
I feel less lonely						
			7	CEG	20/07/2023 17:47	

Company for lonely people.

	8	CEG	20/07/2023 17:49
Useful if alone for company			
	9	CEG	20/07/2023 17:50
They help to keep me company as I live alone and are alone most of the time.			
	10	CEG	22/06/2023 15:07
Helps with loneliness			
	11	CEG	22/06/2023 15:34
People living in their own feel less isolated			
	12	CEG	23/06/2023 10:35
Company if alone			
	13	CEG	23/06/2023 10:38
If you live alone, maybe there are some benefits			

Formatted Reports\\Coding Summary by Code Formatted Report

Page 87 of 88

15/04/2025 16:30

Aggregate	Classification	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On
				14	CEG	20/07/2023 17:52
	Quiz or crossword answers when home alone					

Codes\\Who is perceived to benefit most\\Low Digital Skills

Dataset

Files\\Qualitative_Only

No	0.0005	5			
			1	CEG	19/06/2023 11:27
benefits if unable to use other devices.					
			2	CEG	20/06/2023 11:33
Those who left school before Computers were used or a subject in the curriculum struggle with Technology and should have access to education and learning in places like Community Hubs.					
			3	CEG	20/07/2023 17:41
benefits -easy to use for people without digital skills if they have help to set it up -					
			4	CEG	20/07/2023 17:51
Getting information about things. Like a search engine. Playing music.					
			5	CEG	23/06/2023 13:11
Voice control enables those with difficulties using keyboard and mouse to interact with interweb.					

Appendix J: Initial Factor Analysis of All Terms Relating to Social Benefit

Firstly, to ensure that a factor analysis would be appropriate, the correlation matrix, anti-image correlations, sampling adequacy, and sphericity were assessed. 4 of the 10 correlations were greater 0.3, all of the anti-image correlations were greater than 0.5 (see Table 1), and the determinant was 0.447, all indicating potential factorability of the matrix.

Table 1. *Correlation Matrix conducted between the variables related to social benefit, reflecting the themes identified in RQ2 of Study 1, as a precursor to factor analysis.*

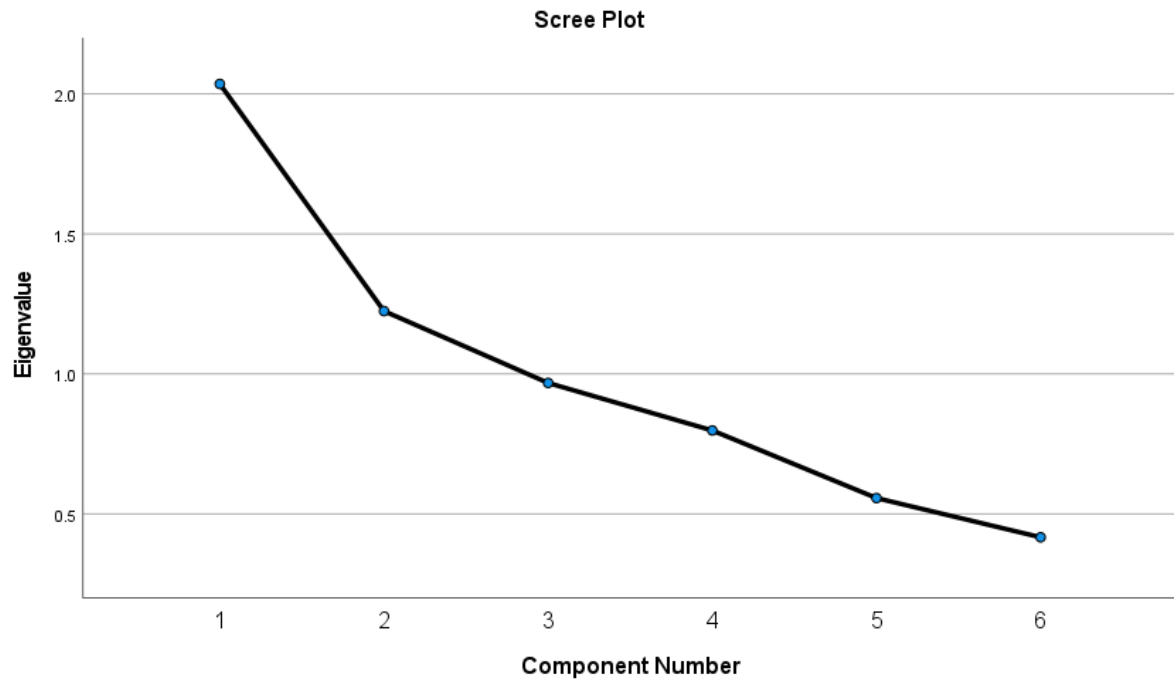
Correlations	Contact	Enjoyment	Alone	Company	Calls	Companion
Contact	0.580					
Enjoyment	0.190	0.754				
Alone	0.101	-0.005	0.586			
Company	0.317	0.185	0.331	0.597		
Calls	0.529	0.124	0.015	0.122	0.545	
Companion	0.179	0.156	0.129	0.401	0.126	0.660

Note: lower triangle reflects the correlation matrix, principal correlations (in bold) reflect the anti-image correlations.

Additionally, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy suggested that the items included were adequate and the factorability of the matrix was acceptable (Kaiser, 1974). This is further supported by Bartlett's Test of Sphericity (Bartlett, 1951), showing that the correlation matrix differs significantly from an identity matrix and therefore the associations between items are meaningful, $\chi^2(15) = 1006.350, p < 0.001$. Collectively these findings, along with the results of the correlation and anti-image correlation suggests that a factor analysis would be appropriate.

Following this confirmation, a series of investigations to estimate the most appropriate number of factors for the data were conducted. Using principal component analysis, the matrix was found to have only 2 factors with an Eigenvalue of >1 (2.036 and 1.225) (Kaiser, 1960). These were able to predict 33.9% and 20.4% of the variance, respectively. This was further supported by the scree plot (see Figure 1), which visually suggests that there are 2 major factors and 4 minor factors (Cattell, 1966). Therefore, these both suggest that 2 factors should be extracted.

Figure 1. Scree plot showing the Eigenvalues of proposed components arising from principal component analysis.



However, as the Kaiser criterion of Eigenvalues > 1 is prone to overfactoring, parallel analysis was conducted to validate the suggestion of two factors from the matrix (see Table 2) (Horn, 1965). The 95th percentile simulated Eigenvalues were only smaller than the raw data Eigenvalues for 2 principal components, further supporting the notion of 2 factors from the matrix.

Table 2. Parallel analysis and the Eigenvalues from the simulated correlations in comparison to the Eigenvalues of the raw data.

Principal Components	Raw Data Eigenvalue	95 th Percentile Simulated Eigenvalue	Supported for Factorisation
1	2.036	1.131	Tick
2	1.224	1.076	Tick
3	0.968	1.037	Cross
4	0.798	1.002	cross
5	0.557	0.974	Cross
6	0.417	0.937	Cross

Note: Raw data Eigenvalues should be greater than the 95th percentile simulated Eigenvalue to support that principal component's inclusion in factorisation.

Based on examining the above Eigenvalues, Scree plot, and the outcome of the parallel analysis, principal axis factoring with 2 factors was conducted. Oblique rotation, specifically using promax rotation, was chosen as the factors are theoretically correlated and so it is unnecessary to constrain the factors to their original orthogonality. This found both factors to have a rotated sum of squared loadings of > 1 , validating them as factors (see Table 3). Additionally, these factors were able to cumulatively explain 39.134% of the variance in the items.

Table 3. Summary of the 2 factors produced through principal axis factoring.

Factor	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	Percentage of Variance	Cumulative Percentage	Total
1	1.591	26.524	26.524	1.352
2	0.757	12.610	39.134	1.268

As only loadings >0.3 are considered meaningful to the factors (Draper & Smith, 1998), values below this are not presented. The principal axis analysis produced 2 factors which seem to reflect the offering intrinsic and facilitative factors suggested by the content analysis (see Table 4). Factor 1 related strongly to the smart speaker offering company, with moderate loadings related to preferring to use the device when alone and viewing it as a companion, reflecting the offering intrinsic social value. Conversely, factors 2 has strong loadings from items relating to using the device to contact friends and family, and using it for calls, reflecting the facilitative social value. Finally, the correlation between these factors is 0.329, suggesting there is a moderate level of correlation between using the smart speaker for offering intrinsic and facilitative social purposes, and possibly reflecting a unified social benefit.

Table 4. Pattern matrix of the items rotated loadings onto the two factors.

Items	Factors	
	1 – Offering Intrinsic Social Value	2 – Facilitating Human-Human Communication
Company	0.940	
Companion	0.401	
Alone	0.354	
Contact		0.737
Calls		0.730