

Together

Understanding How Technology Use within Families Shapes Parents' Experiences

by Eleanor Chin Derix

Thesis submitted in fulfilment of the requirements
for the degree of Doctor of Philosophy

under the supervision of
Dr Tuck Leong Wah and Dr Julia Prior

University of Technology Sydney
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CERTIFICATE OF ORIGINAL AUTHORSHIP

I, Eleanor Chin Derix, declare that this thesis is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the School of Computer Science, Faculty of Engineering and Information Technology at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

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for Us

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FORMAT STATEMENT: THESIS BY COMPILATION

This dissertation is formatted as a ‘*Thesis by Compilation*’ in accordance with the University of Technology Sydney requirements. It compiles new material with content taken from seven, previously published, peer-reviewed papers that report on the studies conducted during my doctoral candidature. Permission to include each of these publications in this dissertation has been granted by the publisher (see Appendix 5).

List of Publications

- I. Eleanor Chin Derix & Tuck Wah Leong. *Days of Our Lives: Family Experiences of Digital Technology Use*. In Proceedings of the 30th Australian Conference on Human-Computer Interaction, Melbourne, Australia. 2018. ACM Press.
<https://doi.org/10.1145/3292147.3292185>
- II. Eleanor Chin Derix & Tuck Wah Leong. *Towards a Probe Design Framework*. In Proceedings of the 31st Australian Conference on Human-Computer Interaction, Perth, Australia. 2019. ACM Press. 117-127. ***Best Paper Award**
<https://doi.org/10.1145/3369457.3369467>
- III. Eleanor Chin Derix & Tuck Wah Leong. *Probes to Explore the Individual Perspectives on Technology Use that Exist within Sets of Parents*. In Proceedings of the Designing Interactive Systems Conference (DIS). Eindhoven, Netherlands. 2020. ACM Press.
<https://doi.org/10.1145/3357236.3395471>
- IV. Eleanor Chin Derix & Tuck Wah Leong. *Tactics for Designing Probes to Explore Parents’ Differing Perspectives on Family Technology Use*. In Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society, Tallinn, Estonia. 2020. ACM Press.
<https://doi.org/10.1145/3419249.3420138>
- V. Eleanor Chin Derix, Julia Prior & Tuck Wah Leong. “*It’s The Same Conflict Every Day, On Repeat.*” *How Digital Technology Use Can Contribute Towards Conflict in Parents’ Relationships*. In Extended Abstracts of the CHI Conference on Human Factors in Computing Systems. Yokohama, Japan. 2021. ACM Press. 1-6
<https://doi.org/10.1145/3411763.3451714>
- VI. Eleanor Chin Derix, Julia Prior & Tuck Wah Leong. *Family Technology Use: Sources of Conflict in Parents’ Relationships*. In Proceedings of the 33rd Australian Conference on Human-Computer Interaction. Sydney, Australia. 2021. ACM Press.
<https://doi.org/10.1145/3520495.3520515>

- VII. Eleanor Chin Derix, Julia Prior & Tuck Wah Leong. *“It’s A Drag”*: Exploring How to Improve Parents’ Experiences of Managing Mobile Device Use During Family Time. In Proceedings of the CHI Conference on Human Factors in Computing Systems. New Orleans, USA. 2022. ACM Press. <https://doi.org/10.1145/3491102.3517501>

Declaration of contribution: Publication I-VII

For each of the seven publications listed above, and included in this dissertation, I formulated the research goals and aims, planned and conducted the research, collected, coded and analysed research data, and wrote the initial draft of the paper. My co-author(s) offered guidance on research design, participated in validation and discussion during data analysis and also contributed by reviewing and editing text.

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January 2023

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Julia Prior

Co-author of Publications V through VII

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RESEARCH JOURNEY

Embarking on this research journey

The work described in this dissertation began in early 2018. I arrived into the PhD program at the University of Technology Sydney after a decade spent working in the design and innovation industry. Over the course of my career as a user experience (UX) researcher, designer and manager, I enjoyed opportunities to contribute to the wider design community and collaborating with academic institutions. These engagements often prompted a desire to explore certain aspects of my work in more detail. Especially, how the digital disruptions that we were busy creating might be impacting society. Yet, I was enthusiastically immersed in the familiar rhythms of managing fast-paced commercial projects.

When taking parental leave and temporarily removed from my professional context, I finally seized the opportunity to dedicate myself to this self-directed research project. I was equal parts delighted and terrified. I was also a parent of two very young children. As I describe in more detail later, my roles as a UX professional and a parent were both instrumental in determining the approach I took to this work and the trajectory it followed.

Looking back, I would arrive at initial meetings with my supervisor in anticipation of a project pitch or kick-off. Nevertheless, these early, productive conversations helped identify my focus on understanding experiences of technology use within families. I familiarised myself with the relevant literature, which included contrasting reports on how technologies should be used in families, especially by children. While these reports often load expectations and responsibilities onto parents, they tend to lack a deep understanding of parents' experiences.

Progression, publications and participation

When planning, conducting and analysing my studies, I was able to utilize my extensive professional experience. Yet, the transition from practice to academia involved a shift in parameters that could sometimes seem disorientating. Transitioning from client-focused communication to academic writing initially felt uncomfortable and here, my supervisors' support was invaluable. As I progressed through my research, I found it helpful to use the process of paper writing as a vehicle with which to frame and reflect on the findings of each study. Seven publications emanated from the course of my candidature:

The findings of my first study were reported in **Publication I** *Days of Our Lives: Experiences of Technology Use*. This paper was presented at the OzCHI Conference in 2018, where I also participated in the doctoral consortium. It reports on Study One, an exploratory workshop that I held to build an initial understanding of parents and their contexts, and to inform the design of my subsequent probe and interview study (Study Two).

When embarking on Study Two, a methodological focus arose within my research. The methodologically focused findings of this study are described in three papers. Firstly, **Publication II** *Probe Design Framework*, which was awarded Best Paper at the OzCHI Conference in 2019. This paper reflects on my attempt to use Wallace et al.'s *Making Design Probes Work* (Wallace et al. 2013) as a guide when designing and using probes. By clarifying and developing this existing framework, this publication suggests how researchers and designers be more strategic when embarking upon the method.

The second publication to describe the methodological focus of Study Two is **Publication III** *Probes to Explore Parents' Individual Perspectives*. This paper was presented at the Designing Interactive Systems Conference in 2020. It presents the novel approach I took to designing and using probes to capture and tease apart parents' individual perspectives on family technology use. The third and final publication that focuses on the method used during Study Two is **Publication IV** *Tactics to Explore Parents' Differing Perspectives*. This paper was presented at the NordiCHI Conference in 2020. It describes design tactics that were particularly effective when developing probes to explore parents' differing individual perspectives on family technology use.

The theoretical findings of the probe and interview study conducted during Study Two are reported in two publications. Firstly, **Publication V** *"It's The Same Conflict, Everyday"*, which was accepted at the CHI Conference in 2021. This paper illustrates how technology use can contribute towards conflict in parents' relationships, and how this conflict can play out within everyday family life. These initial findings are expanded upon within **Publication VI** *Sources of Conflict in Parents' Relationships*, accepted at the OzCHI Conference in 2021. This paper identifies four main sources of the conflict that can arise between parents because of family technology use. The findings of my final study (Study Three) were presented in **Publication VII** *"It's A Drag" Exploring How to Improve Parents' Experiences*. This paper was accepted at the CHI Conference, in 2022. It describes three design approaches that parent perceive would improve their experiences of managing mobile devices during family time.

These publications allowed me to share my work and engage with the human-computer interaction (HCI) community. As a result, I received invitations to participate in a range of opportunities. These included taking part in a Critical Reading Group on Probes at Northumbria University, presenting a keynote at the Service Design Days conference and contributing to a subcommittee of the IEEE (Institute of Electrical and Electronics Engineers) Global Initiative on Ethics of Autonomous and Intelligent Systems. I was also extremely happy to accept invitations to review papers for subsequent OzCHI, DIS and CHI conferences.

Impacts of the COVID-19 pandemic

My decision to undertake my doctoral research at the University of Technology Sydney - rather than to conduct my studies remotely to utilize my existing links with Universities in Europe - was driven by the appeal of in-person supervision and opportunities to teach and participate in a post-graduate environment. Indeed, as I embarked on my candidature, I rapidly established a stable foundation, upon which to develop my academic research and was able to make good progress. Yet, in my second year and after conducting two studies, a health concern caused me to temporarily reduce my study load. Once recovered, I resumed full-time study and was especially motivated when awarded Best Paper at the OzCHI Conference in December 2019. So, just a few months later when the COVID-19 pandemic began to play out in early 2020, it was challenging to accept the scale to which my research progression would be impacted.

The immediate economic fallout of the pandemic led to a change in my husband's work situation. This, together with Australia's international border closures, prompted a difficult decision of returning to Europe so that I could continue my research. In August 2020, I took a leave of absence while relocating to Germany and settling our two children into a new life and school. Against a backdrop of disruption on a global scale, I was grateful to have this option and the unwavering support of my supervisors as I persisted with this work. I was also thankful that many of the participants who had engaged in my initial studies enthusiastically offered to continue participating in my research from afar.

Prior to COVID-19, I had envisaged that Study Three would involve a final round of in-home interviews. Instead, I found myself limited to interacting with participants remotely. However, I realized that there might be some advantages to the restrictions that had been introduced due to the pandemic. For instance, the UX designers and researchers within my professional network were working from home and experiencing the monotony of lockdown. This meant they were more able and willing to participate in a remote ideation workshop than they might have been previously. Similarly, most of the parents I had recruited for Study Three had become quite familiar with participating in video calls and seemed more eager and available to participate in interviews.

Inevitably, interruptions continued to arise throughout the COVID-19 pandemic. These included periods of home-schooling and illness, and eventually a more dramatic change as my husband's work situation took him to a remote region of Saudi Arabia. Restrictions on international travel meant being separated for several months and as these began to ease, we took the decision to move once again and join him. Arriving in March 2022, I was determined for this to be the location where I conclude my research.

On reflection, I am still astounded by what it entailed for me to continue my PhD journey during the COVID-19 pandemic. Clearly the journey itself was far from what I had envisaged.

For instance, five of the seven conferences at which I shared my work were held virtually. Despite my initial intentions, much of my supervision has been conducted across large differences via Zoom and WhatsApp. While I absolutely missed the in-person experience I had hoped for, these ongoing opportunities to share and connect with others felt even more valuable during this difficult and socially distant time. Moreover, I am incredibly grateful for the continuity that this work gave me in this time of huge uncertainty and flux.

This thesis was completed in January 2023.

TABLE OF CONTENTS

| | |
|---|------|
| CERTIFICATE OF ORIGINAL AUTHORSHIP | i |
| DEDICATION | ii |
| ACKNOWLEDGEMENTS | iii |
| FORMAT STATEMENT: THESIS BY COMPILATION | iv |
| List of Publications | iv |
| Declaration of contribution: Publication I-VII | v |
| RESEARCH JOURNEY | vi |
| Embarking on this research journey | vi |
| Progression, publications and participation | vi |
| Impacts of the COVID-19 pandemic | viii |
| TABLE OF CONTENTS | 1 |
| LIST OF FIGURES | 8 |
| LIST OF TABLES | 9 |
| ABSTRACT | 10 |
| CHAPTER 1. Introduction | 11 |
| 1.1 Background | 14 |
| 1.2 Assertions and Research Questions | 16 |
| 1.3 Overview of this Thesis by Compilation | 18 |
| 1.3.1 Compiling the Publications | 19 |
| 1.3.2 Chapter 2. Related Work | 20 |
| 1.3.3 Chapter 3. Research Design | 20 |
| 1.3.4 Chapter 4. Study One | 20 |
| 1.3.5 Chapter 5. Study Two Methodological Focus | 20 |
| 1.3.6 Chapter 6. Study Two Theoretical Focus | 21 |
| 1.3.7 Chapter 7. Study Three | 21 |
| 1.3.8 Chapter 8. Discussion and Conclusions | 21 |
| 1.4 Definitions of Terms Used within this Thesis | 22 |

| | |
|--|----|
| CHAPTER 2. Related Work | 24 |
| 2.1 Theory: Exploring Family Technology Use in HCI | 25 |
| 2.1.1 Complex Experiences of Family Technology Use | 28 |
| 2.1.2 Parenting Children’s Technology Use | 29 |
| 2.1.3 Parents’ Use of Technology | 32 |
| 2.1.4 Technology Use and Family Conflict | 34 |
| 2.1.5 Gaps in Our Understanding: Experiences of Family Technology Use | 36 |
| 2.2 Methods: Addressing the Challenges of Researching Families | 37 |
| 2.2.1 Using Probes to Explore Family Technology Use | 39 |
| 2.2.2 Guidance on Probe Design & Use | 41 |
| 2.2.3 Gaps in Our Understanding: Probing Parents’ Experiences | 43 |
| 2.3 Design: Addressing Problematic Aspects of Pervasive Technology Use | 43 |
| 2.3.1 Designing for Digital Wellbeing | 44 |
| 2.3.2 Enhancing Experiences of Collocated Mobile Device Use | 45 |
| 2.3.3 Gaps in Our Understanding: Designs to Improve Parents’ experiences | 47 |
| 2.4 Conclusions | 47 |
| CHAPTER 3. Research Design | 49 |
| 3.1 Overview of Research Approach | 50 |
| 3.1.1 Research Methods | 51 |
| 3.1.2 Analysing Research Data | 51 |
| 3.1.3 Research Trajectory | 53 |
| 3.2 Methods Used in the Empirical Studies | 53 |
| 3.2.1 Study One: Exploratory Workshop | 54 |
| 3.2.2 Study Two Methodological Focus: Designing and using probes | 57 |
| 3.2.3 Study Two Theoretical Focus: Parents’ Individual Perspectives | 60 |
| 3.2.4 Study Three: Proposing Designs to Prompt Parents in Interviews | 65 |
| 3.3 Considerations of Exploring Parents’ Experiences | 73 |
| 3.3.1 Deciding to Work with Parents of Young Children | 73 |
| 3.3.2 A Holistic Approach to Understanding Parents’ experiences | 74 |
| 3.3.3 Using Probes to Explore Parents’ Individual Perspectives | 75 |
| 3.3.4 Ethical Considerations of Exploring Parents’ Experiences | 76 |

| | |
|---|-----|
| CHAPTER 4. Study One: Establishing an Initial Understanding of Parents’ Experiences of Family Technology Use | 78 |
| 4.1 Introduction to Publication I | 79 |
| 4.2 Publication I – Days of Our Lives | 80 |
| 4.2.1 Introduction | 81 |
| 4.2.2 Related Work | 81 |
| 4.2.3 Method: Workshop with Parents | 83 |
| 4.2.4 Findings: “It’s Complicated” | 84 |
| 4.2.5 Discussion | 87 |
| 4.3 Findings from Study One | 91 |
| 4.3.1 Implications of Study One | 92 |
| CHAPTER 5. Study Two I Methodological Focus: Probes to Explore Parents’ Individual Perspectives | 93 |
| 5.1 Introduction to Publication II | 95 |
| 5.2 Publication II – Towards a Probe Design Framework | 96 |
| 5.2.1 Introduction | 97 |
| 5.2.2 Related Work | 98 |
| 5.2.3 Method: Distilling and Using the Framework | 100 |
| 5.2.4 Findings: Usefulness of the Framework | 108 |
| 5.2.5 Discussion | 112 |
| 5.2.6 Conclusions: Towards a Probe Design Framework | 116 |
| 5.3 Introduction to Publication III | 117 |
| 5.4 Publication III - Probes to Explore Parents’ Individual Perspectives | 118 |
| 5.4.1 Introduction | 119 |
| 5.4.2 Related Work | 120 |
| 5.4.3 Method: Creating Opportunities To Compare | 124 |
| 5.4.4 Findings: Probing into Parents’ Individual Perspectives | 129 |
| 5.4.5 Discussion | 134 |
| 5.4.6 Conclusions | 139 |
| 5.4.7 Limitations and Recommendations | 139 |
| 5.5 Introduction to Publication IV | 141 |

| | |
|---|-----|
| 5.6 Publication IV - Tactics to Explore Parents' Differing Perspectives | 142 |
| 5.6.1 Introduction | 143 |
| 5.6.2 Related Work | 143 |
| 5.6.3 Method: Probe Design and Deployment | 144 |
| 5.6.4 Findings: Effective Tactics for Designing Our Probes | 148 |
| 5.6.5 Discussion | 155 |
| 5.6.6 Limitations and Recommendations | 160 |
| 5.7 Methodological Findings from Study Two | 162 |
| 5.7.1 Moving on to the Theoretical Findings of Study Two | 164 |
| CHAPTER 6. Study Two Theoretical Focus: Understanding Conflict in Parents' Relationships | 165 |
| 6.1 Introduction to Publication V | 167 |
| 6.2 Publication V - "It's The Same Conflict, Everyday" | 168 |
| 6.2.1 Introduction | 169 |
| 6.2.2 Related Work | 169 |
| 6.2.3 Method: Probe and Interview Study | 171 |
| 6.2.4 Findings: Tension and Conflict in Parents' Relationships | 172 |
| 6.2.5 Discussion | 178 |
| 6.2.6 Conclusions | 180 |
| 6.3 Introduction to Publication VI | 181 |
| 6.4 Publication VI - Sources of Conflict in Parents' Relationships | 182 |
| 6.4.1 Introduction | 183 |
| 6.4.2 Method | 183 |
| 6.4.3 Findings: Sources of Conflict in Parents' Relationships | 184 |
| 6.4.4 Discussion | 193 |
| 6.4.5 Limitations and Recommendations | 199 |
| 6.4.6 Conclusions | 199 |
| 6.5 Theoretical Findings from Study Two | 201 |
| 6.5.1 Implications of Study Two | 202 |

| | |
|--|-----|
| CHAPTER 7. Study Three – Proposing Interaction Design Concepts to Improve Parents’ Experiences | 203 |
| 7.1 Introduction to Publication VII | 204 |
| 7.2 Publication VII –“It’s A Drag” | 205 |
| 7.2.1 Introduction | 206 |
| 7.2.2 Related Work | 207 |
| 7.2.3 Method: Using Storyboards as Prompts, when Interviewing Parents | 211 |
| 7.2.4 Findings: Design Approaches to Improve Parents’ Experiences | 216 |
| 7.2.5 Discussion | 226 |
| 7.2.6 Limitations + Future Work | 231 |
| 7.2.7 Conclusions | 232 |
| 7.3 Findings from Study Three | 233 |
| CHAPTER 8. Discussion + Conclusions | 235 |
| 8.1 Research Summary | 236 |
| 8.2 Thesis Contributions | 239 |
| 8.2.1 Theoretical Contribution: Establishing More Holistic Understandings of Family Technology Use | 239 |
| 8.2.2 Methodological Contribution: Novel Guidance and Approaches to Probing Experiences of Family Technology Use | 242 |
| 8.2.3 Design Contribution: Enhancing the Experiences of Families | 245 |
| 8.2.4 Summary of Contributions | 247 |
| 8.3 Thesis Boundaries | 248 |
| 8.3.1 Research Context and Unit of Analysis | 248 |
| 8.3.2 Working with Probes | 249 |
| 8.3.3 Research Approach | 249 |
| 8.3.4 Additional Boundaries | 250 |
| 8.4 Implications: Experiences of being together | 250 |
| 8.4.1 Understanding Experiences of Being Together | 250 |
| 8.4.2 Understanding How Technology Use Can Create Conflict | 251 |
| 8.4.3 Approaches to Researching Experiences of Being Together | 251 |
| 8.4.4 Designing to Enhance Experiences of Being Together | 252 |
| 8.4.5 Mounting Relevance | 253 |

| | |
|--|-----|
| 8.5 Future Work | 254 |
| 8.5.1 Capturing additional perspectives | 254 |
| 8.5.2 Considering further contexts | 255 |
| 8.5.3 Additional methodological and design approaches | 256 |
| 8.6 Concluding Remarks | 256 |
| BIBLIOGRAPHY | 259 |
| APPENDIX | 273 |
| Appendix 1 The Publications | 274 |
| Appendix 1.1 Publication I | 274 |
| Appendix 1.2 Publication II | 280 |
| Appendix 1.3 Publication III | 291 |
| Appendix 1.4 Publication IV | 304 |
| Appendix 1.5 Publication V | 317 |
| Appendix 1.6 Publication VI | 323 |
| Appendix 1.7 Publication VII | 330 |
| Appendix 2 Study One Exploratory Workshop | 350 |
| Appendix 2.1 Photos taken during the Exploratory Workshop | 350 |
| Appendix 2.2 Workshop Information and Participant Consent Form | 351 |
| Appendix 2.3 Example of Worksheets from the Exploratory Workshop | 353 |
| Appendix 2.4 Preparing Data from the Exploratory Workshop | 362 |
| Appendix 2.5 Codebook Examples: Parents' Complex Experiences | 363 |
| Appendix 3 Study Two Probe & Interview Study | 368 |
| Appendix 3.1 Photos of the Sets of Parents who Participated in Study Two | 368 |
| Appendix 3.2 Participant Information Sheet for Study Two | 369 |
| Appendix 3.3 Probe Activity Pack Checklist | 372 |
| Appendix 3.4 Sample Photos of Probe 1: Family Experience Jar | 373 |
| Appendix 3.5 Sample Responses to Probe 2: Digital Family Tree | 374 |
| Appendix 3.6 Sample Responses to Probe 3: Device Journal | 379 |
| Appendix 3.7 Study Two: Opening Interview Guide | 383 |
| Appendix 3.8 Study Two: Closing Interview Guide | 386 |
| Appendix 3.9 Transcript: Study Two Opening Interview (S2P7 & S2P8) | 387 |
| Appendix 3.10 Transcript: Study Two Closing Interview (S2P10) | 409 |
| Appendix 3.11 Codebook Examples: Sources of Conflict between Parents | 423 |

| | |
|---|-----|
| Appendix 4 Study Three I Design Proposals & Interviews | 428 |
| Appendix 4.1 Screenshots of Designers Participating in the Workshops | 428 |
| Appendix 4.2 Screenshots of the Workshop Activities | 429 |
| Appendix 4.3 Storyboards illustrating Concept 1: Wave | 431 |
| Appendix 4.4 Storyboards illustrating Concept 2: Traffic Lights | 433 |
| Appendix 4.5 Storyboards illustrating Concept 3: Shared Space | 434 |
| Appendix 4.6 Storyboards illustrating Concept 4: Family Goal Setter | 435 |
| Appendix 4.7 Design Workshop Participant Information and Consent Form | 437 |
| Appendix 4.8 Screenshots from the 14 Interviews with Parents | 439 |
| Appendix 4.9 Interview Participant Information and Consent Forms | 441 |
| Appendix 4.10 Study Three Interview: Participant Details | 443 |
| Appendix 4.11 Transcript from Study Three Interview (S3P6) | 444 |
| Appendix 4.12 Codebook Examples: Design Approaches to Benefit Parents | 452 |
| Appendix 5: Reproduction Permissions | 459 |

LIST OF FIGURES

| | |
|--|-----|
| Figure 1. Three empirical studies presented by seven publications | 18 |
| Figure 2. Research Trajectory | 53 |
| Figure 3. Study One: Examples of photos taken during the workshop | 55 |
| Figure 4. Study Two: Probe Deployment Plan | 60 |
| Figure 5. Study Two: Photos of three of the eight participating sets of parents | 62 |
| Figure 6. Study Three: Screenshots taken during each of the two design workshops | 66 |
| Figure 7. Study Three: Examples of the idea cards produced during the design workshops | 67 |
| Figure 8. Study Three: The four design proposals resulting from the design workshops | 68 |
| Figure 9. Study Three: Examples of the annotated sketches used to present Storyboard 1 'Wave' | 69 |
| Figure 10. Study Three: Examples of the annotated sketches used to present Storyboard 2 'Traffic Lights' | 69 |
| Figure 11. Study Three: Examples of the annotated sketches used to present Storyboard 3 'Shared Space' | 70 |
| Figure 12. Study Three: Examples of the sketches used to present Storyboard 4 'Family Goal-Setter' | 70 |
| Figure 13. Study Three: Screenshots taken during the 13 interviews held with parents. | 71 |
| Figure 14. Position of Publication I within the context of the three empirical studies | 80 |
| Figure 15. Position of Publication II within the context of the three empirical studies | 96 |
| Figure 16. Study Two - Three Probes: Family Experience Jar (left), Digital Family Tree (centre), Device Journal (right) | 102 |
| Figure 17. Visualizing probe design properties along continuums to help create a balanced probe collection | 107 |
| Figure 18. Study Two - Visualizing how to design different types of probes by varying three probe design properties | 114 |
| Figure 19. Position of Publication III within the context of the three empirical studies | 118 |
| Figure 20. Study Two - Three Probes: Family Experience Jar (left), Digital Family Tree (centre), Device Journal (right) (For reference only; identical to Fig. 16) | 125 |
| Figure 21. Study Two - Probe & Interview Study Outline | 129 |
| Figure 22. Position of Publication IV within the context of the three empirical studies | 142 |
| Figure 23. Study Two - Three perspectives guiding the design of three probes | 144 |
| Figure 24. Study Two - Three Probes: Family Experience Jar (left), Digital Family Tree (centre), Device Journal (right) (For reference only; identical to Fig. 16) | 145 |
| Figure 25. Study Two - Probe Deployment Plan (reference only; identical to Figure 4) | 148 |
| Figure 26. Position of Publication V within the context of the three empirical studies | 168 |
| Figure 27. Position of Publication VII within the context of the three empirical studies | 182 |
| Figure 28. Position of Publication VII within the context of the three empirical studies | 205 |
| Figure 29. Examples of some of the 16 scenario sketches from Storyboard 1 'Wave' | 213 |

LIST OF TABLES

| | |
|--|-----|
| Table 1. Methods Used in the Empirical Studies | 54 |
| Table 2. Study Two: Probe Instructions | 59 |
| Table 3. Study One: Workshop Participant Details | 84 |
| Table 4. Study Two: Distilling the Framework to Describe Probe Design Properties | 101 |
| Table 5. Study Two: Probe & Interview Study – Participant Details | 128 |
| Table 6. Study Three Interviews: Participant Details | 443 |

ABSTRACT

This thesis provides the first empirically grounded understanding within HCI (human-computer interaction) of how the use of interactive technologies within families can shape parents' experiences and their relationships. The studies conducted for this thesis confirm that, while the use of technologies (especially mobile devices) plays an increasingly significant role within families, parents commonly associate it with a range of complex experiences. This is because parents perceive technology use to negatively impact on family dynamics and child development. Thus, parents' experiences of integrating technology use into everyday family life are often contentious and messy.

This research discovers that family technology use can shape, and be shaped by, parents' relationships. Specifically, by describing how the use of technologies within families can contribute towards conflict between parents. These studies also demonstrate how new methodological approaches can help develop a more nuanced picture of how technologies are used and experienced within families. Specifically, by adapting the design and use of probes to capture and compare parents' individual perspectives on family technology use. Finally, this thesis investigates how the design of interactive technologies might help improve parents' experiences of managing mobile device use during family time.

The theoretical focus of this research contributes towards more holistic understandings of family technology use. This work also delivers a methodological contribution of how we might begin to extend existing HCI research methods, that are rooted in the exploration of individual experiences, to interrogate the multiple perspectives of device use in domestic settings. Finally, this thesis proposes ways in which interactive technologies, that have long been intended to prioritise individual user engagement, might be designed to better support parents' needs and aspirations for the time their family spends together.

CHAPTER 1

Introduction

CHAPTER 1. Introduction

Digital technology use plays an increasingly critical role within families, as it does in society. It can provide parents with convenient ways of juggling their work and domestic responsibilities (Mazmanian, Orlikowski & Yates 2013; Palen & Hughes 2007) while offering opportunities to educate and entertain increasingly younger children (Hourcade et al. 2015; Morante, Costa & Rodriguez 2016). However, these technologies tend to prioritise individual user engagement and concerns abound over the negative impacts that they might have on child development and family dynamics (Vandewater et al. 2005a). Thus, parents' experiences of integrating the use of such technologies into everyday family life are complex (Livingstone & Blum-Ross 2020). This thesis explores how the use of these technologies shape the experiences of parents when appropriated into the family. It does this through a set of ethnographically-informed empirical studies that question HCI understandings of how technology is used within families.

From a theoretical standpoint, a deeper understanding was developed through this research of how parents' experiences are shaped by the ways in which technologies are used within today's families. Through a series of three studies, a more nuanced view of how family technology use impacts parents emerged. For instance, these studies considered the way in which parents and their children use the ecosystems of interactive technologies that exist in today's homes, rather than focusing on the use of certain devices by particular family members, or technology use in specific situations. This research focused on the collaborative nature of parenting and the complexity this introduces to experiences of managing family technology use (Ammari et al. 2015, McDaniel et al. 2018). It did so by engaging with sets of parents to explore how they communicate, negotiate and put into practice their individual perspectives on how technology should be used within their family. Furthermore, it revealed the ways in which family technology use can contribute towards conflict in parents' relationships.

From a methodological standpoint, this work demonstrated how to adapt conventional research methods, that tend to focus on understanding the experiences of individual users, to explore more complex experiences of technology use within social contexts. Specifically, this adaption involved following, clarifying and extending existing guidance on how to design and use probes (Wallace et al. 2013). It also involved developing a novel approach to probes that could effectively and sensitively support an exploration into parents' individual (and differing) perspectives on technology use and any resulting conflicts.

From a design standpoint, this research examined how the design of interactive technologies might help to address the problematic experiences that parents currently associate with family technology use. By engaging with a group of professional user experience (UX) designers, examples of early interaction design concepts were proposed that reimagine new ways in which collocated family members could interact with, and through, mobile devices.

These design proposals were used as prompts in interviews with parents, to substantiate whether parents' experiences of family technology use might be enhanced by design approaches that attempt to restore some of the social elements of being together.

Through these studies, this thesis establishes a theoretical understanding of how digital technology use in families can shape parents' experiences and their relationships. In addition, it provides a methodological contribution of how we might extend UX research methods rooted in understanding individual experiences, to consider more complex experiences that exist within social groups. Finally, it offers a design contribution of how interactive technologies, which have long been intended to prioritise individual experiences and user engagement (Kawsar & Brush 2013), might evolve to consider, and better support, the needs and aspirations of multiple individuals in domestic settings. Specifically, the needs and aspirations that parents have for the time that their family spends together.

Before moving on to detail this research journey, I first explain how it was motivated by my personal and professional background.

A Personal Introduction

Over many years as a professional user experience researcher and designer, I was charged with establishing an understanding of people's attitudes and behaviours in order to generate insights into how we might better support them through the design of a certain product or service. The projects I undertook were hugely varied; including explorations into how people communicate, manage their finances, navigate their cities and engage with digital content. Underpinning this work was a sense that digital technologies were enabling us to transform, even disrupt, the way in which people interacted with products and services, while still prioritising user experience. Yet, observing how this digital disruption was developing, I began to question whether we had done enough to consider its broader social implications.

Working as a UX researcher had afforded me the privilege of entering homes all over the world to discuss the ways in which people, and often their families, use and experience digital technologies. Over time, I developed a growing unease at the way in which technology seemed to be affecting people's experiences of interacting and simply being with one another. Initially, such concerns were held only by a marginal subset of designers in an industry overwhelmingly excited at exploiting opportunities to transform and improve existing ways of doing business. However, over time these concerns became more widely accepted and, shortly before starting this research, designers had begun to openly discuss the need to take responsibility for the increasing influence that we have on people's lives (Taylor 2016).

Broadly speaking, it was this interest in understanding how, as designers, we could start

taking greater responsibility for people's experiences of interacting with the technologies we create, led me to embark on this research. Through discussions with my principal supervisor, I sought a specific context on which to focus my attention. I realized that, despite working on a huge variety of products and services, the context in which I was most familiar, and in which my research interest had initially been triggered, was that of the family home.

In addition, I had become a parent, providing me with a new perspective on what seemed to be every aspects of life - including technology use. I discovered what it felt like to be at the receiving end of the polarized debate around parents' responsibilities to manage children's technology use. Despite my professional experience, I had difficulties navigating society's conflicting expectations when deciding how to integrate technology use within my own family. I also observed that my cohort of fellow parents also seemed to be grappling with this issue. This first-hand knowledge was an effective way of gaining empathy, sensitivity and ability to spot problems and identify opportunities (Koskinen et al. 2011). In this way my experience of being a parent, as well as a designer, was instrumental in motivating and informing this work.

1.1 Background

Digital technologies have greatly transformed the way in which people interact with each other. Indeed, within the context of the family, digital technologies play an increasingly critical role (Desjardins, Wakkary & Odom 2015; Isola & Fails 2012). At the same time, HCI studies have highlighted some of the unintended social challenges that can arise due to the increasingly pervasive way in which they are used (Lyngs et al. 2019; Tran et al. 2019). In particular, the use of mobile devices such as smartphones and tablet computers can disrupt the interactions between collocated people, by persistently offering opportunities for engaging in other activities and communicating with remote others (Olsson et al. 2020). It has been suggested that these digital disruptions can introduce feelings of frustration, disconnection and loneliness, and thus reduce the sense of relationship satisfaction, especially within families (Oduor et al. 2016; Turkle 2017).

Concerns over the negative consequences that pervasive device use might have on family relationships are compounded by concerns that it might also delay child development (Boyd 2014; Hiniker, Suh, et al. 2016). Despite these concerns, the widespread embrace of digital technologies within families continues (Livingstone & Blum-Ross 2020). Meanwhile, questions about how parents should manage digital technology use, and what they should expect from them, are contested among policymakers and in the media, leaving parents feeling unclear about how best to integrate technology use into family life (Livingstone & Blum-Ross 2020).

HCI research into the problematic experiences of family technology use have traditionally focused on parents' experiences of mediating their children's technology use and demonstrates

that this can be a considerable source of stress for parents (Hiniker et al. 2015; Radesky et al. 2016). While these reports initially focused on parental mediation of technologies – an interest that can be traced back to the emergence of television (e.g., Bryce & Leichter 1983) – more recent work has drawn attention to the increasing role that digital technologies play in the lives of parents themselves (e.g., Ammari et al. 2015; Balaam et al. 2013; Kumar & Schoenebeck 2015). This suggests that parents also struggle to balance their own need of engaging in the digital world with the needs of their family, which can lead to children disapproving of how their parents use devices (Blum-Ross & Livingstone 2017; Hiniker, Schoenebeck & Kientz 2016; McDaniel & Radesky 2018b). Thus, parents' experiences of family technology use are becoming even more complex.

While prior work provides valuable glimpses into parents' experiences of family technology use, it tends to focus either on children's technology use (Davis, Ferdous & Vetere 2017; Morante, Costa & Rodriguez 2016; Plowman 2015) or on parents' technology use (Ammari et al. 2015; Hiniker et al. 2015; Kumar & Schoenebeck 2015). Focus also tends to be given to the use of particular technologies including smartphones (e.g., Moser, Schoenebeck & Reinecke 2016) or social network sites (e.g., Bartholomew et al. 2012), to certain situations like mealtimes (e.g., Moser, Schoenebeck & Reinecke 2016; Radesky et al. 2014) or to specific practices, such as using household technology rules (e.g., Mazmanian & Lanette 2017).

In addition to limiting their focus, researchers tend to take an individualistic approach to exploring parents' experiences. This approach considers parents as homogenous when, in fact, parents' attitudes and practices regarding family technology use have been shown to vary and to be influenced by their relationships and social context (Ammari et al. 2015; Ammari, Schoenebeck & Romero 2018; Hiniker et al. 2015). Furthermore, it overlooks the fact that parenting is usually a collaborative endeavour and, thus, wrongly assumes that parents effortlessly align on decisions about technology use, or that they are taken by one parent in isolation. Consequently, while substantial research reveals the conflict that technology use can create in parent-child dyads (Blackwell, Gardiner & Schoenebeck 2016; Hiniker, Schoenebeck & Kientz 2016; Hiniker, Suh, et al. 2016) very little is understood about how family technology use can impact parents' relationships. This is despite suggestions that conflict can arise between parents because of their differing attitudes towards the use of technology within the family (Ammari et al. 2015; McDaniel et al. 2018). Moreover, McDaniel et al. (2018) suggest that this conflict over technology use can lower parents' overall relationship satisfaction and perceptions of parenting support.

1.2 Assertions and Research Questions

By taking family as an example of a social context, and parents as the unit of analysis, this thesis argues that it is essential to move beyond focusing on individual user experience and towards understanding and supporting social experiences of being together. An initial review of the literature in HCI and surrounding fields related to how digital technologies are experienced within families. This review led me to assert that there is an urgent need for deeper, more nuanced and more holistic understandings of parents' experiences. Thus, an overarching research question emerged:

RQ0 How does digital technology use within families shape parents' experiences?

Subsequent research questions arose progressively throughout my studies. In other words, the findings of each study guided me towards related work that was integrated into a continually evolving literature review. Through this process, the research focus and approach of each ensuing study was identified.

During the initial review of prior work, I had sought to gain an understanding of how families have been researched in HCI. This understanding informed my research design and, consequently, I decided to turn to probes as a method, with which I would explore this topic. Heeding Wallace's (Wallace et al. 2013) advice on working with probes, I decided to conduct a workshop, in which to build an understanding of parents and their context that would inform the design of a subsequent probe study. Thus, Study One aimed to address the question:

RQ1 What types of experiences do parents commonly associate with family technology use?

The findings of this workshop confirmed that parents' experiences of family technology use are often complex. It indicated that a particularly problematic experience was the conflict that could arise in parents' relationships due to their differing individual perspectives on how technology should be used within the family.

These indications that emerged from Study One resulted in another, more focused, review of related literature. This review revealed that prior work tends to overlook the collaborative nature of parenting. This individualistic approach to exploring parents' experiences wrongly assumes that parents' attitudes, approaches and practices to be homogenous and that parents' effortlessly align on how technology should be used within their family. Otherwise, it incorrectly suggests that only one parent is usually responsible for taking decisions on family technology use. This led me to assert that it is critical to explore parents' individual perspectives on family technology use. I then shifted my attention to how I could explore this in Study Two, through the design and use of probes.

As I sought advice on how to design and use probes to explore parents' individual perspectives in Study Two, an opportunity arose to generate methodological knowledge. Firstly,

to address concerns within HCI discourse, about probes being misunderstood and misused because of a lack of actionable guidance on the method (see 2.3). Secondly, to redress a tendency to employ probes within families in one of two ways; either to capture individual responses from one family member or to capture a collective response from the whole family. I recognised that seeking a balance between these two approaches might enable me to engage with sets of parents and to tease out their individual perspectives on technology use. Reflecting on my process of doing this during Study Two addressed the following, methodologically focused research question:

RQ2 How can we design and use probes to explore the individual perspectives on technology use that exist within sets of parents?

Adapting the approach to designing and using probes in Study Two allowed me to examine the findings that had emerged from Study One. In particular, indications about the conflict that could arise in parents' relationships due to their differing individual perspectives on how technology should be used within the family. So, Study Two's theoretical focus addressed the following research question:

RQ3 How does technology use within families contribute towards conflict in parents' relationships?

The findings of Study Two indicated that conflict between parents tends to be related to the use of mobile devices during family time. They also suggest specific reasons for this that relate to the design of mobile devices and the experiences that they afford users and, inadvertently, the people around them. This led me to assert that there are opportunities for the design of interactive technologies to help address the problematic experiences that parents associate with family technology use. I addressed this through Study Three, which aimed to address the fourth, and final, research question:

RQ4 How could the design of future technologies help improve parents' experiences of family technology use?

1.3 Overview of this Thesis by Compilation

As indicated in my format statement, this thesis compiles seven peer-reviewed papers, in which the findings of my three empirical studies have previously been published. Collectively, these seven publications form a robust report of my research. Yet, each publication focuses on a specific study, as illustrated in Figure 1. This is followed by a brief explanation of how these publications have been compiled.

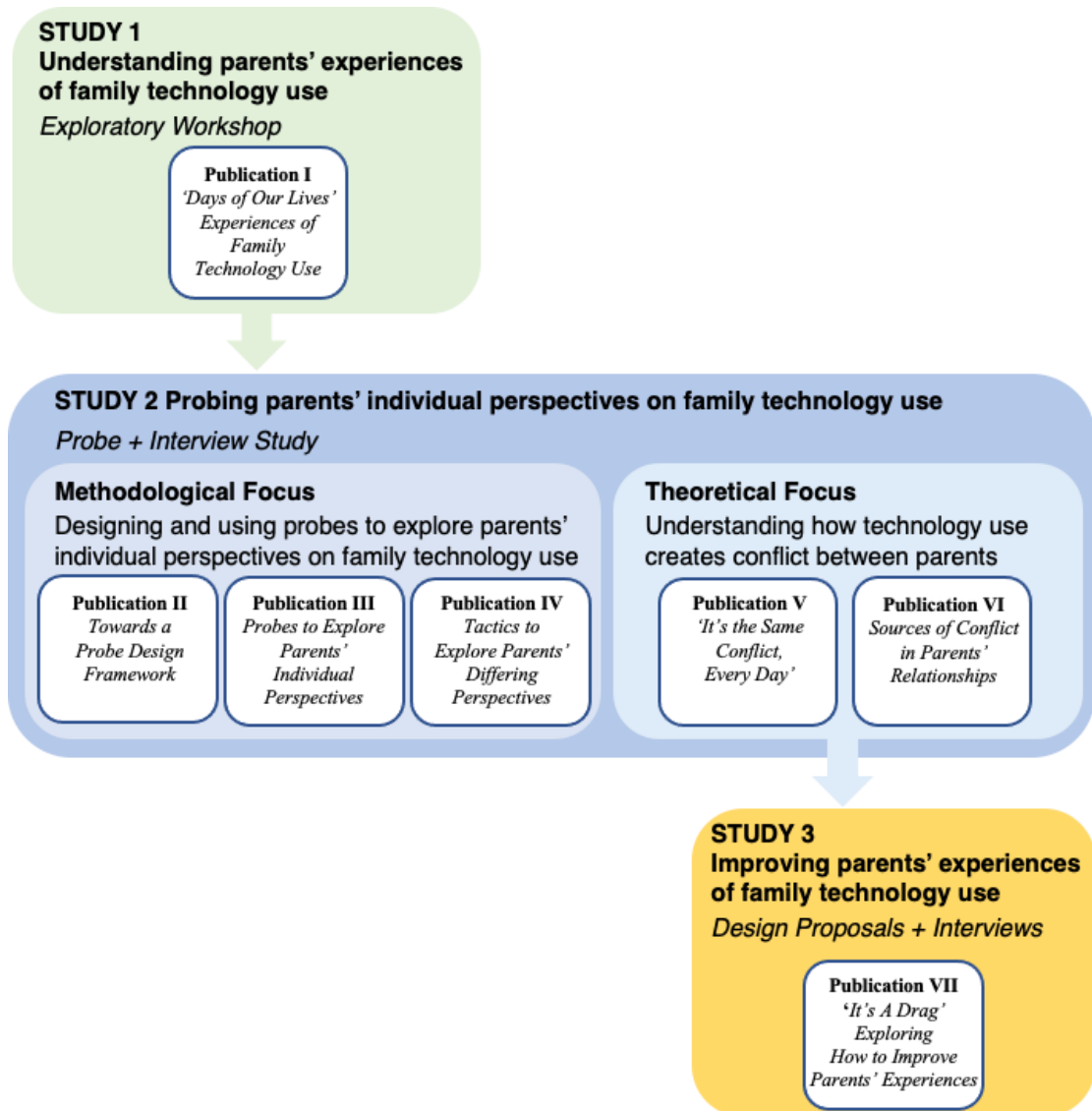


Figure 1. The three empirical studies presented by seven publications

1.3.1 Compiling the Publications

The studies conducted during this research are presented across four chapters (Chapters 4-7) by including seven peer-reviewed, published papers. These publications were originally motivated by a desire to share with the HCI community and to obtain valuable feedback. My decision to compile them was only taken after recognising that collectively, they provide a comprehensive account of my research. Thus, I have attempted to improve the experience of reading these papers sequentially by taking the following steps:

Editing

The publications have been edited to reduce excessive repetition. These edits include the removal of the Abstract sections from all publications as well as some of the Tables and Figures. Additional sections have been removed from some of the publications that describe Study Two. While each of these five publication concentrated on a different aspect of Study Two, similarities inherently exist in the descriptions of related work and the method used.

Reformatting

To align the publications within a single manuscript, various formatting alterations have been made, including layout, text styles and heading titles. References have also been merged into the thesis Bibliography. All seven papers can be found in their original published format in Appendix 1.

Supplementary sections

These have been added to clarify how each publication frames the study it is reporting on. They also explain how the overall research trajectory developed through these studies. For emphasis, each publication is preceded by a variation of Figure 1 that aims to illustrate where each publication is positioned within the broader context of this research (i.e. by highlighting the publication and the study that it reports on, while greying out the preceding/following studies).

In addition to taking these steps, I have addressed the fact that each of the seven publications included in this thesis focuses on a particular study. Thus, Chapters 1, 2, 3 and 8 have been added to provide a consistent overview of this research when considered in its entirety. I now provide a short summary of each chapter within this thesis by compilation.

1.3.2 Chapter 2. Related Work

This chapter describes the pertinent literature leveraged throughout this thesis and is presented as a review of three key areas. Firstly, HCI research relating to family technology use, including those with a focus on parents' experiences and on family conflict. Secondly, reports into how HCI researchers have explored domestic technology use, with a focus on how probes have been designed and used to work with families. Thirdly, accounts of various design approaches that might help to enhance experiences of family technology use.

This review draws on and enhances content from my seven publications, which are each focused on discussing work that relates to a specific study. Yet, by considering this research in its entirety, this chapter organizes the related work into these three sections (theory, methodology and design).

1.3.3 Chapter 3. Research Design

This chapter aims to provide a consistent account of the research approach taken across all three empirical studies. It does so by compiling and enhancing content from my seven publications. These publications each provide very different levels of detail when describing the methods used within a particular study. This variation in detail is primarily due to the fact that **Publications II, III and IV** are focused on furthering methodological understandings rather than theoretical insights. In addition, this chapter discusses the key challenges and considerations that arose from exploring parents' experiences of family technology during this research journey.

1.3.4 Chapter 4. Study One

This chapter describes Study One, an exploratory workshop aimed at establishing an initial understanding of how parents' experiences are affected by the way in which technology is used within everyday family life. It was designed to prompt parents to reflect on their experiences of the way in which they, and their family members, routinely interact with the digital devices. In addition, it was intended to inform the design of a subsequent probe and interview study by building initial relationships with parents and an understanding of their everyday contexts. The findings of this workshop indicated a need to explore parents' individual (and potentially differing) perspectives on family technology use, and how this might contribute towards conflict in parents' relationships.

(This chapter includes an edited version of **Publication I**)

1.3.5 Chapter 5. Study Two | Methodological Focus

This chapter describes the methodological focus that arose during Study Two. First, this involved clarifying, using and extending existing guidance or 'framework' on how to design and use probes. Secondly, it demonstrated how the conventional approach to working with probes

could be adapted to explore parents' individual perspectives on family technology use and ascertain how these might contribute towards conflict in parents' relationships.

(This chapter includes edited versions of **Publication II, III & IV**)

1.3.6 Chapter 6. Study Two | Theoretical Focus

This chapter concentrates on the theoretical knowledge surfaced by the probe and interview study that was conducting during Study Two. This includes descriptions of how technology use can contribute towards conflict in parents' relationships, and the ways in which this conflict can play out during the course of everyday family life.

(This chapter includes edited versions of **Publication V & VI**)

1.3.7 Chapter 7. Study Three

This chapter describes the closing study of this research, which explores how the design of interactive technologies might help to improve parent's experiences of managing device use during family time. This study involved collaborating with professional UX designers to create design proposals that aim to address the problematic experiences raised by parents during the formative studies. These design proposals embodied novel approaches to the design of interactive technologies and were illustrated as scenario-storyboards. These storyboards were then presented to parents during interviews, in which they were asked to envisage how these approaches might improve their experiences of family technology use.

(This chapter includes an edited version of **Publication VII**)

1.3.8 Chapter 8. Discussion and Conclusions

In this chapter, I attempt to step back and consider the contributions of this work as a whole. While the discussions within each of my publications focus on, and are limited to, the contributions of a specific study, this section compiles and enhances these discussions and presents three types of contributions that relate to theory, methodology and design:

- ***Theoretical contributions:*** Establishing more holistic understandings of family technology use and how this shapes parents' experiences
- ***Methodological contributions:*** Developing guidance on how to think about the design and use of probes, especially when using the method to interrogate individual perspectives within families.
- ***Design contributions:*** Exploring how the design of interactive technologies might improve parents' experiences of family technology use and especially of managing the use of mobile devices during family time.

This chapter also describes the implications of this work, its limitations and directions for future work.

1.4 Definitions of Terms Used within this Thesis

Before embarking on a discussion of Related Work, I first define several terms that are regularly used throughout this dissertation, and which might have ambiguous or various implications:

Family: In HCI, one of two types of family construct are usually considered. This is often determined by the affordances of the type of technology being studied. For instance, *family* is used to refer to a group of individuals sharing domestic space in studies of technologies such as location awareness systems (Brown, Taylor, Izadi, Sellen, Kaye, et al. 2007; Sellen et al. 2009), home organisers (Plaisant et al. 2006) and ‘smart-home’ technologies (Harper 2006). In contrast, *family* is used to refer to personal relationships in the research of technologies that support communication over distance (e.g., Judge, Neustaedter & Kurtz 2010b; Kirk et al. 2016). In reality, family experiences comprise of both domestic and distant interactions.

As with any element of society, definitions of family evolve and also vary depending on socio-cultural perspective (Neustaedter, Yarosh & Brush 2009). In recent years, HCI research has encouraged the inclusion of more diverse family structures (Kazakos et al. 2013). This thesis seeks to develop knowledge about how technology use within everyday life shapes the experiences of parents who have children aged twelve years or younger. Thus, it uses the term *family* to refer to cohabiting parents and children. These studies do engage with parents who represent families with less ‘traditional’ constructs. For instance, single parents, same-sex parents and extended family members who share the responsibilities of parenting children who they live with. This relates to the definition of *parent* below.

Parent: This research aims to explore how parents’ experiences are affected by the way in which digital technologies are used within the family. It defines parents as those in a primary domestic caregiving role for children. Recognising that not all children live in homes with biological parents, the term *parent* is used to refer to diverse forms of caregivers (Gillies 2008; Webb 2011). For example, participants included an aunt and a grandmother who lived with the children they care for.

Set of parents: This research aimed to acknowledge that parenting is usually a collaborative endeavour. It defined a *set of parents* as cohabiting adults who share the responsibility of caring for their children. Seven of the eight sets of parents participating in this research lived with their spouse, who was also the child’s other parent. One set of parents consisted of three adults (a mother, aunt and grandmother).

Young children: This research defines *young children* as being up to and including 12 years of age. The way in which children within this age group use technology tends to be heavily influenced and controlled by their parents. For example, at the time of designing this research, in Australia, the legal age of consent to open and manage a personal account online – including social media accounts – was thirteen (Apple 2022b; Commissioner 2022; Google 2022a). Steered by this definition, all 29 participants in this research were a parent of at least one child aged 12 years or younger.

Technology: This research uses the term ‘technology’ to refer to any digital system used to access or interact with digital services or content. This definition follows Silverstone’s concept of double articulation in studies of media in the home (Silverstone 2003) which considers the experiences of users interacting with both hardware (e.g. digital devices) and software (e.g. digital applications/platforms) is relevant. This consideration is especially important given the wide range of digital devices (e.g. smartphones, tablet computers, smart watches, smart toys, home assistants and even robotic vacuum cleaners etc.) employed by today’s users to access an ever widening range of platforms and applications. Together, these digital devices, platforms and applications enable users to connect with the world from their domestic space.

While emergent devices such as Internet of things (IoT) devices and Voice-User Internet (VUI) controlled home assistants are increasingly being adopted by today’s families (Forlizzi & Battarbee 2004; Hanover 2016; Nijholt 2008), the devices most prevalently discussed by the participants of this research include mobile devices (such as smartphones and tablets), personal computers, video gaming consoles and televisions. The activities most commonly described include communicating over distance, searching for information (e.g. via Google), browsing/scrolling news and social networking sites (e.g. Facebook), watching movies, TV, streaming online content (e.g. Netflix, YouTube) and playing video games (e.g. Xbox, PlayStation).

Digital/Interactive technology: The term *technology* has been exchanged with *digital technology* and *interactive technology* when attempting to be more explicit about the types of products and services that are the focus of this research. This includes when referring to future technological systems to digitally facilitate user experiences, that are yet to be developed.

Family technology use: Within this research, the term *family technology use* is used to describe the use of technology (as described above) within families and especially within the home.

Family time: During this research studies, parents used this term to describe periods in which family members are together and have opportunities to interact with one another, often at home.

CHAPTER 2

Related Work

CHAPTER 2. Related Work

This chapter provides an overview of the pertinent literature leveraged throughout this thesis. To do so, it compiles and builds upon related work previously discussed in the seven publications. Whereas each publication discusses prior work in relation to a specific study, this review frames it by considering this thesis in its entirety. Thus, it presents a review of three key areas that relate to theoretical understandings, methodological knowledge and the design of interactive technologies:

Initially, this thesis was guided by literature relating to theoretical understandings of family technology use. As this area evolved, it became increasingly focused on accounts of parents' experiences, as well as reports of complex experiences, including family conflict. Meanwhile, a methodological focus emerged within this thesis, which necessitated the review of a second area of literature. Specifically, accounts of methods and approaches that have been employed to address the challenges of researching family technology use in HCI. In particular, available guidance on how to design and use probes, especially when working with families. Finally, this thesis concludes by considering how various design approaches might help to enhance experiences of family technology use. This conclusion was guided by a review of literature that considers how the design of interactive technologies might help address some of the challenges currently arising from pervasive technology use. This includes approaches that aim to improve digital wellbeing and to enhance experiences of collocated mobile device use.

2.1 Theory: Exploring Family Technology Use in HCI

The study of human-computer interaction (HCI) has progressed from predominantly examining the use of computers in the workplace, to the use of an increasing range of digital devices, platforms and applications for personal use in an expanding array of contexts (Desjardins, Wakkary & Odom 2015; Moggridge & Atkinson 2007). This progression corresponds with the third wave of HCI in which attention shifted away from work-related and “purposeful” interaction and toward understanding the possibilities of novel technologies as they were increasingly adopted into new and more social contexts (Bødker 2015). In other words, as we began living with technology, rather than just using it (McCarthy & Wright 2004).

Thus, for over 30 years, HCI research has engaged with researching and understanding domestic contexts from multiple perspectives. A review of these efforts by Desjardins, Wakkary & Odom (2015) reveal that interests have included social routines in the home, ongoing domestic practices, the home as a testing ground, smart homes, contested values of a home, the home as a site for interpretation, and speculative visions of the home. These efforts to understand the increasingly complex role that technologies play within the domestic sphere

inherently intersect with explorations of how novel technologies can support and enhance the family (Fails et al. 2012; Plaisant, Druin & Hutchinson 2002).

This increased enthusiasm for studying families can be traced to the adoption of the Internet and mobile devices into homes, which have significantly impacted the minutiae of family life: from the way in which families communicate, co-ordinate and coexist (Clark 2011). When seeking to identify ways in which novel technology might support family practices, relationships and experiences, HCI research has tended to pursue one of two objectives: supporting the needs of co-located family members or enhancing experiences of communication over distance between family members (Plaisant et al. 2006).

In considering a shared domestic space, the aspect of presence has been shown to play a pivotal role in how digital technologies shape family interactions. In enabling ‘constant-connectivity’ and encouraging more frequent communication, mobile devices introduce an increased expectation that whereabouts of family members are known. Brown, Taylor, Izadi, Sellen, Jofish’Kaye, et al. (2007) demonstrate the appeal of technologies that can nurture familial bonds through enhanced perceptions of ‘presence’, whilst also offering practical benefits of sharing remote contextual information. However, family tensions can arise when expectations of how frequently, how accurately or through which communication mode members should update each other are not met. These tensions have been primarily documented in relationships between parents and their teenage children (Blackwell, Gardiner & Schoenebeck 2016; Davis, Dinhopl & Hiniker 2019; Turkle 2017).

Digital technologies have also been shown to support families during periods of separation. For example, Kirk et al. (2016) address the changing patterns of remote working and the resulting loss of routine and ritual from everyday family life way experienced by ‘mobile workers’ and their families during periods of separation. Their study highlights digital technology as both an enabler of shifting workplace paradigms, and as a support to the resulting disruption to family life. Of significance, is the concept of presence and the role of shared space, raised by this work. The notion of family implies connections, or bonds, maintained and nurtured either within a shared physical space or between, and despite, separated spaces.

Within research into families, studies have tended to focus on technical typologies; with the adoption of devices and applications reflected in the progression of research topics. For example, studies of how families use of mobile phones (e.g., Faulkner & Culwin 2005) and the Internet (e.g., Livingstone & Helsper 2008) are succeeded by studies on smartphones (e.g., Kim & Choi 2013) and social networking sites (e.g., Kumar & Schoenebeck 2015). Research examples can be found that consider ecosystems of digital technologies in their entirety, rather than focusing on a single device or application. This approach is appropriate when exploring experiences of the increasingly ubiquitous technology use within today’s families, as it can contribute towards a more comprehensive understanding of the values and attitudes that drive

family technology practices (Hiniker, Schoenebeck & Kientz 2016).

With a few exceptions, prior research within family technology use tends to either focus on parents' technology use (e.g., Ammari & Schoenebeck 2015; Hiniker et al. 2015; Kumar & Schoenebeck 2015), or on children's technology use (e.g., Davis, Ferdous & Vetere 2017; Morante, Costa & Rodriguez 2016; Plowman 2015). As Isola & Fails (2012) note in their literature survey of technology use in family, very little work considers the use of technology by all family members. Within the limited research that does, attention is restricted to specific situations, such as mealtimes (e.g., Radesky et al. 2014), to certain devices, such as phones (Moser, Schoenebeck & Reinecke 2016) and home assistants (Porcheron et al. 2018), and to particular practices, such as rules to restrict technology use (Mazmanian & Lanette 2017).

Routines and rituals have often been looked to for insights into experiences of family technology use. Family mealtimes have been studied as an example of both everyday life and of a special event, embedded with traditions and values (Moser, Schoenebeck & Reinecke 2016). Both private (e.g. home) and public (e.g. restaurant) settings provide an understanding of practices, attitudes and expectations. Davis, Ferdous & Vetere (2017) reveal that technology use during family mealtimes can result in tensions, because of the role that they play in establishing family values and healthy child development. Yet, the authors of this study acknowledge the limitations of relying on observations or recollections of a single mealtime and call for further work to examine the issues raised in more detail.

HCI research has demonstrated that, as the role of technology – especially mobile devices – within domestic life has become more significant, so has its impact on families. For instance, the proliferation of mobile technologies has blurred the work and home lives of parents (Mazmanian, Orlikowski & Yates 2013; Palen & Hughes 2007). The eagerness and ease with which teenagers adopted mobile devices has agitated traditional family dynamics, especially when parents are less familiar or experienced with technology and struggle to “keep up” (Blackwell, Gardiner & Schoenebeck 2016; Zhang & Livingstone 2019). Even the use of touchscreen devices by toddlers and babies has been normalized (Hourcade et al. 2015; Morante, Costa & Rodriguez 2016). Within studies of the increasingly ubiquitous domestic technology use, a growing number are exploring growing concerns that its effects on today's families can be problematic (Blackwell, Gardiner & Schoenebeck 2016; Hiniker, Schoenebeck & Kientz 2016; Plowman 2015; Turkle 2017).

2.1.1 Complex Experiences of Family Technology Use

The pervasive adoption of digital technologies, especially personal mobile devices, demonstrates that they offer a host of benefits to both adults and children. However, the unknown impact on families - the fundamental unit of society (UN 1995) - and on children - society's most vulnerable members (Brown 2011) - has raised concerns. Public discourse is rife with alarm and this can often be dismissed as ignorant panic, yet these are often serious, and underpinned by scholarly apprehension.

An ambivalent reaction to technology is not new nor is it unexpected, and to be sure, as technology evolves so do society's attitudes and expectations (Brown 2011). After all, television viewing (Honig 1983) and even the reading of comic strips (Hill & Trent 1940) were initially scrutinized on account of potential damage that they might have on child development and family relationships. Yet, while personal mobile devices are just the latest additions to join a dynasty of screens in family homes, their pervasive use in all social settings has had a markedly greater impact on the relationships we have with each other (Dryer, Eisbach & Ark 1999).

Research – usually emanating from the fields of health, education and sociology - has regularly warned that the social impacts of digital technology use can be problematic. For instance, Hallowell (1999) associate Internet use with depression and loneliness, owed largely to a reduction in face-to-face interactions. Meanwhile, McDaniel & Coyne (2016) suggest that the ubiquitous and distracting nature of mobile phone use results in romantic partners ignoring (also known as *phubbing*) each other while spending time together. Within the context of the family, concerns have tended to revolve around the detrimental effects that children's technology use might have on their development (Brown 2011; Zimmerman, Christakis & Meltzoff 2007). More recently, these concerns have extended to include apprehensions around parents' technology use interfering with their ability to attend to their children's needs (AAP 2018; Lee & Chae 2007; McDaniel & Radesky 2018b; Steiner-Adair & Barker 2013).

Amidst the profusion of digital technologies into families and uncertainties regarding its effects, many researchers have urged for a deeper understanding of ever-evolving family experiences of technology use (Fails et al. 2012; Hertlein 2012; Schiano et al. 2016). This understanding becomes especially critical since much of the evolution of “computers” towards “ubiquitous computing devices” is taking place within the home. The emergence of the Internet of things (IoT), including Voice User Interface (VUI) devices (McReynolds et al. 2017) that are being added to the domestic device ecosystems will further complicate family experiences and amplify uncertainties over issues such as privacy, security and ownership (McReynolds et al. 2017; Porcheron et al. 2018; Valente & Cardenas 2017).

HCI reports of complex family experiences can be found to fall broadly within two contrasting camps. On the one hand, cautionary voices, such as Turkle (2017), suggest that everyday use of digital communication has replaced face-to-face conversations and resulted in

damaging family relationships. On the other hand, such concerns around the adverse effects of technology use are often dismissed as unfounded by scholars such as (Boyd 2014). It is not the concern of this thesis to determine the level of risk posed by digital technology use within families. However, it is important to note the opposing and changing views offered by scholars, proclaimed experts and entire fields. These views create a backdrop of ambiguity and highlights the lack of consistency that further complicates parents' experiences of family technology use, especially since both camps direct an element of culpability towards them (Livingstone & Blum-Ross 2020).

2.1.2 Parenting Children's Technology Use

Integrating technology into everyday family life presents parents with increasing uncertainty and complexity. Digital transformation has resulted in technology playing an increasing role in mediating relations between home, school, work and elsewhere – including among family members themselves. Livingstone & Blum-Ross (2020) emphasise that parents consider digital technology as the single most noticeable difference between their own childhoods and that of their children's. While previous generations might have decided to reject new technologies entirely, opting out is no longer a feasible option.

Meanwhile, parenthood itself is being renegotiated in societies that are becoming increasingly individualized (Lee, Macvarish & Bristow 2010). Private routines of everyday family life that were once considered banal have become contested within debates about what "good parenting" entails and the effects of various "parenting philosophies" (Clark 2013; Macvarish 2016). The combined ambiguities of digital innovation and childrearing result in family technology use becoming an extremely contentious and ambiguous issue (Goldie 2022). Parents' anxieties are enhanced by contradictory messaging from the media and wider society (Radesky & Hiniker 2022). On the one hand, parents are encouraged to embrace new technologies and ensure their children are prepared for a digital future (Blum-Ross & Livingstone 2016). On the other hand, parents are charged with the responsibility of protecting children from the risks of technology use despite both technology companies and policy makers being uncertain about what these risks are (Kardaras 2016; Steiner-Adair 2014).

As with concerns of technology use in society more generally, fears over children's use predominantly emanate from the fields of health and education (e.g., Kardaras 2016; Lee & Chae 2007; Radesky et al. 2014). Viewed as a leading authority on children's health and development, the American Academy of Pediatrics (AAP) has been offering advice on children's screen time since first setting out policy guidelines on television viewing. Research into children's health and education provided the basis of the AAP's 1999 recommendations (Hogan & Bar-on 1999) that children under two years of age not be exposed to any screen time. These recommendations have since been updated to accommodate further research and the

reality of increased digital technology engagement within households (Brown, Communications & Media 2011). Qualitative aspects such as what activities children should engage in, and with whom, are now also recognised as important and have been included in continually evolving guidance. In 2016, the AAP moved beyond time-based guidance altogether with the launch of its online tool, 'Family Media Plan' to assist families with agreeing on and setting technology practice rules such as which online or screen-based activities to engage in (AAP 2018).

As mentioned, HCI's response to concerns surrounding children's use of digital technology has included doubts over how seriously they should be taken. For instance, boyd dismisses fears over children's smartphone and social media use as fear mongering by declaring '*Any new technology that captures widespread attention is likely to provoke...full-blown panic.*' (Boyd 2014). However, the overwhelming response to the concerns of childhood technology use has been to study the parental mediation of children's technology use. These efforts tend to trail the trajectory first established in response to concerns around children's use of earlier technologies, such as television (e.g., Austin 1993; Vandewater et al. 2005b). Research into parents attempt to mediate children's digital technology use predominantly focuses on adolescents who eagerly began the childhood adoption of the Internet and mobile devices (Blackwell, Gardiner & Schoenebeck 2016; Davis, Dinhopl & Hiniker 2019; Mesch 2009; Vaterlaus et al. 2014; Wang, Bianchi & Raley 2005).

Parenting teens

Reports on digital technology use in adolescents tend to focus on the Internet (e.g., Donner & Walton 2013), smartphone (e.g., Schiano et al. 2002), gaming (e.g., Funk & Buchman 1996), and social media use (e.g., Anderson & Jiang 2018) and includes studies of problematic, compulsive use and even addiction (e.g., Adelhardt, Markus & Eberle 2018; Grandhi, Plotnick & Hiltz 2019; Lanette et al. 2018). King et al. (2018) review of policy and prevention approaches for problematic use in adolescence documents the various responses from governments and non-profit organisations across developed countries. Accounts such as this, detailing the acknowledgment of excessive technology use in children can leave HCI practitioners like boyd (Boyd 2014) appearing naïve in downplaying the fears around technology as unwarranted.

To address concerns over excessive use in adolescence, efforts have been made to explore the implementation of parental controls and family technology rules (Blackwell, Gardiner & Schoenebeck 2016; Mazmanian & Lanette 2017; Mesch 2009; Yardi & Bruckman 2011). These studies of what Yardi & Bruckman (2011) refer to as "techno-parenting" begin to reveal the extent of resultant tensions within parent-teen relationships. When considering teenager's use of technology, it is important to acknowledge and understand that parental attitudes and values are not homogeneous. For instance, parents hold diverse views on their children's privacy that

affect their perceptions of how technology use should be monitored (Yardi & Bruckman 2011). Differences in techno-parenting practices have also been identified based on factors such as gender, education, income and cultural background (Clark 2011; K. Chua & Mazmanian 2021). Yet, despite these accounts of the divergent attitudes and approaches, no HCI research was found to have explicitly explored parents' individual (and potentially differing) perspectives on their family's technology use, at the time of this review.

Of course, levels of ability, aptitude, expectation, and experience vary dramatically through childhood. Common Sense Media, an independent organisation providing information, advice and tools relating to media and technology aimed at children, uses three categories to classify age appropriateness of digital applications or media content (CommonSenseMedia 2018). The first group comprise of thirteen to seventeen year olds (often referred to as adolescents, teenagers or youths), followed by seven to twelve year olds (often referred to as primary or elementary school children, and sometimes tweens), and finally two to six year olds (often referred to as pre-schoolers),

A review of HCI literature relating to parents' efforts to mediate children's technology use demonstrates an initial and overwhelming focus on device use in adolescence. Yet, this has since expanded to reflect the widespread adoption of touchscreens and their increasing use in primary education and early childhood (Duckworth, Gendler & Gross 2014; Eastin, Greenberg & Hofschire 2006; Goh, Bay & Chen 2015; Hiniker et al. 2015; Hiniker, Suh, et al. 2016; Livingstone & Helsper 2008; Vandewater et al. 2005b).

Parenting younger children

As the advent of touchscreen devices removed the need for interaction through an indirect pointing device or keyboard, the motor abilities of much younger children were accommodated. Just five years after the launch of the iPhone, a review of Apple's App Store revealed that the majority of educational apps were aimed at preschool children (Shuler, Levine & Ree 2012). Subsequently the trend of younger children – and even babies – using smartphones and tablets has been followed by HCI researchers, often from a usability perspective (e.g., Morante, Costa & Rodriguez 2016; Plowman, McPake & Stephen 2008). As children begin to speak before they learn to read or write, the growing prevalence of connected devices controlled through voice-user interface (VUI) creates yet more opportunity for children to engage with digital technologies at an earlier age (Hafner 2017; Lovato & Piper 2015). These aspects are being leveraged in a growing range of products aimed at younger children (Marsh 2017; McReynolds et al. 2017). Due to associations of early use with habit-formation, Schiano et al. (2016) suggest that a focus on understanding younger children's use of digital technology is essential.

In '*Look, My Baby Is Using an iPad!...*', Hourcade et al. (2015) evaluate YouTube videos of

infants and toddlers interacting with tablet computers to explore if such young children could meaningfully interact with the devices and observe aspects of use. The authors acknowledge that the examples of device use observed in the study have been pre-selected, presumably by the children's caregivers. This limitation highlights the need to look beyond empirical descriptions of younger children's digital technology use and to consider their great dependence on a parent or caregiver. This dependence is underscored by public policy, which determines that parents or guardians have a legal obligation to manage the online accounts of children aged twelve years or younger (e.g., Apple 2022b; Commissioner 2022; Google 2022a). When considering young children's technology use, it is therefore critical to involve and to try and support the role and responsibilities of parents.

As with research into families with older children, studies of families with young children tend to consider parents solely in the capacity of encouraging or limiting their children's screen time. One prominent exception is Hiniker et al's (2016) work that also considers parents as technology users. Their survey-based study reveals that both parents and children struggle to comply with family technology rules, resulting in all family members seeking more attention from one another when in each other's company. These findings suggest a need for research to consider today's parents as both the guardians of their children's technology use as well as technology users in their own right.

2.1.3 Parents' Use of Technology

While research has traditionally focused on parents' role in mediating children's technology use, there has been increased interest in understanding the technology use of parents themselves (e.g., Gibson & Hanson 2013; Hiniker et al. 2015; Lukoff, Moser & Schoenebeck 2017). For instance, Palen & Hughes (2007) have demonstrated how, by enabling 'remote mothering', mobile phones have actually shifted family members' sense of 'home' as a fixed place. Since then, the affordances of mobile devices have expanded far beyond telephony and user demographics have evolved. For instance, as Facebook's first teenage users matured into parents, mothers became the fastest growing demographic of social networking sites (SNS) (Morris 2014). In turn, increasing efforts have been made to understand parents' own device use (Ammari et al. 2015; Ammari & Schoenebeck 2015; Kumar & Schoenebeck 2015).

Explorations into how technology use is changing parenting practices demonstrate that understanding parents' use of technology use is important (e.g., Ammari, Schoenebeck & Lindtner 2017; Toombs et al. 2018). Parents are a growing and evolving user group, who are charged with mediating their children's use of digital technology and considering how their own use might impact on their children. As with other aspects of parenting, their attitudes, views and behaviour can be seen as influential and more work is needed to acknowledge and support this

(Moser, Schoenebeck & Reinecke 2016).

As with research into children's use of technology, studies of parents' use portrays a range of positive and negative outcomes. Despite the fact that prior work has tended to focus on how parents use specific technologies, such as social network sites (e.g., Bartholomew et al. 2012; Madge & O'Connor 2006; Morris 2014), they begin to reveal the finely balanced role that technology often plays in the lives of parents. For instance, Morris (2014) demonstrates that while technology can provide new parents with essential social support and valuable sources of parenting advice, it simultaneously offers distraction away from the primary role of caregiving.

Turkle (2016) also explores parents' technology use in her book, *Reclaiming Conversation*. Firstly, she highlights the role of parents in setting examples for their children, and the requirement of parents to adhere to their own technology rules, such as when not to use their phones, in order for children to also respect and obey them. Her book also raises the issue of distraction, claiming parents and caregivers are too often engaged in digital technology use when they should be paying attention to their children. The most severe effects of this competition for attention can be seen in devastating reports, such as those on child fatalities due to parents' mobile phone use while driving, and exceptional cases of babies dying of neglect given their parents' inability to interrupt video-games (Kardaras 2016).

Whilst not all research that views parents as technology users in their own right deliver such extreme portrayals, they do tend to discern complexity. The role of parents involves balancing their own needs to engage with a digital world while considering their children's interests, in addition to managing their children's own use (Radesky et al. 2016). These competing interests and demands on parents' attention are inherently challenging.

Guilt is a feeling often expressed by parents in relation to their use of technology. Parents express remorse about using devices in the presence of children because it implies reduced attention, apparent disinterest and negative role-modelling (Hiniker et al. 2015). Guilt is also mentioned by parents in relation to disclosing information about their children online (Ammari et al. 2015). Furthermore, parents cite feeling guilty when using digital technology to distract or entertain their children in order to free themselves of child-caring duties (Hiniker, Suh, et al. 2016). Reports such as these indicate the difficulties existing within parents' experiences of technology. It also suggests that technology use by parents and children should be examined together, rather than in isolation.

Some specific contexts have been identified within which to explore the conflicted nature of parents' technology use. For instance, parents admit feeling guilty when turning to their mobile devices to make use of available time, or to distract themselves, when supervising young children at public playgrounds (Hiniker et al. 2015; Lemish, Elias & Floegel 2020). Restaurants are another environment in which parents have been shown to have difficulty balancing their impetus to use devices with their hopes of modelling desirable behaviour to children during

family mealtimes (Davis, Ferdous & Vetere 2017; Radesky et al. 2014) . That parents feel especially conflicted about their technology use in public places demonstrates the way in which social expectations also influence parents' experiences of family technology use.

Even in situations where children are not present, parents find themselves struggling to balance their need to engage with an increasingly digital world while considering their children's interests as well as the expectations of others. For instance, in their exploration into how social network sites (SNS) are shifting practices of sharing family photographs, Kumar & Schoenebeck (2015) reveal the effort and responsibility required by parents to manage their family's online content and to mediate information posted by extended family and friends in a way that considers their children's privacy. These studies of how parents decide what information to share about their children online suggest that differing approaches, attitudes and responsibilities exist not only between families, but within parent couples (Ammari et al. 2015; Kumar & Schoenebeck 2015).

These initial indications that parents can hold differing individual perspectives on how technology should be used within the family had not been further investigated at the time of this review. In fact, an overwhelming focusing on parent-child dyads within HCI research had left parents relationships largely unexplored, and the collaborative nature of parenting overlooked. Study One's findings not only suggested that parents could indeed differ in their attitude and approaches to family technology use, but that this could lead to conflict in parents' relationships.

2.1.4 Technology Use and Family Conflict

Families comprise of individuals but being a member of a family unit often involves reciprocity and a sense of common aspirations. This comes with expectations, duties, and responsibilities that usually depend on an individual's role within the family, and are likely to change over time. For example, collaborating on pragmatic tasks like coordinating family activities or participating in leisure activities (Davis et al. 2007; Harper 2006). They can also include establishing etiquette (e.g. routines, rituals) (Blackwell, Gardiner & Schoenebeck 2016; Kjeldskov et al. 2004) and more nuanced, ephemeral acts such as attention, affection, intimacy, and love (Vetere et al. 2005). As technology use becomes more interwoven into the fabric of family life, technology can be seen to connect the living room with other worlds (Livingstone 2007b). When it comes to technology use, a balance may need to be found between the different experiences, expectations, and attitudes of individual family members (Blackwell, Gardiner & Schoenebeck 2016; Yardi & Bruckman 2011). Oduor et al. (2016) has shown that a failure to do so can lead to frustrations and create opportunities for conflict within families.

Many studies have described how tension and conflict can arise when parents and

children have different expectations as to how much, when and what kind of technology use is appropriate (Blackwell, Gardiner & Schoenebeck 2016; Chen et al. 2019; Hiniker, Suh, et al. 2016). For instance, when parents try to limit children's exposure to screen-based devices (Hiniker, Suh, et al. 2016; Schiano et al. 2016), when parents try to work out what their children are using personal devices for, especially online (Blackwell, Gardiner & Schoenebeck 2016; Yardi & Bruckman 2011), or when parents try to maintain authority when engaging with voice-activated speakers (Porcheron et al. 2018). When children reject, or are found to have broken rules around technology use, disagreements abound.

Parents' experiences of conflict and problematic experiences when managing technology use are heightened as mobile devices appeal to increasingly younger children (Beneteau et al. 2020; Hiniker, Suh, et al. 2016) This has led to research seeking to better understand how 'screen time' has shaped experiences of early childhood parenting (Goh, Bay & Chen 2015; Lauricella, Wartella & Rideout 2015; Nikken & Jansz 2014; Plowman, McPake & Stephen 2008).

Hiniker, Suh, et al. (2016) highlight that, while parents enjoy the convenience of using mobile devices to entertain young children, they often worry about the consequences that device overuse might have on children's safety, health and development. Furthermore, (Hiniker, Suh, et al. 2016) describe the struggle, and conflict, that parents often associate with transitioning kids away from screen-based activities (Mavoa, Carter & Gibbs 2017; Sobel et al. 2017).

Investigations into parents' efforts to establish technology 'rules' have emphasised the importance that parents place on family time. Yet, they demonstrate that parents, as well as children, can struggle to adhere to household technology rules (Blackwell, Gardiner & Schoenebeck 2016; Chen et al. 2019; Moser, Schoenebeck & Reinecke 2016). In turn, the aspirations that parents (and children) have for family members to be attentive and responsive to one another when they are together are impeded (Hiniker, Schoenebeck & Kientz 2016; Mazmanian & Lanette 2017). Research into technology rules has also suggested that parents' attitudes towards children's technology use and how to mediate it can vary (Mazmanian & Lanette 2017). However, when this review was conducted, no reports were found into how sets of parents work together to manage their children's technology use. Nor were any research into how parents communicate, negotiate or put into practice, their individual perspectives on children's technology use and whether or not this impacts parents' relationships.

Meanwhile, technology use has become more pervasive in the lives of parents themselves (Bartholomew et al. 2012; Morris 2014; Toombs et al. 2018). For instance, mobile devices have enabled and encouraged parents to blur the lines between their work and home lives (Porcheron et al. 2018). On the one hand, today's parents can receive information and even photos about their child while being at their place of work via applications that mediate school communication (Cheng & Chen 2018). On the other hand, they are able to correspond with

colleagues whilst caring for children at home (Mazmanian, Orlikowski & Yates 2013). In some ways, the possibilities afforded by technology have evolved into social expectations. However, this constant ability and expectation to engage in online activity (possibly work-related) whilst simultaneously engaging in a primary activity that demands attention and social response (perhaps family-related) has begun to concern researchers about its impact on personal and family relationships (Kushlev & Dunn 2019; McDaniel, Coyne & Holmes 2012; Nolan, Hendricks & Towell 2015; Prabhakar et al. 2017).

The term technostress was originally used to describe the challenges of adopting to a computer revolution that was occurring in the workplace (Brod 1984). Yet, it has since been associated with negative impacts that mobile device use can have within families (Harris et al. 2020; Lee et al. 2014). Within couple relationships, researchers of family health and communication have demonstrated that disruptions caused by technology use - often referred to as '*phubbing*' or '*technoference*' - can lead to diminished time together, lower levels of intimacy, feeling a lack of emotional support, and conflict over use (e.g., Krasnova et al. 2016; McDaniel & Radesky 2018b; Roberts & David 2016; Twist & Hertlein 2013; Wang et al. 2017).

One such study surveyed over 400 parents to suggest that parents' use of technology can create conflict in their relationships. Furthermore, it indicates that this conflict between parents can negatively impact on their overall relationship satisfaction and on their perceptions of how supported they are in raising their children together (McDaniel et al. 2018). Yet, at the time of this review, no HCI studies were found to have explored if and how parents' relationships are affected by the way technology is used within the family.

2.1.5 Gaps in Our Understanding: Experiences of Family Technology Use

The ubiquitous use of technologies in families is a contentious issue. Current literature indicates that we need more developed understandings about how the use of technology within today's families shapes the experiences of parents, especially those with young children. In particular, this theoretically-focused review reveals two clear gaps in HCI knowledge.

First, this review reveals a gap in our understanding of how the experiences of today's parents are shaped by the technologies being used in everyday family life; both by parents and by young children. This is in contrast to prior research that tends to either consider how parents manage children's technology use or how technology is leveraged to support the roles and responsibilities of parents. In addition, previous studies tend to focus on the use of specific technologies such as smartphones or SNS (e.g., Madge & O'connor 2006; Toombs et al. 2018), on certain situations, like mealtimes (e.g., Davis, Ferdous & Vetere 2017; Moser, Schoenebeck & Reinecke 2016), or on particular practices, such as technology rules (e.g., Hasan, Mondal, Ahlström, et al. 2020; Hiniker, Schoenebeck & Kientz 2016)

Second, this review reveals a need to establish an understanding of how family technology use might shape, or be shaped by, parents' relationships. In fact, it highlights an urgent need for research that can redress a tendency to focus on parent-child dyads, thereby overlooking the collaborative nature of parenting and how technology use impacts parents' relationships. After all, there are indications that attitudes and approaches towards children's technology use can vary, and that they are influenced by a parents' social context (K. Chua & Mazmanian 2021; Livingstone et al. 2015). This second gap buoys suggestions that emerged from the findings of Study One; that it would be valuable to explore parents' individual perspectives on technology use, and to examine indications that this could give rise to conflict in parents' relationships. Efforts to address these two gaps respond to specific calls for a more holistic view of parents' evolving experiences of technology use (Fails et al. 2012; Hiniker et al. 2015).

This section of related work has described literature that guided the theoretical focus of my thesis. This theoretical focus includes HCI research involving theoretical understandings of family technology use. This review evolved over the course of my studies; it first helped to identify a need to establish a better understanding of parents' experiences of family technology use. This need was initially addressed by conducting Study One, the findings of which prompted a return to literature and in turn, the identification of a second gap. Specifically, the need to explore parents' individual perspectives on how technology is used within the family. At this point, a methodological focus emerged from this thesis necessitating the review of an additional area of literature. This area includes accounts of the methods and approaches that have been employed to address the challenges of researching family technology use in HCI.

2.2 Methods: Addressing the Challenges of Researching Families

Technology use within families is increasingly pervasive, yet concerns abound over the adverse effects that it might have on the wellbeing of children and families. These concerns have been a key motivation behind HCI efforts to develop understandings of how families experience technology use (e.g., Fails et al. 2012; Schiano et al. 2016). However, researching the complexities of everyday domestic experiences presents various challenges.

Some of the challenges associated with uncovering experiences of family technology use were first described by early researchers of television (Bryce & Leichter 1983; Morley & Silverstone 1990). Practical challenges include the need to integrate research into the busy day-to-day lives of multiple family members. For instance, Yardi & Bruckman (2011) highlight the difficulty in recruiting parents who are already juggling family and work commitments. Mazmanian & Lanette (2017) also discuss the risk of parents wanting to provide socially desirable responses rather than disclosing family experiences that they might feel uncomfortable

or embarrassed about. Others note that researching intimate domestic contexts requires an awareness of privacy concerns, especially when involving children (Davis et al. 2007; Fails et al. 2012).

These challenges have inspired a diverse set of methodologies, often requiring the refinement or reinvention of existing investigative approaches (Desjardins, Wakkary & Odom 2015). These varied methods used to research families include surveys (e.g., Hiniker, Schoenebeck & Kientz 2016; Moser, Schoenebeck & Reinecke 2016), observations (e.g., Hiniker et al. 2015; Mazmanian & Lanette 2017), interviews (e.g., Ammari & Schoenebeck 2015; Blackwell, Gardiner & Schoenebeck 2016) and probes (e.g., Horst et al. 2004; Volda & Mynatt 2005). Participatory design (e.g., Neustaedter & Bernheim Brush 2006; Plaisant et al. 2006), speculative design (e.g., Durrant et al. 2009), smart home experiments (e.g., Kidd et al. 1999; Randall 2003), technology probes and prototype testing (e.g., Brown, Taylor, Izadi, Sellen, Kaye, et al. 2007; Forlizzi & DiSalvo 2006; Judge, Neustaedter & Kurtz 2010a) have also been used to evaluate people's interactions with novel technological artifacts within the real setting of the home (Brown, Reeves & Sherwood 2011). Meanwhile, ethnographic methods (e.g., Horst et al. 2004; Taylor & Swan 2005; Wakkary, Desjardins & Hauser 2016; Woodruff, Hasbrouck & Augustin 2008) and ethnomethodologically inspired studies (e.g., Crabtree et al. 2012; Crabtree & Rodden 2004; O'Brien et al. 1999; Tolmie et al. 2007; Tolmie et al. 2002) have tended to be employed to explore the social life and practices of the home. These are capable of generating more nuanced accounts of family practices to inform the design of future domestic technologies (Crabtree, Rouncefield & Tolmie 2012). The diversity of these methodologies demonstrates how the challenges of examining everyday domestic experiences have required researchers to refine and reinvent their investigative approaches.

The findings that emerged from the workshop conducted during Study One influenced this review by highlighting the need to employ a method that could consider parents both as individuals and as part of a set of parents. This requirement to consider people as individuals at the same time as considering them to be part of a group highlights a particular complexity of researching the social contexts of families. After all, individuals' different experiences, expectations, and attitudes may need to be balanced with those of other family members (Boehner, Gaver & Boucher 2012; Yardi & Bruckman 2011). This builds on Battarbee's (2005) concept of co-experience, in which she reminds us that 'people are both individuals and social beings'.

This complexity is part of the inherent 'messiness' of family life, which Mazmanian & Lanette (2017) caution against overlooking. In their explorations of technology rules in families, they remind us of the need for research tools that are capable of considering power differentials between individual family members (e.g. parents and children), the varying expectations

between family members, and changing family contexts. As recent research shows, a failure to balance and negotiate between different - even opposing - outlooks of individual family members can lead to tension and conflict (Blackwell, Gardiner & Schoenebeck 2016; Yardi & Bruckman 2011). For instance, tensions between parent-child dyads and, as more recently indicated, conflict might be associated with the different individual attitudes that each parent has towards how technology is used within the family (Ferdous et al. 2015; Moser, Schoenebeck & Reinecke 2016).

While Oduor et al. (2016) surface insights into such tensions, they concede that, by failing to interview multiple family members when exploring the frustrations of domestic technology use, their study was unable to capture *'the other side of the story'*. This highlights the importance of understanding the individual perspectives on technology use within families; especially pertinent when considering sets of parents, who not only need to balance their individual interests and desires, but also to negotiate the shared responsibilities, demands and aspirations associated with parenting (Livingstone & Helsper 2008). In order to do this, parents develop assumptions, hopes and expectations of one another (Hiniker, Schoenebeck & Kientz 2016). A set of parents might have to negotiate their varying individual approaches towards how technology should be used within the family, including how they each use technology (Ammari et al. 2015; Moser, Schoenebeck & Reinecke 2016) as well as how to manage their children's technology use (Hiniker, Suh, et al. 2016; Vandewater et al. 2005b).

Previous research into the dynamics of family technology use offer valuable glimpses into parents' experiences and begin to construct an understanding of parents' increasingly complex realities of technology use in family life (Hutchinson, Mackay, Westerlund, Bederson, Druin, Plaisant, Beaudouin-Lafon, Conversy, et al. 2003; Shellenbarger 1999). However, these efforts tend to take an individualistic approach to exploring parents' experiences when in fact, it has been shown that parents' attitudes and practices regarding children's technology use can vary greatly (Livingstone et al. 2015).

This part of the review suggests a need to carefully consider how to overcome the particular challenges of exploring parents' individual perspectives on family technology use. The following section discusses why probes might be an appropriate method with which to try and address these challenges.

2.2.1 Using Probes to Explore Family Technology Use

Since their conception by Gaver, Dunne & Pacenti (1999) – probes have become a well-established approach to understanding users, their behaviours, and use of technologies (Boucher et al. 2018). Probes are playful and open-ended tools used to access aspects of participants' lives

by allowing them to express themselves through collected information (Gaver, Dunne & Pacenti 1999; Mattelmäki 2006). Probes are often used to support and prompt discussions between researchers and participants during contextual interviews. As well as stimulating early dialogue with participants, probes support reflection by users. Many HCI researchers have demonstrated the effective use of this dialogical approach to probes (Horst et al. 2004). This approach usually involves exploring aspects of participants' lives by offering them opportunities to express themselves through completed probes (Mattelmäki 2006), in conjunction with contextual interviews. This dialogical approach of 'probing for empathy' rather than 'probing for inspiration' has been demonstrated effectively within families, as a means of encouraging participants to acknowledge experiences that might usually go unnoticed within everyday life (Horst et al. 2004).

This dialogical approach has also been productive when exploring more ephemeral aspects of family experiences, such as intimacy (Davis et al. 2007). In addition, the ambiguity associated with responding to probes offers participants a sense of privacy that has allowed them to be employed in sensitive settings, or to address topics which require sensitivity (Boehner, Gaver & Boucher 2012). Probes can, therefore, enable intimate and personal issues to be addressed (Dalsgaard et al. 2006; Kjeldskov et al. 2004) and their ability to reveal emotional and experiential aspects of design has also been well established (Leong et al. 2010).

In researching family technology use, one approach has been to design probes to be completed by, and discussed with, an individual family member (e.g., Haines et al. 2007; Neustaedter, Elliot & Greenberg 2006). However, Isola & Fails (2012) caution that taking an individualistic approach to research families might risk promoting Turkle's notion of family members 'being alone together' (Turkle 2017). Instead, they suggest taking an approach that considers the needs of the family as a whole. Similar calls have been made for more holistic approaches to developing more complete accounts of family experiences with technology (Davis et al. 2007; Harmon & Mazmanian 2013; Hiniker, Schoenebeck & Kientz 2016). Another way in which researchers have used probes in research with families has been to design them as a joint family project, to be completed together in preparation for a family interview (e.g., Dalsgaard et al. 2006; Vetere et al. 2005; Volda & Mynatt 2005; Wallace et al. 2013). However, this collective approach tends to assume that families are homogeneous and overlooks the differences between the individual perspectives of family members (Harmon & Mazmanian 2013).

When exploring communication in families, (Horst et al. 2004) describes an attempt to balance these two approaches by designing one probe to capture the collective perspective of the whole family and another to capture the individual perspective of just one family member. Probes have also been used to capture responses from two individuals in order to explore aspects of their

relationships. For instance, in studies of how technologies might mediate intimacy between couples (Vetere et al. 2005) and between children and grandparents (Davis et al. 2007). These examples suggest that probes might be a helpful tool to turn to when attempting to explore parents' individual perspectives on family technology.

2.2.2 Guidance on Probe Design & Use

Despite the enthusiastic uptake of probes within HCI and design, concerns have been raised about the misinterpretation and misappropriation of probes. Boehner et al. (2007) assert that this may be due to a lack of clarity on the method itself because accounts of probe use tend to gloss over details of how they were designed. This review found that some researchers have attempted to add clarity to the method by discussing what probes are (Boehner, Gaver & Boucher 2012) and what they do (Berkovich 2009; Graham et al. 2007). Attempts have also been made to catalogue different kinds of probes (Graham & Rouncefield 2008; Mattelmäki 2006), for instance by topic of interest (e.g. domestic probes, urban probes etc.), desired result (e.g. empathy probes, value probes etc.) or new approaches to using probes (e.g. mobile probes, technology probes etc.) (Boehner et al. 2007). Another effort to provide clarity has been to try and determine what these different probes have in common (e.g. probes inspire, probes create fragments, probes provoke... etc.) (Graham et al. 2007). Despite these efforts, clear guidance on how to actually design probes remains elusive.

Discussions about what probes are, and what probes do, tend to further Gaver et al.'s (2004) original definition of cultural probes as "collections of evocative tasks meant to elicit inspirational responses from people". Yet, detailed guidance on *how to design* probes is limited and instead advice centres on how to approach the probe design process. For instance, in their outline of the probe design process, Hemmings et al. (2002) discuss various skills required by those wishing to adopt the method (e.g. idea generation, graphic design, model etc.) and list the phases involved (e.g. recruitment, assembling probes, deploying probes, retrieving probes etc.). However, while they highlight the need for design skills and for team discussions to generate probe ideas, they neglect to include a probe design phase from their schedule, which moves straight from "Selecting Volunteers" to "Assembling Domestic Probes". The tendency to gloss over the design thinking behind probes is common in probe literature.

I found guidance on how to *think about* probes. For instance, Graham et al. (2008) define common probe features (e.g. capture artefacts, making the invisible visible, participant as expert etc.) and their effects (e.g. humanize, create fragments etc.). Guidance is also offered on how to generate the questions being asked through the use of probes. For instance, Mattelmäki's (2006) introduction to the method suggests considering participation, before designing probes (e.g. "Who is your user?" "How long will people be involved?" etc.). In addition, the Interaction

Research Studio (2018) offer approaches to prompt the ideation of probe concepts. (e.g. “use analogies”, “ask obliquely-related questions” etc.) and provide examples of probe tools. While these attempts add clarity to the method, more explicit and detailed guidance about the design decisions required to develop a probe collection is harder to find.

To be fair, there are a few authors who describe the thinking behind their probe designs in more detail. For example, Tsai, Orth & Hoven (2017) explain the reasoning behind the design of their Memory Probes by describing how they attempted to balance three sets of probe properties (“familiarity–strangeness”, “definiteness–ambiguity” and “objective–subjective”). Boucher et al. (2018) also make reference to several probe properties (e.g. “simple and easy”, “open-ended”, “playful” and “absurd” etc.) when describing the design of a novel probe tool, TaskCam. However, while these reports provide insights and details into the decisions that researchers have taken when designing specific probes, they are not aimed at providing general advice or guidance for taking effective probe design decisions. Furthermore, these occasional glimpses into differing ways of thinking and also of talking about the design properties of probes highlight a need for clearer, more consistent guidance.

One exception that was identified by this review is a paper called *Making Design Probes Work* (Wallace et al. 2013). This paper provides a systematic reflection on probe design decisions. One of its explicit aims is an “attempt to address the identified lacuna” – which is “the lack of accounts that describe in detail the design of probes and their use with participants”. Some have argued that this lacuna is one of the reasons why the method has been often misinterpreted and proved elusive to many (Boehner et al. 2007).

Making Design Probes Work

In *Making Design Probes Work*, Wallace et al. (2013) offer what they call “a framework for probe design and use” based on detailed descriptions of the design of probes and their use with participants. This salient guide, or framework, focuses explicitly on the design decisions required to develop probes. It is a summary of learnings from their projects spanning over a decade involving the design and use of probes. Overall, *Making Design Probes Work* consists of two main areas of guidance. The first area introduces a lexicon of probe design properties: *openness/boundedness*, *materiality*, *pace* and *challenge*. It describes how these properties (and therefore participant engagement) can be affected by taking particular design decisions. The second area of guidance is less prescriptive and relates to supporting “relationships and reciprocity”: how best to consider and involve participants when embarking on a probe study. While this framework seems to provide the most comprehensive guidance on what to consider when designing and using probes, nobody had explicitly described putting this framework to use at the time of this review.

2.2.3 Gaps in Our Understanding: Probing Parents' Experiences

The above review suggests that probes would be a suitable method to turn to in order to address the challenges of exploring complex experiences of family technology use. Yet, it suggests that conventional approaches to probes might need to be adapted in order to capture and explore parents' individual perspectives on family technology use (and the impact that it might have on their relationships). Specifically, by seeking a balance between the individualistic and collective ways in which probes have tended to be designed and used with families. In addition, it indicates that it could be helpful to use Wallace et al.'s *Making Design Probes Work* as a framework as guidance when taking a novel approach to designing and using probes.

This section of Chapter 2 has discussed literature pertaining to the methodological focus that emerged through this thesis research. This includes accounts of the methods that HCI researchers have employed to explore family technology use, with an emphasis on how probes have been used to work with families. The gaps identified within this methodologically focused review were addressed during Study Two. This probe and interview study effectively helped to surface deeper theoretical understandings of parents' problematic experiences of family technology use. Specifically, it revealed how parents struggle to manage mobile device use during family time and the conflict that this can create in their relationships.

To address findings that emerged from the formative studies performed for this thesis, I eventually explored how the design of interactive technologies might help to improve parents' experiences. Thus, a third area of literature became relevant. This includes reports of how we might design technologies that help address some of the complex experiences arising from the use of today's devices, and is presented in the next section.

2.3 Design: Addressing the Complex Experiences of Pervasive Technology Use

Digital technologies have greatly transformed the way in which people interact with each other. HCI studies have highlighted some of the unintended social challenges that can arise due to the increasingly pervasive way in which they are used. The use of mobile devices can be especially disruptive by persistently offering opportunities for people to engage in other activities and to communicate with remote others (Abeele et al. 2019; Kildare & Middlemiss 2017; McDaniel & Radesky 2018a; Oduor et al. 2016; Ugur & Koc 2015). It has been suggested that these digital disruptions can introduce feelings of frustration, disconnection and loneliness, thus reducing the sense of relationship satisfaction, especially within families and intimate couples (Harmon & Mazmanian 2013; McDaniel et al. 2018; Roberts & David 2016).

In response to the problematic experiences that can arise from the pervasive way in which technology is used – especially within domestic settings – several recent studies have explored how they might be addressed through the design of interactive technologies. This review focuses on two prominent approaches. The first approach is to design for digital wellbeing. The second approach is to try to enhance collocated experiences.

2.3.1 Designing for Digital Wellbeing

Designing for digital wellbeing is a recently introduced HCI research and practice agenda (Cecchinato et al. 2019). It responds to people's growing dissatisfaction with the amount of time they spend on devices, or the context in which they use them. This dissatisfaction correlates with the increasingly widespread promotion of technology abstinence, for instance via digital detoxes (Radtke et al. 2022; Syvertsen & Enli 2020; Ugur & Koc 2015). These efforts have developed HCI understandings of technology non-use, a concept originally introduced by Satchell & Dourish (2009). Initially, this concept was used to distinguish between users and non-users and often involved attempts to understand decisions behind technology adoption. For instance, in studies of why people were, or were not, motivated to use the Internet (e.g., Reisdorf & Groselj 2014). However, studies into people's struggles to self-regulate their use of technology, especially mobile devices and social networking sites, have demonstrated the need for approaches that go beyond this binary distinction (Baumer et al. 2014; Fuchsberger, Murer & Tscheligi 2014). For instance, when considering the more complex experiences of people who limited, relinquished or resumed their use of Facebook (Baumer et al. 2013; Baumer et al. 2019).

Explorations into people's attempts to restrict their use of technology have also reframed the discourse surrounding the problematic use of technology from self-determination to the role of design (Lukoff et al. 2021). In other words, by suggesting that rather than placing the burden of change on the user, we should explore the role of design in helping people to have more autonomy over their technology use. Cecchinato et al. (2019) emphasise the need to explore strategies beyond non-use, in order to support people's varying contexts and individual goals. For instance, they recommend research into understanding how promoting more intentional interactions with technology might support users to self-manage their device use and achieve their goals.

Lukoff et al. (2018) have shown that people's motivation for smartphone use, the type of use, and context of use, can determine how meaningful they feel it is. For instance, habitual, passive device use tends to be associated with a lower sense of meaningfulness, especially when driven by boredom. People also report a loss of autonomy and even disassociation when using their phones in this way (Baughan et al. 2022). In response to such findings, HCI is developing

a growing interest in understanding how to support more meaningful interactions with technology by enabling users to self-manage their use to improve their experiences and achieve their goals.

The ‘designing for digital wellbeing’ agenda also reflects a recent influx of apps and features aimed at supporting people to manage their device use, by companies who have traditionally designed technologies to maximize user engagement (Monge Roffarello & De Russis 2019). These features are predominantly marketed towards users of mobile devices, which have been shown to be particularly overloading and distracting (Ugur & Koc 2015). Monge Roffarello & De Russis (2021) characterize them into features that track and visualize data, and features that reduce use through interventions. The design patterns of these features tend to follow those used in personal informatic tools that help people to manage their physical activity, health conditions, and other (e.g., Li, Dey & Forlizzi 2012). Similar strategies of supporting user’s autonomy while using devices have been explored within HCI research. For instance, Whittaker et al. (2016) demonstrate that providing users with real-time awareness of their device use can improve their focus while Kim, Park, et al. (2019) and Kim, Jung, et al. (2019) have explored systems that intervene to limit smartphone use after a certain period of time.

Within family settings, non-use strategies are explored by Bruun et al. (2020) through the design of Pup-Lock, an application that enables all the mobile devices in a household to be locked by any individual family member. This design provocation revealed that families might benefit from technologies that both support non-use during family time and encourage families to reflect on how they use devices. Meanwhile, Hiniker et al. (2017) have examined how technologies that support intentional technology use can improve parents’ experiences of transitioning young children away from screen-based activities. Besides helping to manage screen time, this strategy was shown to create valued opportunities for parents and children to reflect on, and to discuss, their device use. While (Hiniker et al. 2017) provide helpful indications of how we might attempt to address the challenges currently facing parents, their study does not consider how parents use technology themselves, nor how the responsibility of managing family technology use is shared between sets of parents.

2.3.2 Enhancing Experiences of Collocated Mobile Device Use

In trying to maximize engagement, the design of interactive technologies prioritises the interactions of individual users over the resulting interactions and relationships between collocated people. Mobile devices in particular are perceived to promote individual users to engage in activities that create a sense of private “invisible shield” (Kawsar & Brush 2013). Thus, as device use has become more pervasive, concerns have been raised about its potentially

negative social implications. For instance, Przybylski & Weinstein (2013) found that the mere presence of mobile communication devices in social settings can have negative effects on closeness, connection and conversation. Meanwhile, Roberts & David (2016) coined the term ‘phubbing’ to describe the ‘*extent to which an individual uses or is distracted by his/her cell phone while in the company of his/her relationship partner*’ in their study of how it could negatively impact relationship satisfaction and personal well-being. This term became widely used in society after the study was reported on by mainstream media outlets (e.g., Ducharme 2018).

One way in which HCI research has responded to concerns about technology use disrupting ongoing social situations is by attempting to understand how technology might be designed to actually enhance collocated social interaction (e.g., Olsson et al. 2019). Yet, designing technologies to support synchronous interaction between individuals in close proximity, especially those that prompt face-to-face interaction, remains underexplored compared to technologies that support remote interaction over distance. However, HCI, computer-supported cooperative work (CSCW) and social computing do have a significant history of researching systems that enable multiple users to interact with shared interfaces and within group settings (Olsson et al. 2019). More recently, similar systems have been used to inform explorations into how technologies might help to overcome the private, personal way in which mobile devices are designed to be used. Specifically, by actively improving the quality or extent of social interaction between collocated people (Fischer et al. 2016).

One strategy that has been explored as a way of enhancing the social interaction between collocated people is to provide greater awareness of a person’s device use to those around them. For instance, Jarusriboonchai, Olsson & Väänänen-Vainio-Mattila (2015) and Jarusriboonchai et al. (2016) attach displays to the backside of smartphones that show the icon and name of the application being used, thus making it possible for people around the user to understand what a device is being used for at any moment. This example is inspired by prior research into the short-lived popularity of ‘projector phones’ (e.g., Cowan & Li 2011) and demonstrates how social displays can be used to enhance social interaction between collocated people. Specifically, by encouraging device users to be more aware of their usage and more considerate of the ongoing activities around them.

Hasan, Mondal, Khatra, et al. (2020) leverage proxemic sensors to explore this strategy of raising activity-awareness as a way of tackling smartphone overuse in social contexts. Specifically, they study an app designed to allow collocated partners to share information about their smartphone usage with one another. Partners are able to share the name, category or screenshots of the app being used. Additionally, partners can send each other reminders of how long a certain app has been used, and even requests for the app to be closed. While this study indicates that there are opportunities to improve experiences of collocated device use, it also

highlights the need for careful consideration of app-specific privacy concerns and people's tolerance of being monitored and instructed by their partners.

Within the contexts of families, this strategy of increasing activity awareness might help encourage mealtime conversation between family members has been explored by Ferdous et al. (2016). They do this by creating a system that allows mobile devices to be transformed into a shared display when placed next to each other. By suggesting that family experiences can actually be enriched by devices that enable shared activities, this approach challenges common perceptions of devices disrupting social cohesion during mealtimes.

These examples provides valuable insights into various ways in which technologies might effectively help people to enhance experiences of collocated mobile device use. Yet, at the time of this review, no research had explicitly sought to explore how the design of interactive technologies can address the problematic experiences that parents associate with family technology use, particularly when attempting to manage mobile device use within everyday family life. Nor do they consider how we might help to alleviate the conflict that family technology use can create in parents' relationships. This is despite calls for deeper understandings of how design might address the challenges arising from pervasive device use in specific social contexts (Bruun et al. 2020; Cecchinato et al. 2019; Olsson et al. 2019).

2.3.3 Gaps in Our Understanding: Designing to Improve Parents' Experiences

The above review outlines an emerging HCI interest in how to address some of the unintended social challenges that can arise from the increasingly pervasive use of technologies, especially mobile devices. It also describes specific strategies that have been explored. One strategy is to design for digital wellbeing. This strategy aims to support people's efforts to self-manage their device use, primarily through tools that help track and limit certain activities. Another strategy is to try and enhance collocated experiences. This strategy aims to enable and encourage in-person interactions, primarily by making the private, personal activities being undertaken by a mobile device user more recognisable to those around them.

This review suggests that it would be valuable to explore how these strategies, among others, could be employed to explore how the design of interactive technologies could help improve parents' experiences of family technology use.

2.4 Conclusions

This chapter has offered a critique of the pertinent literature that guided this thesis. It has described three key areas that relate to theory, methodology and design. First, studies that offer theoretical understandings of family technology use, in particular, parents' experiences and

family conflict. Second, accounts of methods and approaches that have been employed to research family technology use in HCI, particularly, reports of how probes have been designed and used, especially when working with families. Third, reports that offer ideas about how the design of interactive technologies might help to address some of the problematic experiences currently arising from pervasive technology use, particularly within domestic settings.

Accordingly, three key gaps can be identified within the HCI literature available at the time it was reviewed. These gaps all relate to a need to aspire beyond understanding experiences of individual users and towards understanding more complex social experiences and co-experiences. Yet, the gaps are also distinct in their relation to theory, method and design:

Theoretical Gap

The first section of the review reveals a need for deeper, more nuanced understandings into parents' experiences of how technology is used within today's families. In particular, how family technology use shapes parents' experiences and relationships. This includes exploring parents' individual (and differing) perspectives on family technology use and if this contributes towards conflict in their relationships.

Methodological Gap

The second section of the review reveals a need to understand how the probes method can be adapted to support explorations into parents' complex experiences of family technology use. Firstly, by examining the effectiveness of existing guidance on how to design and use probes. Secondly, by attempting to design and use probes to capture and tease apart parents' individual perspectives towards family technology use.

Design Gap

The third and final section of the review reveals a need to explore how various design strategies might help to improve parents' experiences of managing the use of mobile devices during family time.

This chapter has provided an overview of the pertinent literature that guided this thesis. The next chapter describes the design of the research carried out for this thesis.

CHAPTER 3

Research Design

CHAPTER 3. Research Design

This chapter offers an overview of the methodological approach taken during this research to explore how technology use within families shapes parents' experiences. It also provides details of the particular methods that were employed during each of the three empirical studies that were conducted. In addition, it discusses some of the key challenges and considerations that this thesis involved.

3.1 Overview of Research Approach

Overall, my research approach looked to human-centered design research methodology to explore how parents' experiences are shaped by the use of digital technologies in everyday family life. The nature of my research objective and its focus on user experience called for an empirical research approach (Kuniavsky 2003). This approach involved a series of qualitative studies, yet the exact number of studies, the research questions that they addressed, and the ways in which they were designed to do so, were determined by the findings that progressively emerged as each study was conducted. Thus, the research plan evolved iteratively as the research developed. This evolving approach is common within HCI and one which Blandford et al. (2016) refer to as a 'semi-structured qualitative study' (SSQS). They define this term by drawing on the analogy of the semi-structured interview; that there is enough structure to provide accountability and rigour, yet enough space to pursue important avenues that are discovered during the process of conducting the study.

When seeking to establish an understanding of the contexts in which technology is used and might be used, interpretivist semi-structured qualitative approaches are most appropriate (Blandford 2016). Interpretivist approaches assume that a subjective (rather than objective) reality is constructed through the interpretation of researchers, study participants and even readers of the research when written up. Their emphasis on the interpretation process in how people make sense of reality make interpretivist approaches highly suitable for studies of how a certain kind of technology shapes peoples experiences.

So, within this interpretivist approach, I sought to construct meaning from empirical data, rather than to test a specific hypothesis. In other words, I allowed findings to emerge from various data collected from three sets of participants during three empirical studies, which each employed a qualitative method appropriate for their particular research objective. This interpretivist approach falls broadly into the field of constructionist epistemology (Crotty 1998). Thus, the findings that emerged from each study were not constrained to the topics that participants were directly asked about. For example, while participants were not explicitly prompted to discuss their relationships, insights were surfaced about how family technology use could contribute towards conflict in parents' relationships.

3.1.1 Research Methods

The methods employed during this thesis primarily involve open-ended, semi-structured workshops and interviews. Perceptions and experiences can be gathered - often with greater breadth but less depth than interviews - by facilitating reflection and discussion with multiple participants during workshops. The opening study of this research (Study One) involved a two-hour exploratory workshop conducted with 11 parents of young children. In order to minimise the risk of “group think”, this workshop was designed to comprise a series of activities requiring participants to complete individual tasks and worksheets.

Semi-structured interviews are commonly conducted during HCI studies to understand people’s perceptions and experiences. For instance, when exploring how a particular type of technology shapes people’s experiences (e.g., Kindberg et al. 2005; Palen 1999). In contrast to techniques that establish how people do (or might) interact with existing (or proposed) technologies, in-depth interviews can surface insights into people’s experiences of technology and their hopes for future technologies. Yet, it has been noted that participants might have difficulty reporting accurately on what they do, especially when considering aspects technology use that go unnoticed since they are not the primary focus of someone’s activity (e.g. habitually responding to notifications, or interacting with information) (Blandford, Furniss & Makri 2016). This was one of the reasons why the interviews conducted during this research were situated in the homes that participants share with their families; within the context of the technology use being explored. In addition, interviews were scaffolded with probes, or prompts, that were deliberately designed to capture initial responses that would then help encourage deeper reflection during discussions. I anticipated that this approach would enable me to establish deeper understandings of parents’ experiences of family technology use, with which to inform researchers and designers of interactive technologies.

Specifically, semi-structured in-home interviews were scaffolded by probes during Study Two. This involved conducting a two-week probe and interview study with eight sets of parents (a total of 17 parents). Later, in Study Three, semi-structured interviews were scaffolded by scenario-based storyboards portraying the use of early interaction design concepts (resulting from two creative workshops involving a total of 12 UX designers). While the interviews in Study Three were conducted remotely (via Zoom) due to COVID-19 restrictions, participants were still interviewed from their homes.

3.1.2 Analysing Research Data

Each of these three empirical studies resulted in a set of transcribed data that was coded using Thematic Analysis (TA). TA is a technique for organising and identifying themes within data, that is widely used in HCI (Blandford, Furniss & Makri 2016). This approach to analysing

qualitative data is intended to sit between unstructured analysis and approaches that are more prescriptive. Throughout this research, the analysis process included the key phases defined by Braun and Clarke (2006): familiarisation with the data, generation of initial codes, search for themes, review of themes, definition of themes and assignment of theme names, production of report.

Broadly speaking, my approach to analysing the raw data collected during each of the empirical studies involved three forms of coding (*open*, *axial* and *selective* coding). These three forms of coding were conducted to impose order on the mass of collected data, thus reducing it to a more manageable size and surfacing associations and causal arguments (Neuman & Robson 2014). A “first pass” through the data (*open coding*) was conducted with the aim of identifying themes and of assigning initial codes and labels to them. These themes originated from the initial research question, from concepts within related literature and from new thoughts prompted by immersion in the data. The themes developed during this slow examination of the collected data were at a low level of abstraction, and so it was important to remain open to creating new themes and to changing codes in the subsequent phases of analysis. A “second pass” through the data (*axial coding*) was then conducted, in which more focus was given to the collection of codes and the initial themes from the open-coding process, than to the raw data. Continuing to review the data created opportunities for additional codes and themes to emerge. Yet, the primary focus during this phase of analysis was in organising themes. For instance, deciding to divide a theme into subtypes, or to combine closely related themes into a general one. These decisions were informed by continually revisiting the data and re-evaluating themes. A “final pass” through the data (*selective coding*) was conducted once the major themes of a certain study had been identified. Using this form of coding to re-examine the data and select supporting evidence helps to refine, reorganize and elaborate on the themes.

The raw data from each of the three studies was transferred to NVivo software where it could be organised and analysed. In some cases, an initial round of coding was conducted by noting responses, direct quotes or emerging themes on colour-coded post-it notes. These could then be grouped together based on similarity. This data was then translated to NVivo software in order to proceed with additional rounds of coding. At times, the analysis conducted during this research was ‘data-driven’, and data was coded with no preconception of what might emerge. At other times, the analysis was ‘theory-driven’, and data was coded with a preconceived notion of where attention should be paid. For example, when re-analysing the data from Study Two to establish the effectiveness of specific tactics that had been implemented when designing and deploying probes.

3.1.3 Research Trajectory

My initial research question arose from a preliminary literature review. This review continued to evolve as my research progressed, in response to the findings emerging from each study. In turn, this evolving review helped identify my subsequent research questions, which I duly addressed through the design of each following study. Hence, my research trajectory evolved over the course of my three studies, as shown in Fig. 2.

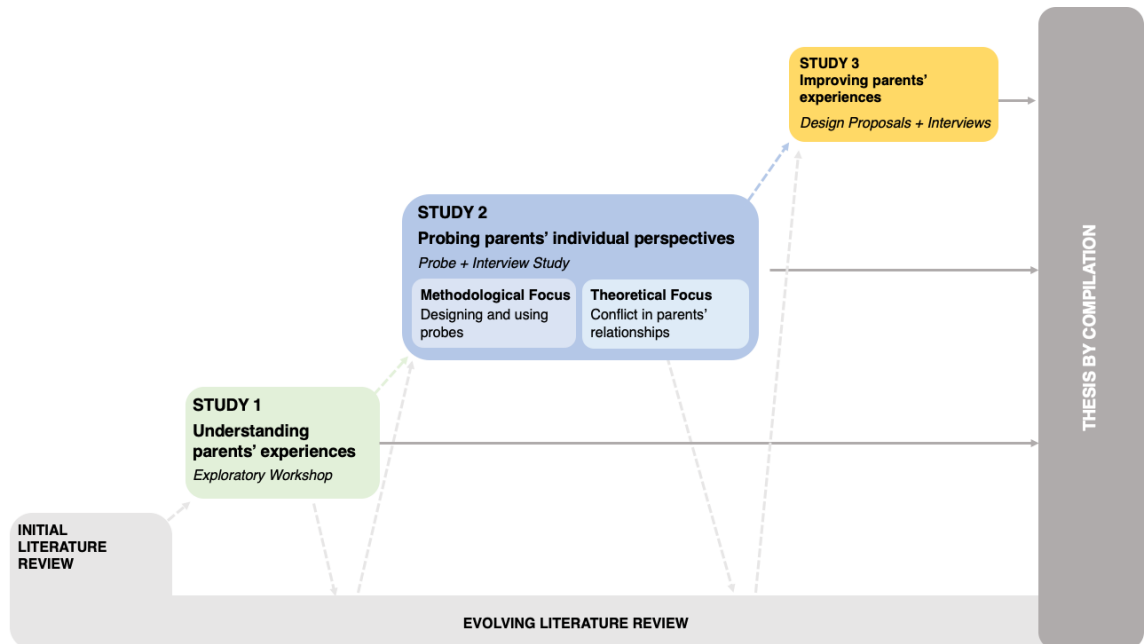


Figure 2. Research Trajectory

3.2 Methods Used in the Empirical Studies

In this section, I aim to provide a more balanced account of the methods used in my empirical studies by compiling and elaborating on content from my seven publications. These publications describe the methods used in different studies in very varying levels of detail. This variation in detail is because three publications (**Publications II, III & IV**) focus on methodological knowledge, while three (**Publications I, V & VI**) report theoretical insights and one (**Publication VII**) discusses design possibilities. The methods used in each of the studies are summarised in Table 1.

Table 1. Methods Used in the Empirical Studies.

| Study | Method | Aim | Publication |
|-------------|---|--|---|
| Study One | Exploratory workshop with 11 parents | To establish an initial understanding of parents' experiences of family technology use | Publication I |
| Study Two | Probe & Interview Study with eight sets of parents (Total of 17 participants) | To reflect on and extend existing methodological guidance on probe design and use | Publication II Publication III Publication IV |
| | | To develop theoretical understandings of family technology use: conflict in parents' relationships | Publication V Publication VI |
| Study Three | Workshops with 12 UX designers Interviews with 14 parents | To explore how the design of interactive technologies might improve parents' experiences | Publication VII |

3.2.1 Study One: Exploratory Workshop

This study was designed to address the research question that arose from an initial literature review:

RQ1 What types of experiences do parents commonly associate with family technology use?

The decision to conduct this workshop was motivated by Wallace et al. (2013) recommendation to build an understanding of participants and their contexts before embarking on the design and use of probes (for more details see 2.2.2). This workshop was designed to consider any experience that parents associated with any of the digital technologies used within their family. Furthermore, it intended to capture parents' accounts of interacting with technology themselves, of their children's use of technology and of situations, in which parents and children use technology together. Thus, Study One heeded calls for more holistic and inclusive research into family technology use (Isola & Fails 2012). As mentioned previously, prior HCI research has tended to focus on the use of specific technologies, including smartphones (e.g., Hiniker et al. 2015) and social networking sites (e.g., Kumar & Schoenebeck 2015) or certain situations such as mealtimes (e.g., Moser, Schoenebeck & Reinecke 2016).

This (approximately) two -hour, lab-based workshop was conducted with 11 parents of young children (under 12 years of age) at the University of Technology Sydney on a Sunday morning. In an effort to take an holistic approach, the workshop asked parents to reflect on any aspects of family technology use that affected their experiences, rather than concentrating on particular devices or specific situations. While the workshop was not solely focused on capturing problematic experiences, a review of related literature suggested that examining these in more detail would surface the most valuable contributions. Here, I summarise the approach that was originally presented in **Publication I** and provide additional relevant details.

Workshop Preparation

Based on my experience, both as a user experience researcher and as a parent, I decided to conduct a two-hour workshop. By limiting the length to two hours, I hoped to reduce any perceived disruption to family life, thus reducing some of the challenges involved in seeking to recruit parents of young children who are often busy and constrained by professional and caregiving responsibilities. My extensive professional experience of designing and facilitating effective user research workshops also gave me confidence that this would be enough time, in which to establish an initial overview of parents' experiences of family technology use.

Holding the workshop at the University of Technology Sydney campus on a Sunday morning took into account general patterns of urban family life (e.g. reduced travel times, young children tend to wake early) as well as factors more specific to Australia (e.g. sporting clubs usually to meet on Saturdays, children's parties often take place during the afternoon). The University is centrally located within the city and well connected within the public transport network. During the weekend, I was able to make use of a large meeting room adjoining the Interaction Design and Human Practice Lab. The lab was well equipped to serve as a recreational space for participants' children and partners to wait during the session. I recruited four collaborators to assist me; two to help conduct the workshop and two to attend to the needs of participants' family members in the recreational space.

In preparation for the workshop, I created a participant screener and participant form (Appendix 2.2). I also created a flyer describing my request for participants, which was distributed via an informal network, including local schools and community groups, and shared on their social media channels. As an incentive and demonstration of appreciation, parents would each receive a store voucher with a value of \$20 AUD. I sought 10-12 participants and began to recruit four weeks before the workshop was planned to take place. Meanwhile, I designed and produced the presentation, activities and material required for the workshop. I presented these to my supervisors and collaborators, both for critical feedback and as part of preparatory briefing.



Figure 3. Study One: Examples of photos taken during the workshop

Workshop Design & Activities

The workshop activities are summarised below:

- **Introduction:** Welcome, Introduction to the research topic and workshop agenda. (10 mins)
- **Activity 1 - ‘Icebreaker’:** Participants each complete a worksheet designed to capture information from about family life, technology attitudes and practices. Participants then introduce themselves to the group and share an overview of this information. (10 mins)
- **Activity 2 - ‘☺ (Positive Experiences)’** – Participants each complete a worksheet designed to prompt them to reflect on positive experiences associated with technology used by children, parents or by the whole family. Participants then discuss their individual responses with the person next to them before sharing an overview of their responses and discussions with the group. (20 mins)
- (10 minute break)
- **Activity 3 - ‘Love/Hate’** – Participants each complete a worksheet designed to prompt them to reflect on aspects of technology use that they associate with both positive *and* negative experiences. Participants then discuss their individual responses with the person next to them before sharing an overview of their responses and discussions with the whole group. (20 mins)
- **Activity 4 - ‘That’s Not OK’** – Participants each complete a worksheet designed to prompt them to reflect on situations, in which they feel technology use is inappropriate. Participants then discuss their individual responses with the person next to them before sharing an overview of their responses and discussions with the whole group. (20 mins)
- **Wrap Up:** During a group discussion, participants share what they learnt, didn’t agree with, found surprising, helpful or enjoyable during the workshop. (10 mins)

Workshop Participants

I recruited 11 parents (S1P1-S1P11) to participate in this workshop, all of whom had at least one child under the age of 12 years (inclusive). These 11 parents represented ten families since two participants were married. Parents had between 1 and 3 children ranging in age between 9 months and 9 years. All parents had at least one child over the age of two years old. These parents came from ethnically diverse backgrounds, varied technological expertise and ranging employment situations. An overview of participants’ details can be found in **Publication I**.

Qualitative Analysis of Study One: Workshop Data

Early analysis began during a debriefing meeting held immediately after the workshop with my collaborators. One of my collaborators is a UX designer/researcher and former colleague with whom I had previously conducted UX research. While we had both taken handwritten notes during the workshop, theirs were more extensive as I focused on facilitating the session. It was therefore helpful to compare and collate initial key themes and early insights during this initial debriefing meeting.

Later, I alone manually transcribed completed worksheets. I then used an automated transcription service (Otter.ai) to create a first draft from the audio recordings before manually checking them and correcting any errors. I then conducted a first round of thematic analysis on these transcripts, using initial themes from the debrief and identifying additional themes. This first round involved me using colour-coded post-it notes, on which to group together clusters of responses taken from worksheets, quotes from the discussions or emerging themes. I then transferred this data to NVivo software where I proceeded to conduct a second round of coding.

This analysis produced four problematic experiences that parents discussed in relation to family technology use. In addition, it revealed that conflict can arise between parents who hold differing attitudes towards the way in which technologies are used within the family. More details on the method used in Study One are provided in Chapter 4 and Appendix 2.

3.2.2 Study Two | Methodological Focus: Designing and Using Probes

This first methodologically-focused phase that arose during Study Two responds to RQ2:

RQ2 How can we use probes to explore parents' individual perspectives on family technology use?

That parents can have differing individual perspectives on how technology is used within the family had been revealed by the findings of Study One. These findings had highlighted the need to capture and tease apart parents' differing individual perspectives and to sensitively examine any resulting conflict in their relationships. Next, I summarise some of the details about the method that are presented in **Publication II, III & IV**.

Preparing to work with probes – Making Design Probes Work

When seeking guidance on working with probes from within HCI literature, I had identified *Making Design Probes Work* (Wallace et al. 2013) as a nascent framework for using the method. I had also discovered concerns about the method being misinterpreted and misunderstood due to a lack of actionable guidance around how to think about probes (Boehner et al. 2007). While I had professional experience of conducting probe and interview studies while working as a UX researcher, I had been unaware of the contested HCI discourses

surrounding method. Thus, I felt it would be valuable to document – and critically reflect upon - my attempt to use *Making Design Probes Work* as a guide when designing and using a collection of three probes to explore parents’ individual perspectives on family technology use.


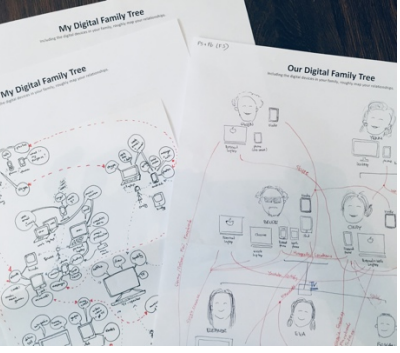
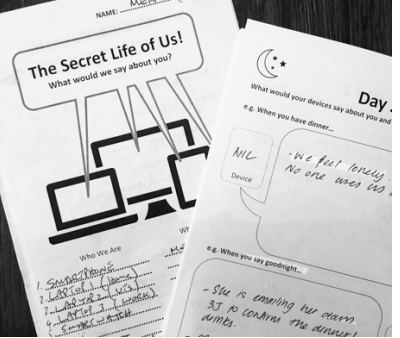
My process of analysing, distilling and employing Wallace’s guidance led to the design and use of a collection of three probes; (i) Family Experience Jar, (ii) Digital Family Tree and (iii) Device Journal. These probes are detailed in **Publication II - IV** and are also summarised in Table 2.

A Novel Approach to Probe Design & Use

Exploring parents’ individual perspectives on technology use involved adapting the way in which probes have traditionally been designed and used when working with families; either to capture individual responses from one family member, or to capture collective responses from multiple people (usually the whole family). The key adaptation of this novel approach lies in capturing a variety of individual and collective responses from each set of parents. Doing so meant deciding which probes would be completed by one parent individually, and which would be completed by a set of parents, together. It also involved considering whether each parent’s response to a specific probe would be kept private, or shared with the other parent(s). Furthermore, I reflected on how each probe would complement and support each other, and thus work together as a set to reach its objective.

This aspect of my research is presented by **Publication III**, which explains the novel approach I took to working with probes and **Publication IV**, which describes the particular tactics that I employed when designing them.

Table 2. Study Two: Probe Instructions

| Probe | Instructions to parents |
|--|--|
| <p>Probe 1. <i>Family Experience Jar</i></p>  | <p>“This is an individual task to be completed daily.</p> <p>Using the coloured paper provided, make notes about any and all of your experiences of family technology use (Pink notes = positive, yellow notes = neutral/mixed, blue notes = negative).</p> <p>Initial and date each note.</p> <p>Do not share or discuss your notes.</p> <p>Fold note so it cannot be read and insert into the glass jar.</p> <p>Notes cannot be removed from jar.</p> <p>Make at least one note per day.”</p> |
| <p>Probe 2. <i>Digital Family Tree</i></p>  | <p>“DURING WEEK 1: Using the <i>My Digital Family Tree</i> template, each parent is to draw/sketch a family tree that shows the relationships between the people and devices in your family.</p> <p>DURING WEEK 2: Compare your individual family tree sketches with each other and, using the <i>Our Digital Family Tree</i> template, work together to create a joint version.”</p> |
| <p>Probe 3. <i>Device Journal</i></p>  | <p>“This is an individual task to be completed on any two days.</p> <p>Imagine how the devices that you and your family use experience everyday life.</p> <p>Using <i>The Secret Life of Us</i> comic book, write about the experiences you imagine them to have by filling in the blank pages.</p> <p>Do not share or discuss your comic book entries.”</p> |

Probe & Interview Study Plan

My novel approach to probes involved deploying them in a way that enabled a combination of individual and collective responses to be captured from each set of parents. To do this, I introduced the probes to each set of parents, together, during eight semi-structured opening interviews. On the other hand, I decided to conduct 17 semi-structured closing interviews with each parent on their own, in which to review their probe responses. As well as ensuring that we captured their different perspectives, this decision was made with an expectation that it would encourage parents to be more candid during discussions.

Feedback from participants of Study One had confirmed that it was necessary to ensure parents, especially those working full-time, would not perceive that participating in this probe and interview study would be too demanding or disruptive. Thus, the study was limited to around 14 days and activities and interviews were designed to accommodate their busy schedules. The deployment plan shown in Figure 4 is taken from **Publication III**.

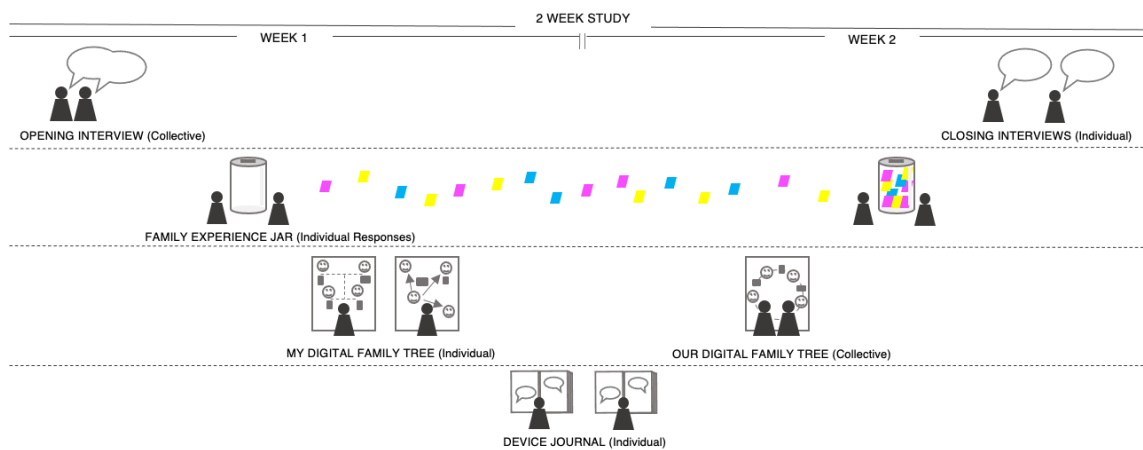


Figure 4. Study Two: Probe Deployment Plan

While Study Two provided an opportunity to develop methodological knowledge about designing and using probes, its ultimately objective was to help explore parents' experiences of family technology use. I now go on to describe how Study Two was designed to surface theoretical findings. Later, I will return to provide details about how the methodological findings of Study Two were surfaced by analysing probe and interview data.

3.2.3 Study Two | Theoretical Focus: Parents' Individual Perspectives

The second (and theoretically-focused) phase of Study Two responds to the research question that emanated from the findings of Study One:

RQ3 How does family technology use within families contribute towards conflict in parents' relationships?

It involved teasing apart parents' individual perspectives on technology use and exploring any resulting conflict in their relationships. This method has been well documented by **Publications II, III & VI**. Here, I summarise the method and provide additional details about the recruitment, interviewing and analysis processes.

Probe & Interview Study Participants

I had set out to recruit participants for Study Two in parallel to designing and producing my probe materials. Three participants had already taken part in Study One and volunteered to continue participating in this research with their family members. A further five sets of parents were recruited through the network of schools and community groups used during Study One. To summarise, Study Two engaged with eight sets of parents, which translated to a total of 17 participants (S2P1-S2P17). One set of parents included a mother (S2P15), grandmother (S2P16) and aunty (S2P17) of three children, who all lived together and shared parenting responsibilities. All participants had at least one child under the age of twelve years (inclusive). Participants held a range of occupations and a broad spectrum of outlooks and experience of technology. Participants were also ethnically diverse. Participant details are presented in **Publication III** (see Table 5).

Opening Interviews

At the start of the study, I held eight opening interviews to introduce the probes to each set of parents. Each semi-structured in-home interview was designed to last around 60 minutes and in some cases continued for an additional 30 minutes with participants who voluntarily agreed for me to stay longer. I defined the opening interview protocol to develop an initial sense of the broad context, attitudes, and aspirations that each set of parents held, with a focus on technology and how it was used within the family. At the same time, I was hoping to elicit initial clues about the individual perspectives of each parent and relationship dynamics. During these interviews, each parent was asked to introduce themselves and their family. Then, to describe how technology tends to be used within their family's everyday life, especially in relation to their routines, values, aspirations and expectations. Finally, the collection of three probes were introduced, with an explanation about how and when they should be completed. I emphasised whether or not that probe activity was to be completed individually, or collectively, and whether responses to it would need to be kept private or to be shared between parents.

I explained that I would make contact towards the end of the 14 days and arrange to collect completed probes before the closing interviews. I also encouraged parents to ask if they were unclear about the instructions and offered that they could contact me if needed during the study.

As I conducted these opening interviews, I iteratively revised my instructions to address questions that previous participants had asked about completing the probes. Opening interviews were audio recorded and I also took handwritten notes that included observations about hesitations, interruptions, facial expressions, and body language. The final protocol for the opening interview, which included the probe instructions, can be found in Appendix 3.7.

Closing Interviews

At around Day 14 of the study, I held 17 closing interviews with each parent on their own, which were designed to last around 60 minutes each. This interview was intended as a researcher-participant co-exploration to make sense and to reflect, retrospectively on their responses to the set of probes. Closing interviews provided me with an opportunity to seek clarifications of certain responses that I had found interesting when reviewing the completed probes. I defined an initial semi-structured interview protocol that aimed to prompt parents to further reflect on their experiences of how technology is used within their family. After collecting and reviewing completed probes from each set of parents, I amended this protocol before meeting with them individually to discuss their responses. As I conducted closing interviews, I iteratively analysed my data using an open-coding approach and iteratively revised my protocol to accommodate emerging themes.

I ended each of my closing interviews by asking parents to reflect on their overall experience of participating in the study and especially of completing the probes. This question provided an opportunity to collect important feedback from participants about my novel method, that I could consider when critically reflecting on my approach and its effectiveness. To participants, who were only aware of the theoretical focus of my study, this question was only intended to appear as an appreciative signal that the session was concluding. As with opening interviews, closing interviews were audio recorded and I took handwritten notes that also included observations about hesitations, interruptions, facial expressions, and body language. The final closing interview protocol can be found in Appendix 3.8.



Figure 5. Study Two: Photos of three of the eight sets of parents who participated (with their children and devices used within the family)

Qualitative Analysis of Probe & Interview Data

The qualitative analysis of probe and interview data in Study Two involved two distinct phases. The first phase had a methodological focus aimed at critically reflecting on my process of adapting the design and use of probes and examining how effectively this novel approach had helped to capture and tease apart the individual perspectives on technology use that exist within sets of parents (addressing RQ2). The second phase aimed at surfacing theoretical insights into how family technology use could contribute towards conflict in parents' relationships (addressing RQ3).

My novel approach of capturing and comparing a combination of individual and collective responses from each set of parents also introduced an additional level of complexity into the data analysis process. This complexity stemmed from attempting to view each participant at once as an individual and as part of a set of parents. In practice, it involved preparing and viewing the data in various ways; (i) as individual responses representing 17 participants (ii) as collective responses representing eight sets of parents (iii) as individual responses within a certain set of parents.

Data preparation

All interviews were automatically transcribed using an online transcription service. I verified these transcriptions for accuracy and included initial annotations from my handwritten interview notes. Once I had collected the completed probes, I converted them into a format that could be easily reviewed. Doing this involved me identifying the responses that belonged to each parent and scanning them so they could be stored and accessed digitally. Examples of completed probes, interview transcripts and excerpts from codebooks are provided in Appendices 2.4 - 2.9.

Second phase of data analysis: focusing on methods

I embarked on a first phase of thematic analysis with a methodological focus on understanding how probes can be used to explore the individual perspectives on technology use that exist within sets of parents (RQ2). To do this, I conducted iterative coding on all probe responses and interview transcripts to develop three code books with categories and example responses/quotations that related to RQ2:

RQ2 What guidance can help researchers who embark on the use of probes to explore technology use within families, particularly the individual perspectives of parents?

In response to RQ2, I first sought to understand how the probes had been completed by participants and to complement my own reflections on how effective it had been to use *Making Design Probes Work* (Wallace et al. 2013) to guide the design and use my set of probes. I

initially took a ‘probe-by-probe’ approach to analysing how participants had responded to the probes, rather than on attempting to understand the actual experiences that they described. Then, I considered each participants’ written responses to set of probes, to help determine the extent to which three probes had worked together, as intended. Finally, I analysed participants’ responses to the final interview question, which asked them to reflect on their experience of completing the probes. I iteratively coded all written probe responses and the responses to the final interview question. I developed a code book with categories and example responses/quotations. My supervisors and I discussed the codes together using example responses/quotations. Codes were used as the basis to develop themes. These themes are presented in **Publication II** (see also 4.2.3).

I then responded to RQ2 by focusing on how my novel approach to designing and using probes had been effective at exploring the different individual perspectives on technology use that exist within sets of parents. The novelty of my approach was underpinned by trying to design and use probes to capture a combination of individual and collective responses. So, I considered the data as originating from eight sets of parents, and compared the individual responses within each set. For each set of parents, I also compared their individual and collective responses to the Digital Family Tree probe.

Finally, I responded to RQ2 by reflecting on how particular probe design tactics had helped to explore parents’ differing perspectives on their family’s use of technology. I began by extending my previous analysis to identify the specific attributes of my probes were especially helpful at revealing the more surprising insights into parents’ perspectives on family technology use. In practice, this involved comparing the responses that each of the 17 participants had made at each stage of the study; in opening interviews, when completing probes and in closing interviews. I also re-reviewed data, in which I had identified contradictions in the individual responses of a set of parents.

I iteratively coded all probe and interview responses and developed a second code book with categories and example responses/quotations. Final code categories included: comparison confirms alignment between parents (to me), comparison reveals uncertainty/lack of awareness between parents (to me), comparison reveals misalignment between parents (to me), participation confirms alignment to participant(s), participation reveals uncertainty/lack of awareness to participant (s), participation reveals misalignment to participant(s). Again, my supervisors and I discussed codes together using example responses/quotations. These codes were used as the basis to develop two sets of themes that enabled me to contribute further guidance, including on how to adapt the method so it could be used to explore multiple individual perspectives within families and social groups (see **Publication III** and **IV** in Chapter 4).

First phase of data analysis: focusing on theory

The second phase of data analysis had a theoretical focus on understanding how technology use within families can contribute towards conflict in parents' relationships (RQ3). I concentrated on responses that revealed differences in parents' attitudes and approaches towards family technology use, that had been identified in the first (methodologically-focused) phase of analysis. I also extended this analysis in search of responses that indicated that parents' relationships were being impacted. I iteratively re-coded all probe and interview responses and developed a third code book with categories and example responses/quotations. Final code categories included: differing attitudes towards technology use, differing parenting values, differing parenting roles, differing technology practices, indications of tension (disapproval, frustration, jealousy etc.) and explicit conflict (arguments, disagreements etc.). Once again, my supervisors and I discussed the codes together using example responses/quotations. These codes were used as the basis to develop two sets of themes.

The first set of themes helped to describe the various ways in family technology use could give rise to tension and conflict between parents, and how this could play out within family life. My analysis confirmed that two sets of parents had been especially candid when describing their disagreements about how technology was used within their family, something I observed while conducting the interviews. Thus, I drew on the responses of these two sets of parents when presenting this data in **Publication V** (see also 4.3.3). The second set of themes helped to identify four aspects of technology use that often serve as a source of conflict between parents. These are presented in **Publication VI** (see also 4.3.4). Detailed documentation of the artefacts relating to Study Two can be found in Appendix 3. This includes examples of completed probes and interview transcript coding.

3.2.4 Study Three: Proposing Designs to Prompt Parents in Interviews

This closing study aimed at addressing the final research question of this thesis:

RQ4 How could the design of future technologies help improve parents' experiences of family technology use?

This study was designed to conclude my research by responding to the findings that had emerged from my earlier studies. These findings had demonstrated that parents' experiences of family technology use were problematic. In particular, that tension and conflict can arise in parents' relationships because of the way in which mobile devices are used during family time.

To explore how technology design might help to address these problematic experiences, I took inspiration from the way in which critical research practices (e.g. speculative design (Durrant et al. 2009) and design fiction (Blythe 2014) create design proposals for the purpose of

probing into the ideas and values that they envision. Specifically, I held interviews with 14 parents, to capture their reflections on four scenario-based storyboards (Rosson & Carroll 2009).

My storyboards depict design proposals that reimagine new ways in which collocated family members could interact with, and through, mobile devices. These proposals evolved from design workshops involving 12 professional user-experience (UX) designers. By sketching the proposals as storyboards, they served as interview stimuli and prompt parents to imagine, reflect on, and discuss how their experiences and relationships might benefit from the proposed ideas within each narrative.

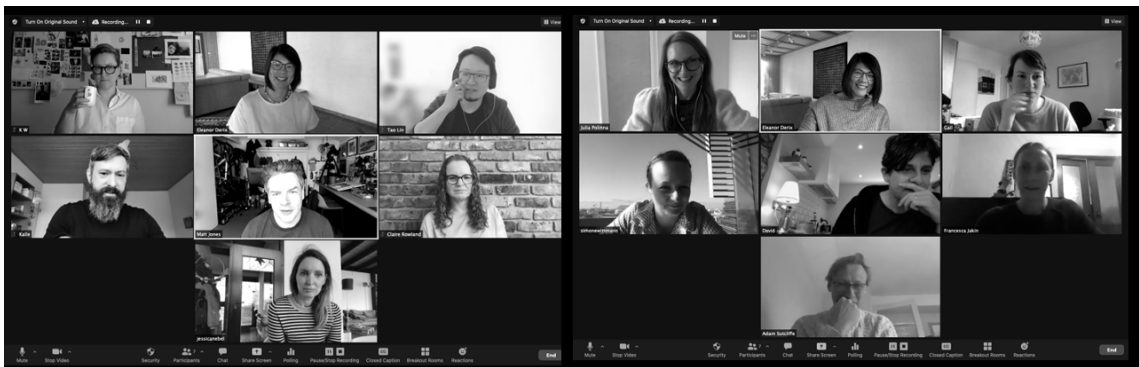


Figure 6. Study Three: Screenshots taken during each of the two design workshops

Workshops to create scenario-based storyboards

I recruited 12 professional UX designers to take part in one of two design workshops. Six designers participated in each workshop, which were held remotely due to COVID-19 restrictions. The aim of my workshops was to develop between three to four design proposals that reimagine the design of mobile technologies used in family homes. I began by introducing the designers to my research topic and the findings of my previous studies. Emphasis was placed on the problematic ways in which mobile device use within families can affect parents' experiences and create conflict in their relationships. I then challenged them to propose technology-based solutions aimed at addressing this.

Both workshops followed the same format, informed by well-established idea generation methodologies commonly used within design practice (e.g., frogDesign 2021; IDEO 2021). My extensive experience as a UX researcher/designer meant I was very familiar with using these methodologies and facilitating similar workshops. Having previously worked with all of the participating designers, I was confident of the value that they each would contribute. All 12 have spent 10-20 years working on digital design projects at companies, including Google, IBM and Microsoft Research. They also all have experience of generating speculative design proposals through insight-driven ideation workshops. To prepare for the workshops, I sent the designers a presentation summarising my research context and objectives. I used Zoom as my video conferencing platform (see Fig. 6), and Mural as my remote collaboration environment. After introductions, I guided the designers through four key activities:

Activity 1 – Initial Ideas (20 mins)

Designers used virtual notes to post short descriptions of initial ideas onto a shared board. I placed various captioned images around the periphery of the shared board that served as prompts to consider three different categories:

- challenge areas (e.g., *Conflict between parents who monitor each other's device use*)
- opportunity areas (e.g., *Helping parents by designing for self-control*)
- design triggers (e.g., *Gamification*)

In each workshop, over 30 initial ideas were generated during this activity.

Activity 2 – Idea Grouping (10 mins)

This activity lasted 10 minutes and resulted in seven groups of ideas that shared similar features. (e.g., *Proximity Alerts* and *Shared View*).

Activity 3 – Scenarios (20 mins)

Designers worked in groups of three to develop two themes into annotated scenarios. They were provided with 'Idea Card' templates (see Fig. 7) and asked to include a sketch, title and description of various aspects (e.g., *How would it work?* and *How would it benefit parents?*). I also asked them to consider the potential challenges and limitations of each proposed scenario.

Activity 4 – Discussion (10 mins)

Designers presented their scenarios to the group during a discussion.

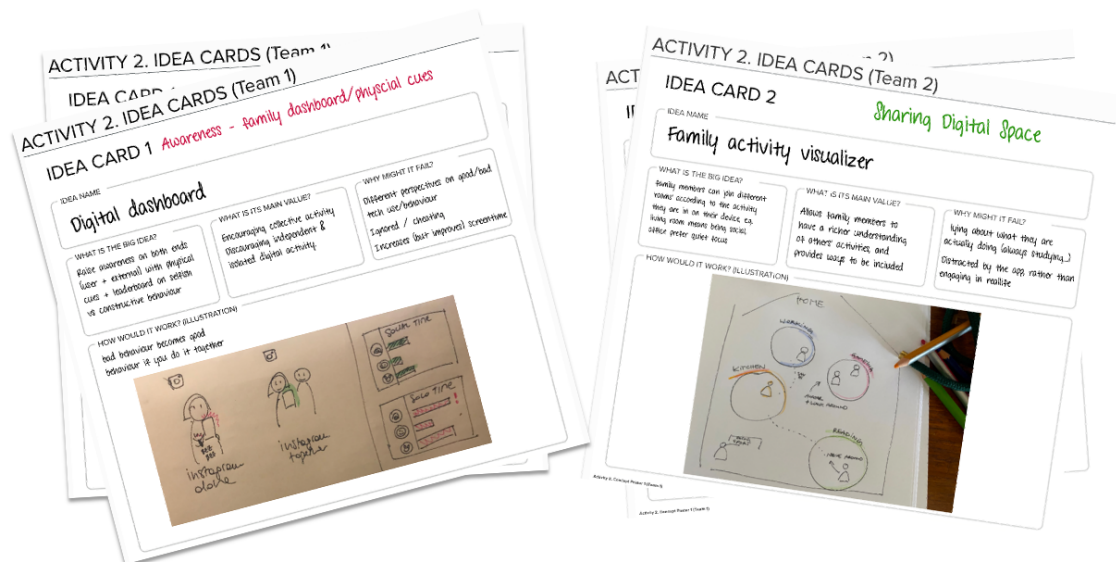


Figure 7. Study Three: Examples of idea cards produced during the design workshops

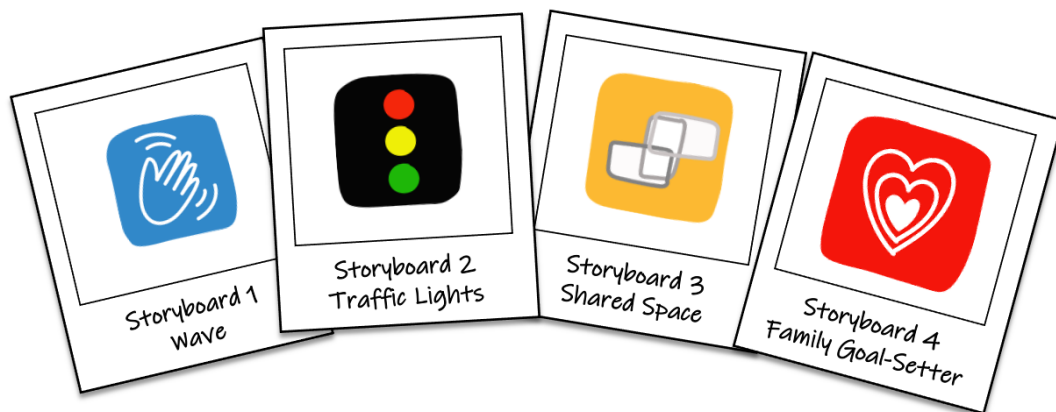


Figure 8. Study Three: The four design proposals resulting from the design workshops

A total of eight scenarios resulted from my two workshops, which I then reviewed and distilled into four interaction design proposals. This was done by considering similarities, and how well they each met the design brief. I also considered plausibility. Since my objective was to prompt parents to imagine and reflect on how they might benefit from the proposals, I wanted to minimize the risk of them becoming confused or distracted by questioning technological feasibility. Thus, I decided to couch each proposal as a mobile application that, once installed, enables new features and device capabilities. I expected that parents would be familiar with, thus comprehend, this notion.

I then sketched each design proposal as a scenario-based storyboard comprising 9-14 scenes. I consulted with a professional communication designer who provided guidance on storyboard development as well as the style and fidelity of my sketches. My storyboards were to be used as interview stimuli; prompting (and probing) parents to imagine, reflect on, and discuss how these design proposals might improve their experiences and relationships. To ensure that the design proposals were understood as rough and incomplete ideas, I chose an annotated, comic style that broadly communicated *what* they allow users to do, but without detailing *how* (Rosson & Carroll 2009). Each of my four storyboards demonstrates the use of a design proposal within a family (comprising two parents and two young children) by highlighting the main steps and key features involved. Here, I provide a brief description of each storyboard and the example sketches that originally appeared in **Publication VII** (see Fig. 8). Complete storyboards are included in Appendices 4.3 - 4.6.

User-Scenario Storyboards

Storyboard 1 – Wave

The first storyboard describes *Wave*, an application to help collocated family members remain more aware of one another while using their mobile devices. Wave is designed to do this by displaying icons of family members who are nearby on the user’s screen, after a set period of

device use. These icons initially appear as faint avatars, which become more prominent over time, by growing larger, bolder and eventually ‘jiggling’ to gain the user’s attention. Various options allow families to determine when, and how, these icons appear, as well as the different ways in which users can respond to them. By helping family members to remain more aware of each other, *Wave* also aims to encourage families to discuss and agree on how much attention they wish to pay to devices during family time. This storyboard includes a scenario, in which a parent is reminded by *Wave* to curb their mobile phone use when family members are nearby.

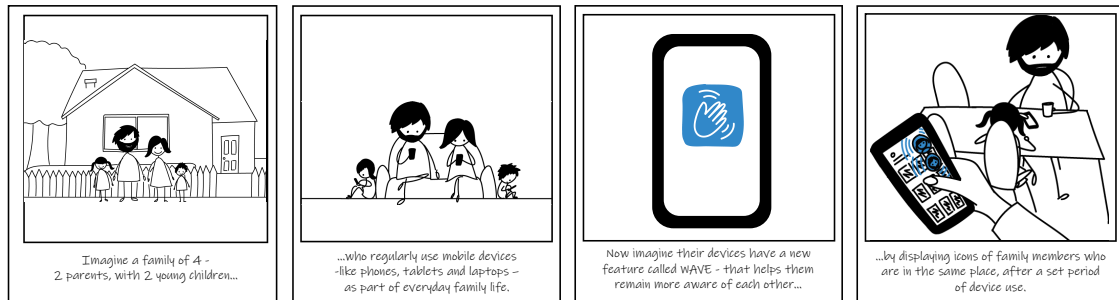


Figure 9. Study Three: Examples of the scenario sketches used to present Storyboard 1 'Wave'

Storyboard 2 – Traffic Lights

The second storyboard shows the use of *Traffic Lights*, an application to help collocated family members gauge how ‘busy’ or ‘available’ one another are when using mobile devices. It does this by displaying colour-coded icons on the users’ screen, that indicate the ‘availability status’ of family members who are using devices nearby. *Traffic Lights* offers a range of options for how family members set their status. For example, by selecting a status colour when unlocking a device, or by assigning status colours to applications (e.g. email) or times of day (e.g. evenings). Thus, *Traffic Lights* tries to help family members to understand how available they are to each other, while maintaining a level of privacy around precisely what a device is being used for. By providing this level of awareness, *Traffic Lights* also aims to encourage families to set intentions around everyday device use. This storyboard includes a scenario in which a parent uses *Traffic Lights* on their phone to ascertain how ‘busy’ their family members are on their devices, without disturbing them.

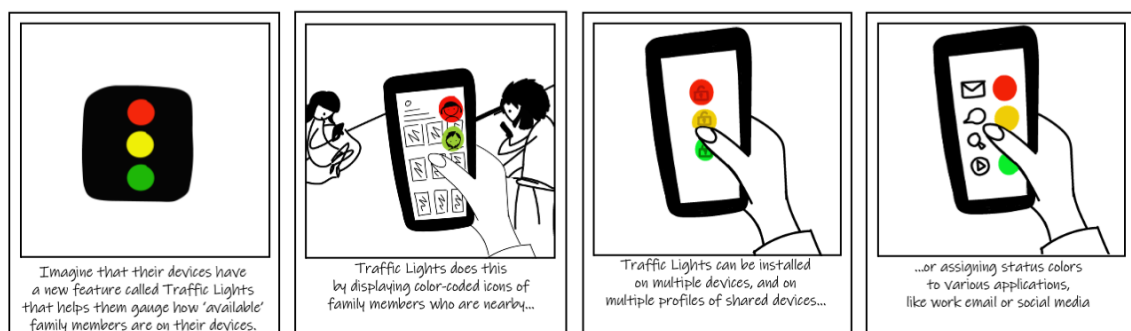


Figure 10. Study Three: Examples of the scenario sketches used to present Storyboard 2 'Traffic Lights'

Storyboard 3 – Shared Space

The third storyboard depicts *Shared Space*, an application to help increase collocated family members’ awareness of what mobile devices are being used for. It tries to do this by allowing multiple family members to easily and simultaneously make their individual screens visible to each other via a large, shared display (e.g. smart table or TV). *Shared Space* also allows family members to make their screens visible to each other’s mobile devices. Families can decide when, and how, their screens can be shared. For instance, to limit sharing during certain times, or between particular devices. *Shared Space* attempts to encourage communication and collaboration within families by offering them more transparent experiences of device use. This storyboard includes a scenario in which a parent and two children can see, and engage with, what each other are using mobile devices for while sitting together at a smart table.



Figure 11. Study Three: Examples of the scenario sketches used to present Storyboard 3 'Shared Space'

Storyboard 4 – Family Goal-Setter

The fourth storyboard envisions *Family Goal-Setter*, an application to help parents integrate technology use into everyday life in a way that aligns with their family’s values and aspirations. It aims to do this by encouraging families to set intentions for physical and digital activities that can be tracked over time. It allows both individual and joint activities to be tracked. It also displays everyone’s progress on individual devices, and on shared displays. Doing so aims to foster motivation by serving as a reminder and promoting a sense of teamwork. Families can also choose to aim for shared rewards (e.g. accessing a movie) and to avoid shared penalties (e.g. Wi-Fi break). This storyboard includes a scenario, in which family members discuss and set their goals together and view their progress on a shared display mounted on a smart fridge.

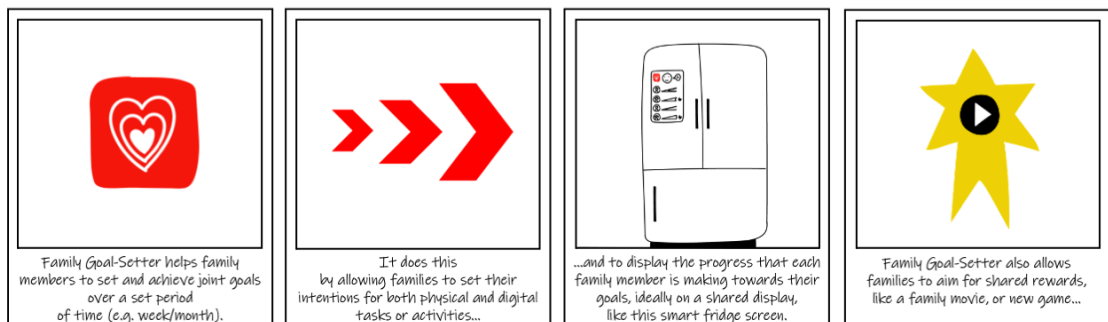


Figure 12. Study Three: Examples of the scenario sketches used to present Storyboard 4 'Family Goal Setter'

Interviewing parents about the storyboards

During interviews, I used my storyboards to prompt parents to consider, and reflect upon, how new ways of interacting with technology might improve their experiences of managing mobile device use within family life. 14 parents participated in semi-structured interviews, which each lasted between 40-60 minutes and were conducted remotely using Zoom (see Fig. 13) due to COVID-19 restrictions. I took video and audio recordings of each of the 14 interviews.

Of the 14 parents who I interviewed, 9 had volunteered to continue after participating in Study Two. I recruited a further 6 parents through the same network of local primary schools and community groups as I had used in earlier studies. All 14 parents had at least one child between one and twelve years old, and shared parenting responsibilities with another adult with whom they lived. Parents had between one and four children, ranging in age from one to 16 years. On average, parents had 2.3 children, with a median age of seven years. Parents were aged between 37 and 55, with a median age of 42. Five described themselves as fathers, and nine as mothers. While all 14 participants lived in Australia, seven identified as being of non-Australian heritage.

I defined a semi-structured interview protocol which began with a short summary of my research context and introductory questions relating to attitudes around family technology use. I then explained to participants, that I would be showing them four storyboards that each depicted a design proposal, or ‘concept’ being used within a family. I anticipated that the term ‘concept’ would be more familiar and easier to understand for my participants, than the term ‘proposal’. Yet, I emphasised that my storyboards were not descriptions of fully developed designs, but rather suggestions of alternative ways in which mobile devices could be used within families. I also highlighted that I was interested in how they imagined parents’ experiences and relationships would be shaped by these design proposals, and that their feedback was not informing concept development.



Figure 13. Study Three: Screenshots from the 14 interviews held with parents

I manually animated each of my storyboards by narrating a sequence of scenario sketches presented in PowerPoint. While this format created a similar experience to viewing a video, it enabled me to pause and respond to questions from participants, who I invited to interrupt with questions at any time. This format also made it easy for me to iteratively adapt my narration over the course of the 14 interviews, based on participants' contributions. After presenting each storyboard, I confirmed whether participants felt that they understood what was being proposed. I then asked them to explain what they perceived to be positive and negative aspects of the proposal they had been shown. These questions were intended to be easy to answer and encourage parents to start sharing their opinions. I hoped this would create opportunities for initial lines of enquiry and serve as an 'icebreaker' before I then asked questions designed to prompt deeper, more focused reflection on how each proposal might improve parents' experiences and relationships.

When all four storyboards had been discussed, I asked participants which of the four design proposals they imagined would best improve parents' experiences of managing mobile device use within the family, and which would be most helpful at alleviating the conflict that family technology use can create between parents. Lastly, I asked them if they had any additional contributions to prompt participants to confirm, or re-consider, their initial responses to the individual proposals. These final questions also provided me with opportunities to identify additional lines of enquiry and to interrogate responses more deeply.

Qualitative Analysis of Interview Data

All interviews were automatically transcribed using an online transcription service. I verified these transcriptions for accuracy and included initial annotations from my handwritten notes that I had taken during interviews. I took an inductive approach to develop codes (Wertz 2014) from this data, using NVivo software. I read through each interview and noted codes, which were then independently reviewed by my supervisors. I then discussed these codes with my supervisors and created an initial set of themes. Since I aimed to establish an understanding of how we might improve parents' experiences of managing family technology use, my primary focus was on participants' positive responses to each of my storyboards. This led to the identification of three design approaches, that parents found especially appealing. I then created a more comprehensive list of codes by collaboratively conducting another round of coding on each of these three approaches. By organising these codes into a second set of themes, I identified the main reasons why parents perceived they would benefit from these design approaches. These findings are described in more detail in Chapter 7 (**Publication VII**).

Detailed documentation of the artefacts relating to Study Three can be found in Appendix 4. This includes material produced during the ideation workshops, the full

storyboards presented to parents during interviews and coding of the interview transcripts. Having explained the methods used during this research, I now describe some of the challenges, considerations, and decisions made in the approach taken to exploring parents' experiences of family technology use.

3.3 Considerations of Exploring Parents' Experiences

Exploring parents' experiences of how technology is used within the family introduced a variety of considerations and challenges. While some of these are mentioned in Publications I and VII, this section discusses in more detail, those that applied throughout my research journey.

3.3.1 Deciding to Work with Parents of Young Children

I chose to work with parents of young children for several reasons. These include growing concerns over increasingly young children accessing technology, the importance of establishing early habits and the responsibility placed on parents (by media and wider society) to manage these concerns (Genc 2014; Livingstone & Blum-Ross 2020). My decision to focus on parents of younger children was also informed by the extensive prior research on parents' attempts to mediate teenage children's technology use (e.g., Blackwell, Gardiner & Schoenebeck 2016; Davis, Dinhopf & Hiniker 2019; Yardi & Bruckman 2011). These reports highlight complexities in parent-teen relationships and indicates that limiting the age of children being cared for by parents would lower the extent to which I would need to consider the independent outlooks, attitudes, and choices of children.

I decided that my research would only include participants who were parents of at least one child between the age of 12 months and 12 years (inclusive). This decision was based on several assumptions. Firstly, that parents of younger children assume more (or full) responsibility for determining how technology is used within the family. After all, parents are legally required to provide consent for children aged 12 and under to open online accounts (Commissioner 2022). That parents of younger children are required to manage most (or all) of their children's activities and schedules since younger children tend to demand more time, attention, and physical contact. Also, that parents of younger children would be less practiced at establishing expectations around family technology use, and at juggling their own needs with those of their children's. Lastly, that parents of younger children would inherently have a greater awareness of the way in which parenting had impacted the way in which they perceived technology use in general.

Being a parent of young children provided me with an implicit awareness of some of the factors that might encourage or inhibit parents from participating. In addition, it provided an informal network of parents who offered further insights into what I should consider when attempting to recruit participants for my studies. A primary consideration is that parents of

young children often find it difficult to commit to volunteering their free time. Family life is busy and juggling the demands of caring for young children can result in unpredictable schedules. In addition, parents might still be adjusting to the efforts and responsibilities entailed in the transition to parenthood. Furthermore, I was acutely aware that the parents I sought to recruit would likely be juggling their parenting responsibilities with professional commitments (i.e. day jobs), especially given the relatively high costs of living in Sydney and other Australian cities, especially with respect to childcare. Thus, it followed that my research design would have to appear both engaging and flexible in order for parents to volunteer their time.

Determining research sites and participants

Being a parent provided me with a familiarity of parents' contexts that helped in various ways during this research. For instance, when seeking to recruit parents of young children to participate in my studies, I was already aware of many of the constraints to consider. This awareness enabled me to judge the amount of investment that I could expect from participants, thus helping me to accurately plan and prepare for each empirical study. In practice, this translated into decisions about when and where to hold the exploratory workshop, the level of engagement required by participating in my probe and interview study and how to address parents' concerns and challenges of participating during the COVID-19 pandemic.

I found that being a parent also helped in my efforts to recruit participants. Firstly, it provided access to an informal network of schools and community groups who kindly offered to distribute my request. Secondly, I found that being a parent allowed me to establish a sense of camaraderie with potential participants that seemed to not only encourage them to participate, but to engage more candidly and willingly in the research. Indeed, after each study I received overwhelmingly positive feedback from parents, with some even volunteering to participate in further research and to help recruit their family members and friends.

3.3.2 A Holistic Approach to Understanding Parents' Experiences

Related work reviewed in Chapter 2 highlighted a need to take a more holistic approach when attempting to examine the problematic experiences that parents might associate with family technology use. This is because existing HCI efforts tend to be limited in their focus. For instance, either exploring the use of technology by parents (e.g., Gibson & Hanson 2013) or by children (e.g., Plowman, McPake & Stephen 2008), or examining the use of specific devices, including mobile phones (e.g., Hiniker et al. 2015) and social networking sites (e.g., Morris 2014), in certain situations like mealtimes (e.g., Chen et al. 2019; Ferdous et al. 2015), or studying particular family practices such as technology rules (e.g., Hasan, Mondal, Ahlström, et al. 2020; Hiniker, Schoenebeck & Kientz 2016). The range of digital technologies used in

today's family homes is increasingly broad and the situations in which they are used are increasingly diverse. Thus, I intended to take as holistic an approach as possible when setting out to explore how these broad and diverse contexts of technology use are shaping parents' experiences.

This holistic approach meant being inclusive of any and all of the experiences that parents associate with the way in which devices are used within the family. Thus, this research set out to not only consider parents' experiences of their own technology use, but also how their experiences are shaped by their children's use. Parents' experiences of using technology with their children were also of interest. In effect, it aimed to consider any and all situations across everyday family life in which technology use impacts on parents' experiences.

3.3.3 Using Probes to Explore Parents' Individual Perspectives

The findings from Study One indicated that technology use within families can shape, and in turn, be shaped by parents' relationships. Moreover, it revealed that disagreements over how technology is used within families could contribute towards tension and conflict in parents' relationships. I recognised that exploring parents' different perspectives would introduce additional challenges and considerations. Primarily, it would require a novel approach that considers parents not only as individuals, but also as part of a set. To challenge matters further, parents may not be fully aware of their own attitudes and assumptions relating to technology, let alone of each other's. So, my method would also need to be capable of encouraging parents to reflect on experiences that might seem unremarkable within the habitual technology use of everyday family life. Lastly, parents might also be embarrassed to share details about family conflicts. Therefore, I anticipated the significant challenge of encouraging sets of parents to reflect on their own experiences of technology use, and on each other's.

The tactical ways in which I addressed these challenges through the design and use of probes is detailed in 3.2.2 and Chapter 5. In addition, I also addressed them by anticipating and responding to any awkwardness and difficulties that might arise while engaging with participants, especially during interviews. I realised that some participants might question the relevance that some of my lines of enquiry had to technology use. Thus, I pre-emptively reassured participants that seemingly unrelated questions were designed to help me understand parents' broader values and contexts and how these might influence their experiences of technology use. I also encouraged participants to ask if they were uncertain about the relevance of a certain question and emphasised that they were not obliged to answer any of my questions if they did not feel able or comfortable doing so.

In addition, I drew on my experience of conducting interviews to explore challenging subjects that could be perceived as awkward, embarrassing and even taboo. These include researching experiences of trauma, grief, financial difficulties and using personal hygiene

products. My approach involved being sensitive to participants' responses throughout the interviews. This included observing their body language and even hesitations. It also meant attempting to astutely 'read the room' to know whether to wait or to press for more information, when to build or diffuse tension, and when to simply move on. Once again, being open about being a parent myself seemed to help reassure some participants that they could open up, since we were "in the same boat". Occasionally, participants assumed or sought reassurance that I had experienced similar challenging, embarrassing or undesirable issues within my own relationship and family. I tried to respond encouragingly, while ensuring that the discussion remained focused on their experiences.

3.3.4 Ethical Considerations of Exploring Parents' Experiences

I conducted all the studies in this research in accordance with the University of Technology Sydney's Human Research Ethics Committee, under the approval number ETH17-1811. I collected information and signed consent from all participants before embarking on each study. All participants provided me with their signed permission to publish their anonymised data, including images of their probe responses. I also ensured that I collected signed permission to use any photos of participants and their family members in publications and presentations. The raw data collected across this research is only available to me and my supervisors, who are bound by the same ethics protocol.

I regularly discussed the ethical considerations of my work with my supervisors, lab-partners and when presenting each of my publications at various conferences. In addition, I offered reassurance to the participants of what I was doing and why. As described, I encouraged participants to ask if they had any uncertainties about any aspect of the research and emphasised their right to decline to participate in any activity at any stage.

A specific ethical issue was presented by Study Two, which sought to examine the differing perspectives within sets of parents and explore how technology use could contribute towards conflict within parents' relationships. The primary challenge was in identifying differences in parents' individual perspectives and surfacing insights into conflict in parents' relationships, in a way that did not introduce any additional negative impact to my participants or their family members. In an attempt to address this, I ensured that participants fully understood which of their responses would be shared and which would be kept confidential. This included ensuring that participants' responses from closing interviews were kept confidential.

In addition, I used several techniques to ensure participants' felt comfortable about the information they shared with me. For instance, explicitly explaining that my purpose was not to judge, but to listen, and that I would not consider any opinions or actions they described to be

‘incorrect’, ‘wrong’ or ‘shameful’. It also meant reading and responding to participants’ cues that they sought some form of reassurance from me, about the experiences, feelings, or situations that they described. As mentioned above, this meant responding as a researcher at times and, at others, as a fellow parent. It also involved me employing various techniques to help avoid participants feeling embarrassed or uncomfortable and to diffuse tension. For example, using analogies and humour to scaffold conversations to help shift participants’ perspectives (as described in 5.6).

This chapter has focused on describing the methodological approach and considerations of this research. The following three chapters present each of the three studies by compiling the seven published papers that originally reported on their findings.

CHAPTER 4

Study One

CHAPTER 4. Study One: Establishing an Initial Understanding of Parents' Experiences of Family Technology use

This chapter presents Study One by including **Publication I**, before summarising the findings from this initial study and explaining how they influenced the trajectory of subsequent studies.

4.1 Introduction to Publication I

To present Study One, I include an edited version of **Publication I** *Days of Our Lives: Experiences of Family Technology Use*, which was published in the *Proceedings of Australian Conference on Human-Computer Interaction* in 2018. This publication reports on how Study One addressed the following research question:

RQ1 What types of experiences do parents commonly associate with family technology use?

This research question arose from my initial literature review, which highlighted calls for more holistic/complete understandings of how technology use affects family life (Isola & Fails 2012). In particular, this review revealed a need for deeper, more nuanced understanding of how parents' experiences are shaped by the way in which they (parents) and their children interact with technologies during everyday family life. This is in contrast to studies that tend to focus either on parents or children's use of specific technologies including smartphones (e.g., Hiniker et al. 2015) and social networking sites (e.g., Morris 2014), or that concentrate on certain situations like mealtimes (e.g., Chen et al. 2019; Ferdous et al. 2015) or practices such as technology rules (e.g., Hasan, Mondal, Ahlström, et al. 2020; Hiniker, Schoenebeck & Kientz 2016).

The workshop was planned as a precursor to a subsequent probe and interview study. Specifically, the workshop was considered as an opportunity to build relationships with parents and learn about their everyday contexts. Investing in such a step before embarking on the design and use of probes is recommended by Wallace et al. (2013) in *Making Design Probes Work*, an account of their extensive experience using the method.

While this workshop was not solely focused on capturing parents' problematic experiences, the initial review of related literature suggested that it might be valuable to understand these in more detail. Indeed, the most fervently discussed topic was parents' ongoing struggles to reconcile their reliance on and enjoyment of technology use, with their concerns around the potential harmful impacts that might come from their use – and especially overuse – within the family. This paper discusses four complex experiences that parents commonly associate with family technology use.

4.2 Publication I

Days of Our Lives:

Family Experiences of Digital Technology Use

Derix, Eleanor Chin & Leong, Tuck Wah

First published in the Proceedings of Australian Conference on Human-Computer Interaction OzCHI '18. Melbourne, Australia.

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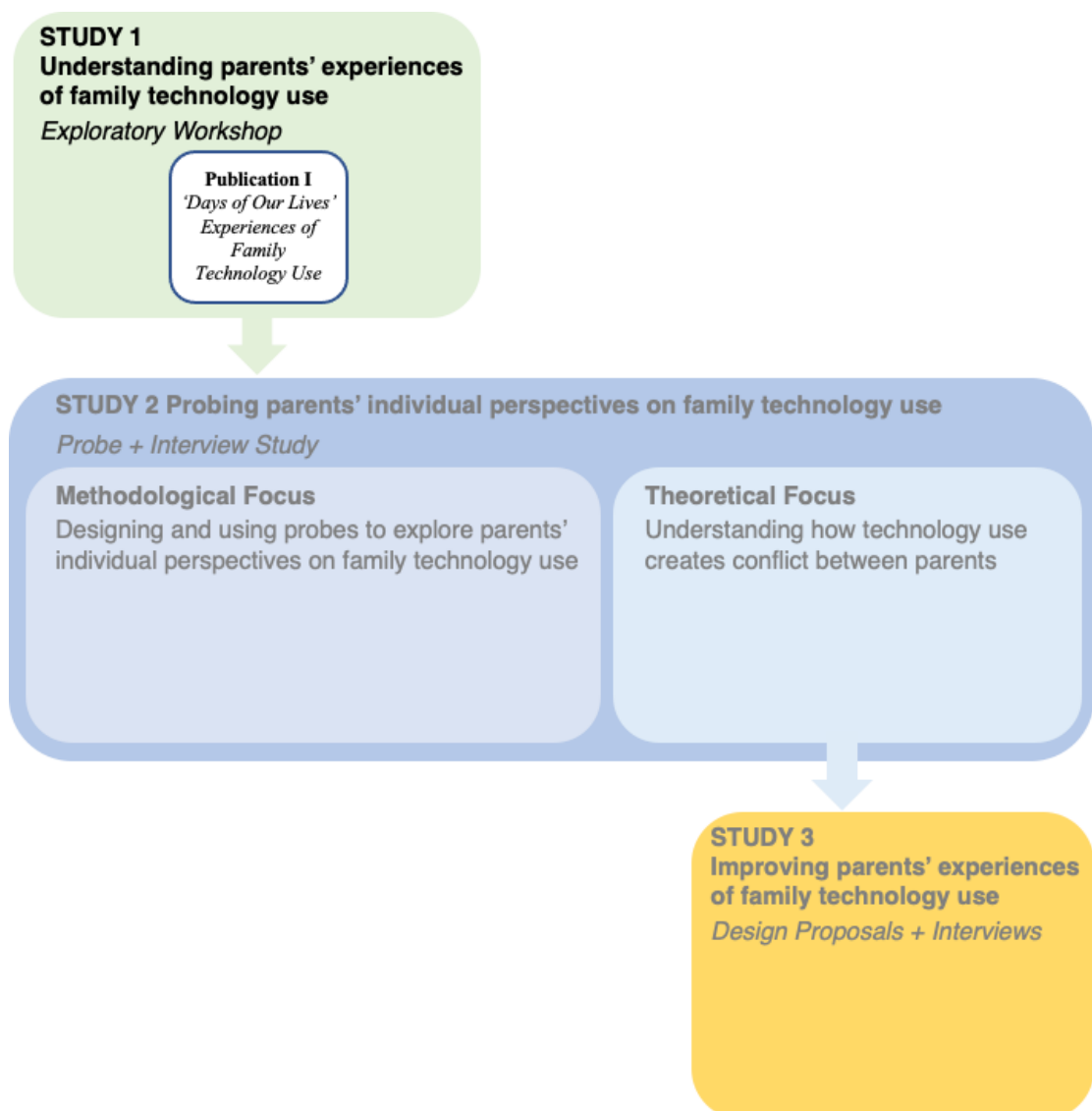


Figure 14. Position of Publication I within the context of the three empirical studies

4.2.1 Introduction

HCI research into the pervasive use of technology in family life has shown how digital technology has affected the minutiae of family life. Digital technologies, such as smartphones and tablets, have become a mainstay of today's families. The proliferation of mobile devices has blurred the work and home lives of parents (Mazmanian, Orlikowski & Yates 2013; Plowman, McPake & Stephen 2010) and they are increasingly relied upon to manage prosaic aspects of domestic life (Harper, Rodden, Rogers, et al. 2008). Even the use of touchscreen devices by toddlers and babies has been normalized (Hourcade et al. 2015; Morris 2014). Meanwhile, debates and uncertainty endure over how the presence and use of these devices are affecting aspects of family life (Boyd 2014; Vandewater et al. 2005b).

Amidst the profusion of digital technologies into families and uncertainties regarding its effects, many researchers have urged for a deeper understanding of the ever-evolving experiences of family technology use (Fails et al. 2012; Hertlein 2012; Hiniker, Schoenebeck & Kientz 2016; Toombs et al. 2018). This will be more critical, with the emergence of Internet of things (IoT) and voice-user interface (VUI) devices that are set to join the current device ecosystems of family homes. These emergent technologies amplify uncertainties over issues such as privacy, security and ownership, further complicating family experiences (McReynolds et al. 2017; Morante, Costa & Rodriguez 2016; Schiano et al. 2016).

It is against such a backdrop that we sought to explore how today's families are experiencing their digital technology use. As we will explain in Related Work, efforts to date have tended to limit their focus to particular family members or specific family practices or activities. Our workshop sought to capture a broader view of how digital technology is incorporated and experienced in all aspects of everyday family life. The aim was to establish an initial understanding of family experiences of digital technology use, and to surface productive directions for future research.

4.2.2 Related Work

As digital technologies have increasingly become part of the home and families (Harper, Rodden, Rogers, et al. 2008; Livingstone & Helsper 2007), HCI researchers have explored how digital technology can support family practices, relationships and experiences. One common approach in HCI involves the design and introduction of (novel) digital technologies to try to improve certain aspects of family life. These interventions include video connections to enhance experiences of families communicating over distance (Judge, Neustaedter & Kurtz 2010b), a location-aware clock to improve experiences of home coordination (Brown, Taylor, Izadi, Sellen, Kaye, et al. 2007), and even technologies to enrich experiences within intimate relationships (Grivas 2006). While many seek out opportunities to exploit digital technologies to

support practices and experiences in families, there are others who warn that digital technology use within today's families is problematic (Toombs et al. 2018; Vandewater et al. 2005b).

There are suggestions that the pervasive use of technology in childhood can be detrimental to child development (Boyd 2014; Kardaras 2016), and that parents' prolific use of technology reduces their ability to attend to the needs of their children (Vandewater et al. 2005b). Unsurprisingly, paediatricians and psychologists have weighed into these claims. For example, the American Academy of Pediatrics issued screen-time guidelines, associating use in early childhood with greater risk and recommending age-dependent limits (AAP 2018). Meanwhile, psychologists report on how technology-based interruptions, or 'technoference', negatively affect family relationships, and associate parents' device use with problematic behaviour in young children (McDaniel & Radesky 2018a). Amplified by mainstream media (Davies 2017; Kardaras 2017), such reports fuel widespread uncertainty amongst laypeople around the effects of technology use in families (Boyd 2014). Some in HCI are trying to understand this apparent 'darker side' of technology use in the family (Blackwell, Gardiner & Schoenebeck 2016; Hiniker et al. 2015; Hiniker, Suh, et al. 2016; Mazmanian & Lanette 2017; Palen & Hughes 2007).

To address concerns over excessive use in childhood, efforts have been made to explore the implementation of parental controls and family technology rules. Research into the effect of rules on relationships and experiences has tended to focus on specific activities, such as video gaming (Rosenwald 2017) and Internet use (Livingstone & Helsper 2008). Since the widespread adoption of touchscreens, an initial focus on adolescents has expanded to include technology use in early childhood (Goh, Bay & Chen 2015; Hiniker, Suh, et al. 2016; Vandewater et al. 2005b). Research into controlling childhood technology use tends to consider a parent's role as the guardian of their child's technology use. A prominent exception is Hiniker, Schoenebeck & Kietz's (2016) work on technology rules that also considers the role of parents as technology users. This found that both parents and children struggle to comply with rules, leaving all family members desiring more attention from one another when in each other's company. The authors call for further work to explore contextually appropriate use of technology within families.

The role of parents as users of technology has received increasing attention in recent years. Palen & Hughes' (2007) study found mobile devices enabled 'remote mothering' and shifted family members' sense of 'home' as a place. The affordances of mobile devices have since expanded far beyond telephony. With Facebook's first teenage users now maturing into parents, mothers have become the fastest growing demographic of social media users (Moser, Schoenebeck & Reinecke 2016). In turn, researchers demonstrate a growing interest in parents' use of technology, particularly of social networking sites (SNS) (Ammari & Schoenebeck 2015; Gibson & Hanson 2013; Kumar & Schoenebeck 2015; Trujillo-Pisanty et al. 2014; Turkle 2016). These studies reveal that while considering their own technology use, parents'

experiences remain governed by their responsibilities as parents and the need to consider their child. For instance, parents report negative emotional experiences, including guilt, when using their smartphone whilst caring for their children at public playgrounds (Hiniker et al. 2015). Parents also describe struggles to consider issues such as child privacy, when deciding what information to share about their child online (Ammari et al. 2015).

In summary, our review of related work in HCI found that efforts tend to limit their focus to the technology used by parents (Ammari & Schoenebeck 2015; Balaam et al. 2013; Hiniker et al. 2015; Kumar & Schoenebeck 2015; Trujillo-Pisanty et al. 2014; Turkle 2016) or by children (Blackwell, Gardiner & Schoenebeck 2016; Boyd 2014; Morris 2014; Porcheron et al. 2018). As Isola & Fails (2012) note in their literature survey of technology use in family, very little work explores technology use by the family as a whole; recommending that future work should adopt a more holistic view of family. The limited research that does consider technology use by both parents and children tends to focus on specific situations, such as mealtimes (Davis, Ferdous & Vetere 2017; Ferdous et al. 2015), certain devices, such as mobile phones (Palen & Hughes 2007) and home assistants (Read et al. 2018), and particular practices, such as rules to restrict family technology use (Hiniker, Schoenebeck & Kientz 2016; Mazmanian, Orlikowski & Yates 2013). However, the range of digital technologies used in families today is broad and increasingly growing; often used by all members of the family. Given the uncertainties that surround the effects of technology use on family experiences, we need to develop more nuanced understandings of how technology is used by families as a whole, especially within the complex and messy nature of everyday family life. As a first step towards this goal, we conducted a workshop with parents of young children, to understand their experiences. The workshop was granted ethics approval from the University of Technology Sydney.

4.2.3 Method: Workshop with Parents

The activities of the two-hour workshop were informed by our review of related literature. This included ways to explore how digital technology is experienced by all family members, which devices were typically used, when, where and why. Importantly, we explored participants' feelings towards these experiences, as well their perceptions of how their family members felt.

Workshop participants

The workshop consisted of 11 parents from ten Sydney households with ethnically diverse backgrounds. These parents, of children ranging between 9 months and 9 years old, had varied technological expertise and a broad spectrum of technology outlooks – from self-proclaimed 'futurists' to those declaring they were cautious and apprehensive (Table 3).

Table 3. Study One: Workshop participant details

| Participant | M/F | Age | Relationship Status | Employment Type (Full/Part-Time/Home Duties) | No. of children (age) |
|-------------|-----|-----|---------------------|--|-----------------------|
| S1P1 | M | 38 | Married | Architecture (FT) | 2 (3,<1) |
| S1P2 | F | 36 | Married | Architecture (PT) | 1 (2) |
| S1P3 | F | 42 | Widowed | Planner (FT) | 3 (8,7,5) |
| S1P4 | F | 40 | Single | Pharmacist (PT) | 2 (6,3) |
| S1P5 | F | 30 | Married | Home Duties (HD) | 3 (5,3,<1) |
| S1P6 | F | 37 | Married | Marketing (PT) | 2 (3,1) |
| S1P7 | M | 52 | Married | Marketing (PT) | 2 (9,6) |
| S1P8 | M | 33 | Married | Project Manager (FT) | 3 (5,3,<1) |
| S1P9 | F | 47 | Married | IT (FT) | 2 (6,2) |
| S1P10 | F | 35 | Single | Child-Care (PT) | 1 (9) |
| S1P11 | M | 40 | Married | Home Duties (HD) | 2 (8,6) |

Workshop activities & data

The workshop began with an Icebreaker introduction exercise to capture an overview of technology attitudes and practices. Three activities followed. Each activity required a worksheet to be completed individually, before parents discussed their responses with the group.

The first activity asked about *Positive Technology Experiences* in family life. The second activity, *Love/Hate*, explored issues of ambivalence. Participants were asked to consider family experiences of digital technology use that were felt to have both positive and negative aspects. The final activity, *That's Not OK*, asked about family experiences with technology that were felt to be negative or inappropriate. We provided participants with picture cards, which were intended to serve as inspirational prompts. During the first two activities, these depicted a range of prevalent digital technologies (e.g. smartphones, home assistants etc.). During the third activity, various family contexts of technology use were shown (e.g. families making a video call together, parents trying to remove a device from a child etc.).

Audio and video recordings of the workshop were transcribed. Thematic analysis (Moon, Kim & Shin 2016) was used to analyse the transcripts and the completed activity sheets. This produced different pertinent themes, which we will describe next.

4.2.4 Findings: "It's Complicated"

Despite the group's diverse backgrounds, common themes emerged. Participants described a wide range of experiences: positive, negative and those in-between. We highlight four prominently discussed experiences that reveal the complicated nature of family life. Whilst they are discussed separately, the experiences are interlinked, shaping and influencing each other.

Experience 1: Apprehension

Participants described how their attitudes towards digital technology had changed since having children, with most having become more apprehensive. This was put down to two main factors. Firstly, concerns over potential adverse effects on children's social, emotional or physical development, as a result of excessive or inappropriate technology use in childhood. Secondly, considerations of children's privacy, safety and identity ownership. These factors contribute to feelings of uncertainty that parents have regarding family technology use. For example, S1P1, a father of two young kids whose work involves digital technology explained,

"it (is) weird...I'm very interested (in technology) professionally, and personally, but...I don't really know yet what I think when it come to my kids" (S1P1)

Therefore, parents are more hesitant, especially when deciding whether to adopt new technologies. For instance, S1P1's concerns over his children's privacy had so far prevented him from purchasing a VUI home assistant.

Due to these feelings of apprehension, all participants believed family technology rules were required. However, none had a clear process of setting, managing, or enforcing technology rules. As a result, participants felt unable to fulfill their expectations of themselves as parents. For example, S1P2 commented,

"So I'm quite cautious, particularly since Max has come along...we've tried to set up tech rules...but it doesn't work" (S1P2)

Participants often looked ahead, considering how they would incorporate future technologies with added apprehension. For instance, S1P6 stated,

"we are probably going into a bit of a minefield as they grow up" (S1P6).

Experience 2: Ambivalence

Although we planned to discuss ambivalent experiences during the second activity, participants already began sharing their experiences of ambivalence during their introductions. For example, S1P9, who works in IT, described her attitudes to technology,

"I'm a bit apprehensive about it, though I do love it...I'm at home mostly with the kids, and I do appreciate their appreciation of technology, so I can do the dishes or whatever" (S1P9)

She added,

"I'm enthusiastic about digital technology as a concept...but I'm not so enthusiastic about it at home" (S1P9)

Other examples of ambivalence were found as participants unwittingly later contradicted views they had shared earlier in the session. For instance, S1P6, began the session by describing her use of SNS as a positive experience,

“Mindless scrolling...there’s something quite therapeutic about that, just thinking about everything and nothing” (S1P6)

But towards the end of the session, she claimed,

“the time wasting of social media...I think it makes you a bit stupid and unbalanced!” (S1P6)

Ambivalence was found to pervade and to affect all of the other experiences shared by our participants.

Experience 3: Compromise

Participants worried that their family’s use of digital technology might be compromising aspects of their children’s upbringing. For instance, S1P3, who had described her use of mobile news, online shopping and online banking, as positive experiences, added,

“the flip-side, is that while its great and convenient for me, I worry that my kids are missing out...they are not coming to the bank with me, they are not learning about money...they are not seeing that I am reading the newspaper, and not playing a game...whereas I grew up seeing my parents reading newspapers and learning that they were valuable and important” (S1P3)

Interestingly, a father who had introduced himself as a ‘*technologist and futurist*’ stated,

“I prefer to take (the kids) shopping with me for the real experience...its actually some time that we get to spend together” (S1P7)

Questions were also raised over the individual and curated nature of online experiences. For instance, a mother of three complained,

“...how individually tailored it all is, particularly with my kids. They get used to, ‘Well, I want to watch MY things’, and I have 3 kids all wanting to watch separate things...(my concerns are about) them learning to...share and...do things collectively as a group” (S1P3)

She also questioned how her children’s access to online knowledge might be altering her role,

“I get a bit sick of (technology) being right all the time. You used to be the fountain of all knowledge, now they’re like ‘No Mum, you’re wrong’. I used to be able to con them on lots of things! Now they can look it up, so they don’t have that relationship with you anymore” (S1P3)

Experience 4: Conflict

Disagreements over device use were cited as a major source of negative experiences with technology. Whilst disputes between parents and children were mentioned, the differing approaches between parents were more vehemently discussed. S1P5 presented herself as *“lenient”* whereas, she stated, *“my husband is very strict”*

Another participant explained,

“My wife is very strict, so there is a conflicting approach, which is tough on the kids” (S1P9)

Parents explained that conflict between parents and children could escalate when parents held differing parenting attitudes towards their children’s technology use. Parents also disapproved of each other’s behaviour, such as S1P9’s condemnation of her wife’s habit of shopping online while at the dinner table, *“I can’t stand it!”*, she declared.

Internal conflict was also discussed, mainly by mothers, who admitted being unable to adhere to their own rules. For example, when discussing negative experiences, S1P3 explained,

“my big (rule) that’s not OK, is screens in bed, but then I end up doing the same thing in bed once they’re asleep, and very often they are asleep with me in my bed while I am secretly watching!” (S1P3)

S1P5 also reflected on her ability to stick to her own rules,

“putting my phone before my children’s needs...I’m guilty of all of this, I can’t even read this, I feel bad...I’m sitting there on my phone. I should be able to put it aside for the kids” (S1P5)

Meanwhile, S1P6 referred to her past behaviour,

“Breastfeeding my child and checking my phone...that was the time you should be talking to your child. So (I felt) conflicted as I was always doing that” (S1P6)

S1P6 also said that she found managing family technology use to be harder than any other parenting issue. S1P9 concurred,

“it’s so prevalent, you deal with it as it comes up but it’s everywhere ...it’s about everything you do” (S1P9)

4.2.5 Discussion

Our participants’ stories reveal the complicated nature of parents’ felt and lived experiences with technology within the messiness of everyday family life. This builds on previous reports

into the complexities of technology use within everyday family life (Livingstone & Helsper 2008). In particular, our participants' experiences were strongly shaped by their family values. The values that emerged from these stories included togetherness, privacy, freedom and parental responsibility. The value that was discussed most by our participants was togetherness. Given the constraints of this paper, we will focus on togetherness, to discuss how family values shape experiences.

Our participants generally describe family life as busy. Parents repeatedly express a desire to spend 'family time' with partners and children, in which to share a sense of togetherness. As such, technology use that promotes togetherness is described as a positive experience. In contrast, technology use that diminishes togetherness is described as a negative experience. For example, S1P3 enjoys the convenience of online shopping and banking, as she feels it enables her to spend more time with her family. On the other hand, S1P9 dislikes her wife's habit of shopping online during family mealtimes, as she feels it reduces togetherness.

People's values drive their behaviour (Harper, Rodden, Rogers, et al. 2008) and even an individual's decision on whether or not to adopt and use certain technologies (Leong & Robertson 2016). However, our findings reveal a more complicated situation of 'values in action' in family life. This is because all individual family members contribute to putting shared family values into action. However, individual values might not always align. In order to establish shared family values, individual values need to be communicated and negotiated. Prior research has explored experiences of conflict between parents and children associated with technology use (Blackwell, Gardiner & Schoenebeck 2016; Hiniker, Suh, et al. 2016). Stories from our workshop also reveal recurrent conflicts of values between parents, with regards to technology use. Conflicts arise when parents' approaches to children's technology use differs, or when they disapprove of each other's technology use. More attention is paid to a partner's use of technology in situations when children are present. Additionally, parents experience internal conflict when their own use of technology disregards rules that they have enforced on family members. We are not aware of any prior work exploring the range of conflict experienced within families as a result of technology use.

The presence and use of technology in families can create conflicts in values. Our participants' reports of ambivalent and compromised experiences highlight the extent to which a particular use of technology can promote certain family values, whilst simultaneously undermining others. It is possible for compromises to only become evident over time, such as when parents perceive a lag in their child's development. It might also be that individual family members benefit, at the expense of others. An example of this can be seen in S1P5's admission of '*putting my phone before my children's needs*'. This leads to attempts to balance individual values with shared family values. This can become complicated, especially since parents are both users of technology and guardians of their children's technology use. Parents attempt to

restrict their own use of technology, in order to prioritise the needs of their children.

Researchers have shown that parents limit their device use at times when children are present, such as mealtimes (Moser, Schoenebeck & Reinecke 2016) or at children's playgrounds (Hiniker et al. 2015). For some of our participants, they have gone further and their prioritisation of family values has led to them deliberately opting out of using a specific technology that they enjoy as an individual. For example, parents who avoid online banking or shopping and instead physically take their kids to the bank or supermarket, in order to teach them about certain aspects of money or food. In fulfilling their parental responsibility, these parents forgo their desire for convenience.

Family values govern how experiences of technology use are evaluated, yet the ways in which family values are put into action can vary between families. Though guided by the same family value, different families adopt different family practices. So, while several participants used online shopping to free up time to support togetherness, others felt that a trip to the shops with their kids was, in fact, an opportunity for togetherness. Research into ageing individuals' values has described how people's values are dynamic, open to negotiation and change over time to best fit in with their new and changed life circumstances (Leong & Robertson 2016). This resonates with the stories we heard, revealing that people's attitudes towards technology change when they become parents. While researchers note parents' concern over different aspects of technology use (Ammari et al. 2015; Blackwell, Gardiner & Schoenebeck 2016) and are increasingly exploring the use of technologies, such as SNS, by new parents (Gibson & Hanson 2013; Trujillo-Pisanty et al. 2014) we have not found research that explicitly describe how values and attitudes change as individuals transition into parenthood. Nor have we found any explorations of how family experiences of technology change over time. However, we found that any rules and boundaries associated with technology use need to be continually revisited, renegotiated and even revised as children become older. This need is furthered by the availability, adoption and incorporation of ever-new devices into family life.

In addition, we discovered emergent associations between primary caregivers and their experiences of family technology use. In our workshop, most primary caregivers were mothers. They confessed to having a more lenient parenting approach to technology, compared to their partners who were described as strict. All the stories we heard of internal conflict, guilt and regret resulting from family technology use were from mothers. This possibly hints at influences of gender with regards to values pertaining to technology use. After all, the approach of mothers and fathers to particular aspects of technology use has been found to differ (Ammari et al. 2015). These differences require parents to discuss and negotiate certain aspects of technology use. We certainly encourage more sensitive and considered work to better understand if and how gender roles affect family values in action, and resulting experiences of family technology use.

In closing, we must qualify that our study was constrained to a short workshop with 11 participants. Nevertheless, it provides a glimpse into the complicated experiences of today's family experiences of digital technology, including the uncertainties regarding adverse effects on children. This paper also offers an emergent understanding of how these experiences are shaped by people's values. Our findings strongly suggest that the design of future technologies, intended for use by families, would benefit from deeper, richer, and more nuanced understanding of how family values are established, negotiated, change over time, and are put into action with regards to technology use. Through this, we might design technologies that are more supportive of family values, and desired experiences.

(End of Publication I)

4.3 Findings from Study One

Study One contributes to a more holistic understanding of family technology use by capturing an initial and broad view of the types of experiences with which parents commonly associate it. This exploratory workshop confirmed that parents' experiences of digital technology use within families are often complex. Despite perceiving many benefits of digital technology use, parents are concerned about the negative effects that it might have on family and child development. In particular, parents fear that device use tends to disrupt interactions between family members and thus prevents a sense of togetherness from developing between them.

Parents' experiences and the value of 'togetherness'

The discussions between the parents who participated in Study One highlight the value that parents place on 'togetherness' within the family. Moreover, parents' experiences of a particular use of technology are determined by whether or not they perceive it to support or threaten this value of family togetherness. When asked to consider positive experiences of digital technology use, almost all the parents who attended the workshop described situations in which family members were engaged in a shared activity together, such as watching a family movie.

The importance of 'togetherness' was also raised by parents who described the use of digital services that allowed them to routinely conduct tasks remotely (such as online shopping and online banking) as positive experiences because of the additional time they perceived it allowed them to spend with their family. However, several parents shared their concerns that, by avoiding the in-person experiences of such activities, they might be depriving their children of picking up skills that would traditionally have been modelled to children by their parents when families spend time together.

Parents' complex experiences of family technology use

While parents acknowledge that digital technologies provide a range of intended benefits (convenience, connectivity, entertainment, education etc.), they most ardently discussed the struggle of reconciling immediate, short-term and individual benefits with concerns around the potential negative impacts that might come from their use – especially overuse - within the family. These impacts included delaying child development and disrupting family dynamics. Four experiences emerged from these discussions that reveal the complicated nature of integrating technology use within family life. These complex experiences are; *apprehension, ambivalence, compromise and conflict*.

My initial literature review had prepared me to hear participants voice concerns over children's technology use and the resulting disputes between parents and children. However, I

was surprised by the extent to which parents compared their attitudes and approaches towards family technology use with that of the other parent in their family. Furthermore, participants' responses indicated that conflict can also arise in parent's relationships when they struggle to align their individual perspectives on family technology use.

4.3.1 Implications of Study One

The insights surfaced through Study One revealed a gap in our understanding of family technology use and a need to explore parents' individual perspectives on family technology use. Specifically, to explore how these individual perspectives are communicated, negotiated and might contribute towards conflict in parents' relationships. The impact of technology use on parents' relationships appears to have been considerably overlooked by prior work in this space, with an overwhelming focus on parent-child dyads. In fact, existing efforts into understanding parents' experiences of technology use tend to ignore the collaborative, co-operative nature of parenting. Instead, they adopt over-simplified ideas of parenting, in which decisions around technology practices are either assumed to be reached unanimously or to be made by one parent in isolation.

Study One was originally conceived as a way of developing an initial understanding of parents and their context of everyday family life, to inform the design of a subsequent probe and interview study into parent's experiences of family technology use (Study Two). The theoretical insights surfaced during the workshop evidenced that Study Two would need to engage with sets of parents - rather than considering individual parents in isolation – in order to explore how they communicated and negotiated possibly differing attitudes and approaches on family technology use.

Study One also enabled me to establish trust and relationships with participants. In fact, several participants not only volunteered to take part in Study Two, but also convinced friends and family members to do so. So, investing in Study One not only established the need to conduct a probe and interview study that would focus on exploring parents' individual perspectives on technology use, but it better equipped me to do so.

When considering how to go about designing and using probes to explore the findings of Study One in more detail, an opportunity transpired to also generate methodological understandings during Study Two. These methodological understandings are addressed by Chapter 5 and the theoretical findings of Study Two are then described in Chapter 6.

CHAPTER 5

Study Two

Methodological Focus

CHAPTER 5. Study Two I Methodological Focus: Probes to Explore Parents' Individual Perspectives

This chapter presents the methodological focus that transpired during Study Two, when designing and using a novel probes to explore parents' individual perspectives on family technology use. In fact, these probes were intended to examine indications that had emerged from the findings of Study One about the conflict that could arise between parents who have differing individual attitudes and approaches on family technology use. The theoretical understandings developed by this two-week probe and interview study are described later (in Chapter 6). Meanwhile, this chapter concentrates on explaining the methodological knowledge that Study Two helped to surface, when addressing the research question:

RQ2. How can probes be designed and used to explore parents' individual perspectives on family technology use?

This research question arose as I considered how to approach Study Two and reviewed the way in which probes had previously been used, especially when working with families. This review surfaced two main methodological issues. Firstly, despite probes being a well-established method with which to support research with families (Boucher et al. 2018), I was unable to find examples in which probes had been employed to capture and tease apart the differing individual perspectives of multiple family members. Instead, research had tended to use probes to capture responses from a single 'representative' family member, or to seek collective responses from the whole family. Thus, I recognised that in Study Two, I might need to adapt (and seek to balance) these more conventional approaches to the method.

Secondly, I discovered concerns about misinterpretation and misuse of the method, due to a lack of actionable guidance on how to design and use probes (Boehner et al. 2007). Since I had already been referring to *Making Design Probes Work* (Wallace et al. 2013) for advice, I realized that designing and using a novel set of probes in Study Two presented an opportunity to explicate and extend existing guidance on the method.

The methodological knowledge established during Study Two has been reported across three publications (**Publication II, III & IV**):

- **Publication II** *Towards a Probe Design Framework*, published in the *Proceedings of Australian Conference on Human-Computer Interaction* in 2019, where it was awarded Best Paper. This paper reflects on my process of using *Making Design Probes Work* (Wallace et al. 2013) as a framework, when considering the design and deployment of the probes developed during Study Two. In doing so, it also distils, explicates and develops this framework.

- **Publication III** *Probes to Explore the Individual Perspectives on Technology Use that Exist within Sets of Parents*, published in the *Proceedings of the Designing Interactive Systems Conference* in 2020. This paper describes the adapted approach to designing and using probes that I used to engage sets of parents during Study Two. In particular, it reflects on how this approach effectively helped to capture and tease apart parents' individual perspectives on how technology is used within the family.
- **Publication IV** *Tactics to Explore Parents' Differing Perspectives*, published in the *Proceedings of the Nordic Conference on Human-Computer Interaction* in 2020. This paper focuses on specific design tactics that were implemented within the probes used in Study Two. Specifically, it reflects on how they helped in overcoming some of the challenges involved in exploring parents' differing perspectives and in uncovering conflict in parents' relationships.

After presenting these three publications, this chapter concludes by summarising the methodological findings of Study Two.

5.1 Introduction to Publication II

The first paper that I include to describe the methodological focus of Study Two is **Publication II**. This publication describes my attempt to use *Making Design Probes Work* by Wallace et al. (2013) to guide the design and deployment of three novel probes. In their paper, Wallace et al. (2013) provide detailed accounts from their extensive experience of designing probes and using them with participants. I found it to consist of two main types of guidance. First, descriptions of four probe design properties (*openness/boundedness*, *materiality*, *pace* and *challenge*) and examples that demonstrate how these properties can be affected by taking certain design decisions. The second type of guidance explains how to consider and involve participants when designing probe studies.

This paper explains how the accounts of probe use within *Making Design Probes Work* were distilled and translated into more generable advice on how to use the method. It then reflects on the effectiveness of this attempt to use *Making Design Probes Work* as a probe design framework by considering the responses that were captured from eight sets of parents during a two week probe and interview study. Finally, this paper extends the framework by providing additional considerations for designing and using probes to explore individual perspectives within families.

5.2 Publication II

Towards a Probe Design Framework

**Best Paper Award*

Derix, Eleanor Chin & Leong, Tuck Wah

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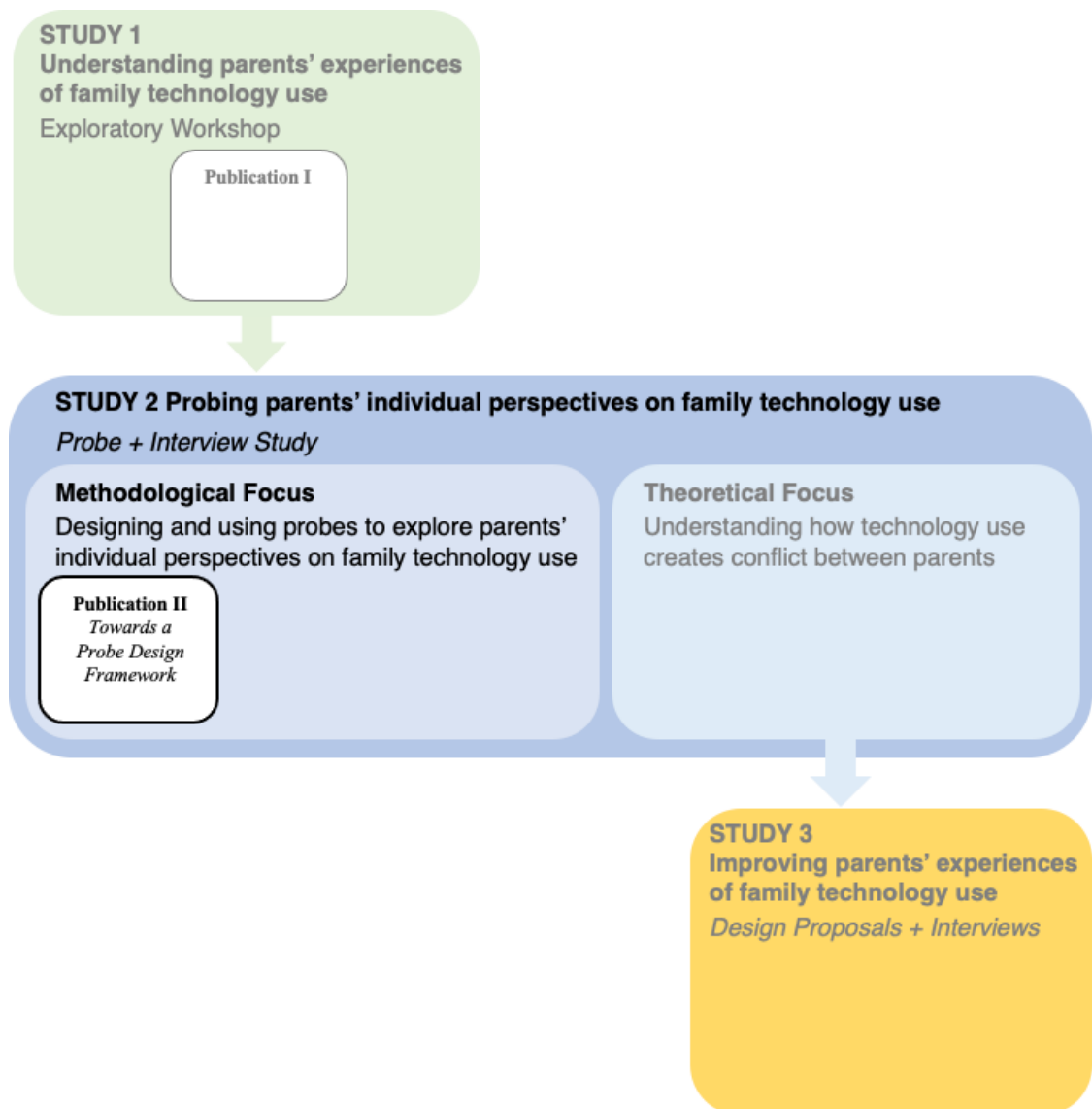


Figure 15. Position of Publication II within the context of the three empirical studies

*NB. This publication shares some similarities with **Publication III & Publication IV** (which also report on the methodological findings of Study Two) and with **Publication V & VI** (which report on the theoretical findings of Study Two).*

5.2.1 Introduction

This is a methods paper that contributes to current understandings of how probes can be designed more thoughtfully and strategically, to support user research in HCI. More specifically, it describes how we utilized Wallace et al.'s (2013) framework that guides probe design and use, to help inform our decision-making when developing a set of probes of our own. We reflect on our probe design process, and on how our research participants used the probes, to ascertain the usefulness and effectiveness of this framework. This leads to suggestions and insights as to how this framework could be extended and tested, so as to be more helpful to HCI researchers. This contribution is especially valuable in supporting (budding) researchers and designers contemplating probes as a method; offering a more structured and strategic way to think about the decisions taken when designing and using probes. After all, these decisions can impact how deeply participants engage with probes, the quality of their responses, and their overall sense-making of these designed objects of inquiry.

The need to develop a set of probes came from our research, which explores the complex experiences associated with family technology use. In particular, we were interested in capturing the different individual perspectives held by parents within the same family (Derix & Leong 2018). We planned to supplement a series of in-home interviews with probes as a means of encouraging participants to reflect on aspects of routine technology use that are often overlooked within the messiness of everyday family life. When reviewing the literature on probes, we found many publications describing probes, but that only Wallace et al.'s (2013) paper went some way to providing comprehensive 'guidance', in the form of a framework. So, we were interested in exploring the usefulness of this framework to guide us in designing the probes for our research project.

Our review of related work will unpack some of the debate and concerns around probes, especially regarding the lack of clarity about the method itself. We also discuss the availability of design guidance offered within the literature on probes, in particular the one presented by Wallace et al. (2013). We then describe how we operationalized this framework to guide the design and use of a set of probes. First, distilling the framework: outlining the key design properties of probes and the decisions that affect them. Second, putting the distilled framework to use as a guide to design and use of three probes of our own. The 'findings' section will be our reflections on the effectiveness of the framework to guide the design of a probe collection. We also discuss the framework's utility by considering how participants responded to using these probes. Finally, by reflecting on what we learned by using the framework in this way, we suggest refinements, extensions, and ways that the framework could be adapted and tested in future.

5.2.2 Related Work

Since their conception by Gaver, Dunne & Pacenti (1999) probes have become a well-established approach to understanding users, their behaviours, and use of technologies (Boucher et al. 2018). However, amidst this enthusiastic uptake of the method within HCI and design, concerns have been raised about the misinterpretation and misappropriation of probes. In particular, Boehner et al. (2007) suggest that this may be due to a lack of clarity on the method itself, with accounts of probe use tending to gloss over details of how they were designed. Some researchers have attempted to add clarity to the method by discussing what probes are (Boehner et al. 2007) and what they do (Berkovich 2009; Graham et al. 2007). Attempts have been made to catalogue different kinds of probes (Graham & Rouncefield 2008; Mattelmäki 2006), for instance, by topic of interest (e.g. domestic probes, urban probes etc.), desired result (e.g. empathy probes, value probes etc.) or new approaches to using probes (e.g. mobile probes, technology probes etc.) (Boehner et al. 2007). Another effort to provide clarity has been to try to determine what these different probes have in common (e.g. probes inspire, probes create fragments, probes provoke...etc.) (Graham et al. 2007). Despite these efforts, clear guidance on how to actually design probes remains elusive.

Existing probe design guidance

Most publications involving the use of probes discuss what probes are and what probes do, furthering Gaver et al.'s (2004) definition of cultural probes as “collections of evocative tasks meant to elicit inspirational responses from people”. Detailed guidance on *how to design* probes is limited. Instead, advice centres on how to approach the probe design process. For instance, in their outline of the probe design process, Hemmings et al. (2002) discuss various skills required by those wishing to adopt the method (e.g. idea generation, graphic design, model etc.) and list the phases involved (e.g. recruitment, assembling probes, deploying probes, retrieving probes etc.). However, while they highlight the need for design skills and for team discussions to generate probe ideas, they neglect to include a probe design phase in their schedule, which moves straight from “Selecting Volunteers” to “Assembling Domestic Probes”. The tendency to gloss over the design thinking behind probes is common in probe literature.

We found guidance on how to *think about* probes. For example, Graham & Rouncefield (2008) define common probe features (e.g. capture artefacts, making the invisible visible, participant as expert etc.) and their effects (e.g. humanize, create fragments etc.). Guidance is also offered on how to generate the questions being asked through the use of probes. For instance, Mattelmäki's (2006) introduction to the method suggests considering participation, before designing probes (e.g. “Who is your user?” “How long will people be involved?” etc.). In addition, the Interaction Design Studio (2018) offer approaches to prompt the ideation of probe

concepts. (e.g. “use analogies”, “ask obliquely-related questions” etc.) and provide examples of probe tools. We acknowledge that these attempts do add clarity to the method, yet we still lacked more explicit/detailed guidance about the design decisions required to develop a probe collection.

To be fair, there are a few authors who describe the thinking behind their probe designs in more detail. For example, Tsai, Orth & Hoven (2017) describe their rationale for designing Memory Probes; balancing three sets of probe properties (“familiarity–strangeness”, “definiteness–ambiguity” and “objective–subjective”). Boucher et al. (2018) also discuss probe properties (e.g. “simple and easy”, “open-ended”, “playful” and “absurd” etc.) when introducing a novel probe tool, TaskCam. However, while these reports provide insights and details into decisions taken to designing probes, these efforts are not aimed at providing general advice on taking effective probe design decisions. These occasional glimpses into differing ways of thinking and also talking about the design properties of probes further highlight a need for clearer, more consistent guidance. One exception is a paper by Wallace et al. (2013), which provides a systematic reflection on probe design decisions. One of its explicit aims is an “attempt to address the identified lacuna” – which is “the lack of accounts that describe in detail the design of probes and their use with participants”. Some have argued that this lacuna is one of the reasons why the method has often been misinterpreted and proved elusive to many.

Wallace et al.’s Framework: Making Design Probes Work

In *Making Design Probes Work*, Wallace et al. (2013) offer what they call “a framework for probe design and use” based on detailed descriptions of the design of probes and their use with participants. This salient guide, which we will refer to in this paper as ‘the framework’, focuses explicitly on the design decisions required to develop probes. It is a summary of learnings from their projects, spanning over a decade, involving the design and use of probes.

The framework in this paper consists of two types of guidance. The first is a lexicon of probe design properties; which can be used in probe design to provide “scaffolds for response”. This section also offers guidance as to how design decisions can affect certain design properties and, in turn, participant engagement and response. The second type of guidance offered in this paper is less prescriptive. It relates to supporting “relationships and reciprocity” and includes ways to best consider and involve participants when designing probe studies. To the best of our knowledge, nobody has explicitly described putting this framework to use. So, our initial aim was to ascertain the effectiveness of this framework as a guide to design a set of probes deployed in an empirical study. As mentioned earlier, this was part of our research into parents’ experiences of family technology use.

5.2.3 Method: Distilling and Using the Framework

We quickly realized that operationalizing Wallace et al.'s (2013) framework to design our probes was not a straightforward exercise. They have provided some resources and general advice but we had to first distil the various elements to make it useful.

Distilling the framework

As we mentioned earlier, one set of guidance from the framework describes four probe design properties. First, *openness/boundedness* relates to how clear or vague a participant finds the question being asked by a probe, as well as what is required to complete it. Second, *materiality* relates to the physicality of the probe tool (or artefact) that might help embody the question being asked by a probe, or encourage certain types of response from participants. Finally, *pace* and *challenge* relate to the time and effort required to complete a probe.

Openness/ Boundedness:

The framework explains this property by describing the design of the probe *Self Tree*. Participants were asked to write about people in their lives on a series of oval, locket-like paper discs. This example shows how the openness or boundedness of a specific probe can be determined by both the physical dimensions of a probe tool and conceptual decisions to define a probe task. For instance, the openness of the question asked by *Self Tree* is balanced by the choice to use small paper discs that restrict the amount that can be written.

Materiality:

The framework describes how material choices, and decisions around the shape, style and finished appearance contribute to the *materiality* of a probe. The examples used to describe this design property reference relevant objects in order to invoke an intended response from participants. The use of physical metaphor is demonstrated through the example of *Home* probe, intended to capture participants' sense of home, and designed as a cardboard structure in the form of a house. More subtle references are shown through the example of *Pillow* probe and *Self Tree*. The former aims to invoke a sense of intimacy, by asking participants to write on a pillow, while the latter aims to suggest preciousness by taking the form of jewellery.

Pace:

The framework describes how probes can be designed to encourage faster responses from participants. In particular, they describe breaking a probe task up into smaller chunks that participants perceive as being more completable. The example of *Top Trumps* probe is described, in which the request for participants to describe objects that are significant to them is broken down into smaller activities by using six playing cards.

Challenge:

The framework highlights the need to offer probes that offer space for deeper reflection on certain topics or to tease out issues that are more difficult to express. It describes how probes designed to do this often present participants with higher levels of challenge. As an example, it uses the design of the probe *Communication Fairytale*, a short storybook that creates an imaginary scenario and enables participants to express complex ideas (such as how they feel loved) as one of the characters. These more imaginary scenarios remove the restraints of what is possible and instead afford freedom from inhibitions and realities. This prompts participants to reflect from fresh perspectives.

By discussing their own probes, Wallace et al. exemplify how different design properties can be put to use. So, we had to first analyse and interpret the various design guidance in relation to the specific probes described. We then distilled this set of guidance into a more structured (and more generally applicable) set of design direction, by mapping each of the probe design properties to corresponding design decisions (see Table 4). As we did this, we noticed that probe design properties can relate to probe tools (i.e. artefacts) and/or probe tasks (i.e. activities). *Materiality* tends to relate to the artefact, while *pace* and *challenge* tend to relate to the task and *openness/boundedness* often relates to both.

Table 4. Study Two: Distilling the Framework to describe Probe Design Properties

| Probe Design Property | Design Decision |
|----------------------------------|--|
| <i>Openness/ Boundedness</i> | <i>Scale:</i> e.g. provide small vs. large physical boundaries for response |
| | <i>Context:</i> e.g. provide real vs. imagined scenario |
| <i>Materiality</i> | <i>Materials:</i> e.g. use novel vs. familiar materials |
| | <i>Shape and Style:</i> e.g. reference familiar objects or ideas, use physical metaphor |
| | <i>Aesthetic:</i> e.g. create rough vs. polished finished appearance |
| <i>Pace</i> | <i>Speed:</i> e.g. offer the opportunity for fast vs. slow response |
| | <i>Duration:</i> e.g. offer long vs. short time within which to respond |
| | <i>Frequency:</i> e.g. offer the opportunity for single vs. multiple responses over time |
| <i>Challenge</i> | <i>Level of Commitment:</i> e.g. encourage light vs. greater effort |
| | <i>Level of Creativity:</i> e.g. encourage factual responses vs. use of imagination |

Using the framework

After analysing and distilling the guidance from the framework, we then put it to use. In general, this meant adopting the approach suggested. And when we were ready to design our probes, we used the information from Table 4 to guide our design decisions. Next, we describe the process chronologically.

Investment and trust: Building relationships

Following Wallace et al. (Wallace et al. 2013), we began with considerations for *investment* and *trust*. This means, prior to designing the probes, researchers should first build an understanding of the participants and their context to inform the design of probes. In our project, we held a workshop with parents to gain initial insights into their experiences of family technology use (Derix & Leong 2018). We then used these insights to design a collection of probes that would be given to eight sets of parents to use within a two-week study. We planned to introduce our probes to each set of parents during an in-home ‘opening’ interview on Day 1. Completed probes would be collected 10-12 days later and reviewed to inform ‘closing’ interviews planned for Day 14. We now focus on how we used the framework to guide the design of a collection of three individual probes.

Design properties: Supporting thinking about probe designs

We used the information in Table 4 to guide the design of each of our three probes. We used the four probe design properties; *openness/boundedness*, *materiality*, *pace*, and *challenge* to systematically explore different possible probe designs. We also went back to the examples provided in the framework to find inspiration and ideas for tangible alternatives. We now describe each of our three probes and explain how their design was guided by the framework’s probe properties.



Figure 16. Three Probes: Probe 1. Family Experience Jar (left), Probe 2. Digital Family Tree (centre), Probe 3. Device Journal (right)

Probe 1: Family Experience Jar

We wanted a probe that would serve as an icebreaker by encouraging participants to offer quick, regular responses and to reflect on their experiences throughout the study. We designed it as an extension of a diary, inspired by Andell et al.'s (Mattelmäki 2006) stress-relaxation container. Each set of parents are given a large clear glass jar and asked to fill it with handwritten notes that log their experiences of family technology use (Fig. 16, left). Three colours of 'post-it' style notes are provided: pink for positive experiences, blue for negative experiences and yellow for neutral or mixed experiences. We hoped that this icebreaker probe would offer participants a simple entry point into our probe collection, as recommended within the framework.

Openness/Boundedness

Since we intended *Family Experience Jar* to serve as an icebreaker, we kept both the concept of the question being asked and the physicality of completing the task bounded. The task requires little imagination or creativity to complete. The instructions are simple, and a reminder is written on the side of the jar. Providing small 'post-it' style notes limits the space on which to write about each experience. In contrast, the large number of notes we provided, and large size of the jar convey to participants that while we ask for at least one contribution per day, many contributions are welcome, if not expected.

Materiality

We intended for the *Family Experience Jar* to encourage both parents within a family to offer their thoughts and feelings on experiences of family technology use. We understood that these experiences could be both overlooked and contentious. We hoped that the final appearance of the jar would remind participants of family swear jars and piggy banks.

We chose clear glass jars usually bought as a decorative homeware item or vases, in the hope that participants would position them in visible locations in their homes. This visibility might serve to remind participants to add contributions more regularly. The jar had a cardboard lid with a small slot cut into it. Notes must be folded in order to be fit through this opening. The lid was attached to the jar with glue so, once inserted, notes could not be removed. This prevented the details of the notes being read by family members. We hoped that the privacy this affords would also encourage curiosity and further participation.

By choosing jars made of clear glass, participants could see contributions amassing over time. The visible colour of the notes inside the jar would provide an 'at-a-glance' idea of the types of experiences that had been logged. We hoped this might generate curiosity as to what other family members have contributed; encouraging reflection and further participation. We also anticipated that visible empty space would promote more participation.

Pace

We hoped that compartmentalizing this ‘diary’ task into fast-paced, high-frequency note-taking would keep participants mindful of family technology use throughout the study. We asked participants to submit at least one note per day and invited them to make additional contributions as-and-when such experiences would occur. However, it was entirely possible for them to introduce their own flexibility with this task and add notes to the jar retrospectively. We also hoped that participants would find the physical act of selecting, writing and contributing notes to the steadily filling jar more rewarding and compelling than simply completing diary entries. Since *Family Experience Jar* is intended as an icebreaker probe, we designed the task to be light-weight, requesting factual information about the realities of everyday life. It does not require much time, creativity or deep reflection. Participants were asked not to discuss contributions with each other as we hoped that this element of secrecy might introduce a sense of competition and make the activity feel more playful than completing a two-week diary.

Probe 2: Digital Family Tree

We wanted this second probe to help transition participants from the icebreaker task to a task that requires deeper reflection. We designed a mapping exercise in which participants create a family tree that would also include the digital technologies used in everyday family life (Fig. 16, centre). We asked each parent to complete an individual family tree during the first week of the study. During the second week, we asked that each set of parents compare their individual family trees and collaborate to create a joint family tree. We hoped this probe would encourage participants to think about the role that technology plays within their family and to provide us with overviews of the different ways in which each parent perceived technology to be incorporated within family life.

Openness/Boundedness

We provided participants with blank paper templates on which to complete this task; individual templates for the first part of the task and a shared template for the second. The minimalistic design of templates was intended to offer participants the freedom to interpret this open-ended task. We chose to use A3 sized paper, hoping that it would invite self-expression and creativity, yet provide clear boundaries to convey a sense of easy completability. When we piloted the use of this probe, we realized that more cautious participants might benefit from extra scaffolding to help explain the task and encourage creative-thinking. To do this, we prepared an example of a completed *Digital Family Tree* to show participants when explaining the probe activity. Since we were more interested in how participants interpreted this probe, than in accurately recording their technology use, we took this example away once participants confirmed they understood our instructions. This also reduced any risk that they might follow our example too closely.

Materiality

When preparing our example of a completed *Digital Family Tree*, we tried to follow the ‘typical’ style of family trees and hoped participants would be especially familiar with this, given the popularity of services such as Ancestry.com at the time. We attempted to keep our example unrefined in appearance to remove any concerns that participants might have over the level of artistic talent expected from them.

Pace

We offered participants flexibility over when to complete this probe. We slowed the pace of this probe by asking participants to leave time between completing the individual task and collaborating on their joint *family tree*. We hoped this lower pace would encourage reflection.

Challenge

We designed this probe to demand a certain level of creative thinking and imagination from participants, which we hoped would provide them with fresh ways of thinking. We were inspired by Wensveen’s (1999) use of anthropomorphism to design probes that prompt imaginative responses from participants, and Battarbee et al.’s (2004) probe design that encourages creative thinking by asking participants to represent domestic appliances with animals. We hoped that using the familiar notion of family trees as a physical metaphor to pose our question would support the challenge presented by this probe.

An additional challenge presented by this probe was in asking participants to compare their individual responses and to collaborate to complete a shared family tree. This demanded extra commitment and introduced the need for communication, negotiation and collaboration. We asked participants to make a note of any difficulties they encountered to help surface insights into how parents manage their differing perspectives.

Probe 3: Device Journal: ‘The Secret Life of Us’

Aspects of family technology use are often habitual and overlooked. Some are uncomfortable or even socially undesirable. We hoped that the use of this probe would provoke unexpected responses from participants by prompting them to reflect from a different point of view. To do this, we designed a comic book called ‘*The Secret Life of Us*’, in which the characters are the digital technologies most typically used within everyday family life (Fig. 16, right). This probe inverts the traditional diary by asking participants not to write about their own experiences, but to imagine how their devices experience family life and to journal from that imagined point of view. The journal entries are made by completing the comic book over the course of two days. We were inspired to design this probe by reading about the probe *Communication Fairytale* in the framework.

Openness/ Boundedness

We introduced an imagined context and used anthropomorphism to make the familiar strange. This is because we hoped to prompt participants to reflect on aspects of technology that usually go unnoticed, or aspects that they are less inclined to share with researchers, such as less socially desirable contexts. As with *Communication Fairytale*, we hoped that creating an imagined scenario would enable participants to remove themselves from the constraints of reality and to express complex ideas as a character in a story. We balanced the openness of the ideas introduced by this probe by designing it as a (literally) bound A5 comic. By using a series of empty speech bubbles to divide each page we hoped the task would seem easy to understand and more importantly, to complete.

Materiality

We hoped that the compact, playful comic design would make this probe seem approachable, despite it introducing unfamiliar ideas. We hoped the use of a cartoon style would encourage participants to respond by using their imagination and creative thinking. Specifically, we used device icons and speech bubbles to remind participants that we wanted them to give their technological devices an imagined voice. The design of this comic book was guided by the way Wallace et al. (2013) describe their probe *Communication Fairytale* as providing participants with a novel way of thinking and expressing themselves.

Pace

The aim of this probe is to provoke participants to shift their perspective and promote deeper reflections on the topic. We slowed the pace of *Device Journal* by asking participants to spend two days focusing on this activity and adding at least four entries per day. We hoped that the second day of journaling would encourage participants to recognise a wider range of experiences and any repetition. Participants are given the freedom to complete this journal over any two days during the study.

Challenge

This probe demands a high level of imagination and creative thinking and we hoped it would elicit deeper reflection by furthering the imagined context introduced by Probe 2. A relatively high level of commitment is required from participants during the two days on which they complete this. First, we asked them to introduce their character (the imagined character of a particular technology) and to describe themselves and their families, as they imagined their character would. Then we asked them to make regular journal entries that describe the imagined experiences of their character throughout the day.

When we piloted this probe, we realized that, as with Probe 2, our participants might benefit from additional scaffolding, given the levels of imagination that this task demands. We chose to support our participants in this way by providing a link to an audio clip of ‘Everything Is Alive’ (Chillag 2018), a podcast series of fictional interviews with personified everyday objects, played by actors.

Reciprocity and Communication: Probes as a Collection

Finally, the framework encouraged us to design our probes as a collection. The rationale is that probe collections should offer participants a range of channels for different kinds, types and ways to respond and reflect, to foster *reciprocity* and *communication* in the researcher-participant relationship. Our approach to designing probes was to design our three individual probes in parallel, and to step back regularly to gauge how the individual probes complement and support each other. We were also aware that altering the design of one probe might require changes to the design of another. This also meant using the different design properties (Table 4) to help vary the probes within the collection.

We found it helpful to use linear scales to represent the probe design properties (i.e., *openness/boundedness*, *pace* and *challenge*) as shown in Figure 17. Comparing the properties of our probes in this way helped us visualize the different role that each probe would serve within the collection. We could see that the relative boundedness, fast-pace and low-level challenge of Probe 1 would contribute to its role as an icebreaker. Meanwhile, the openness, slower pace and higher challenge of Probe 2 would help it transition participants towards Probe 3. We hoped the slowness, great openness and high challenge presented by this probe would enable it to encourage deep reflection from participants. We discuss the utility of these linear scales in guiding the design and use of our probes in greater detail in our findings.

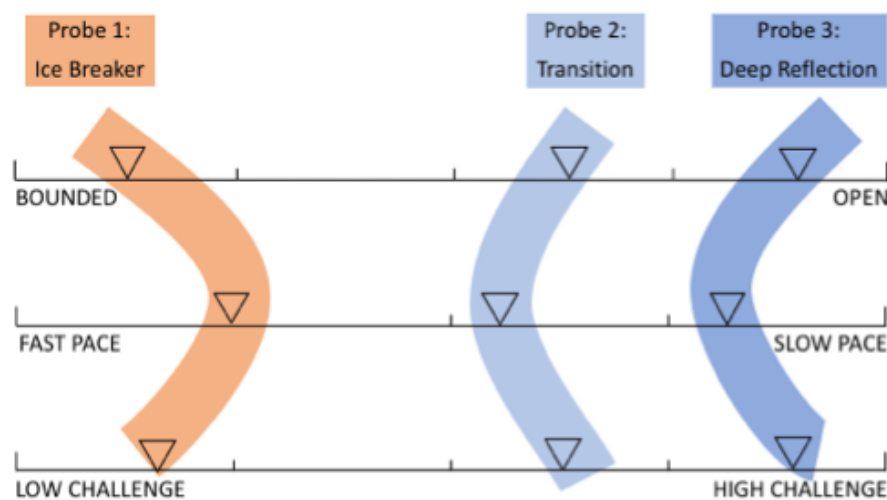


Figure 17. Visualising probe design properties along continuums to help create a balanced probe collection

5.2.4 Findings: Usefulness of the Framework

Probes are artefacts for inquiry, designed to be used in a bi-directional way to facilitate conversations between researchers and their participants. Thus, our findings will first reflect on the framework's utility to guide our design of our probes, and then on how our participants responded to these probes.

Part One: Reflections on probe design

We found Wallace et al.'s framework useful because it provided a structured way to think about probe design and design decisions. It foregrounds the need to consider our relationships and interactions with our participants. It also prompts us to consider the design properties not as binary states, but as properties along a continuum in order to guide the planning, thinking and design of a varied probe collection. However, there were also parts of the framework that we found ambiguous.

A structured way to define probe design properties

The framework introduces a lexicon of four design properties - *openness/boundedness*, *materiality*, *pace* and *challenge* with tangible examples that helped us to better understand how to use the properties. This lexicon provided us with a clear and structured way to consider, plan and think when designing our probes. The lexicon also gave the research team a consistent terminology to talk about the probes as well as reducing potential misunderstandings.

A structured way to take design decisions

The framework also provides a structured way to consider how different probe design properties are affected by different kinds of design decisions e.g. scale, style, aesthetic etc. This enabled us to reflect and modify the design properties of our probes in a more measured way. For example, we originally thought of Probe 1 as a two-week paper diary. However, we anticipated that our participants would perceive this to be a heavy commitment, given how busy they had described family life to be during the preliminary workshop. We tried to reduce this apparent commitment through the design of *Family Experience Jar*. We hoped that participants would perceive the task of making short notes and collecting them in a jar to be less demanding.

Prompts consideration of design properties as continuous

We found it helpful to consider design properties as continuous, rather than as binary states. When describing the property *openness/boundedness*, the framework suggests taking design decisions that "offer a participant both openness to share whatever she feels appropriate and clear boundaries to respond within". We adapted this advice by visualizing this balancing act by means of a linear scale ranging from *bound* to *open*. As we explored various design decisions,

we found it helpful to slide the relative position of a certain probe along this continuous scale. For instance, we could slide it from more open to more bound by reducing the size of a probe or slide it from more bound to more open by introducing an imagined scenario. We found it helpful to visualize the three properties in this way; *openness/boundedness*, *pace* (ranging from fast to slow) and *challenge* (ranging from low to high). On the other hand, we found that it is not meaningful to visualize the property *materiality* in this way since choices such as material, shape and style are distinct rather than continuous.

Helps guide the design of a varied probe collection.

Besides providing helpful guidance on the design of individual probes, the framework is especially effective at steering the design of varied probe collections. In particular, when we used the scales to compare *openness/boundedness*, *pace* and *challenge* (see Fig. 17). We realized that these properties can be used to distinguish each probe within a collection; Probe 1 (*Family Experience Jar*) serves as an ice-breaker, Probe 2 (*Digital Family Tree*) as a transition to reflection and Probe 3 (*Device Journal*) as a source of deep reflection. This realization helped us to ensure a collection of distinct probes that support and complement each other.

Areas of ambiguity

While the framework was useful, there were also aspects that were ambiguous. First, the connection between probe design properties *pace and challenge*, second, uncertainty over the effects of certain design decisions and finally, general difficulty in translating the second section of the framework. Wallace et al. discuss the design properties *pace and challenge* together, which we found rather ambiguous both when translating the framework, and when considering the design of our own probes. These two properties may often relate to each another, however they can be affected by different design decisions. After all, it is possible that both fast and slow-paced probes could be designed to be challenging. Therefore, we chose to separate these two probe design properties in our distilled version of the framework.

Another area of ambiguity was when we tried to map the design property of *materiality*. Several choices that are said to affect *materiality* were also found to affect *openness/boundedness*, *pace* and *challenge*. For instance, while the use of physical metaphor is described as affecting *materiality*, it is also shown to affect *challenge* and *openness/boundedness*. We found that this introduced uncertainty and hesitation when distilling the framework.

The framework's lexicon of probe properties was useful, especially once we distilled it into a more usable format (Table 4). Examples of actual probes that exemplified particular design properties were very useful at articulating how these properties could be used. They helped to clearly explain what and how we could do when designing probes. However, the

framework's general advice on how to approach probes was less accessible and helpful. Understandably, this could not be as prescriptive as the probe properties. Nevertheless, we were able to interpret and heed certain advice to inform our design process. For example, we invested time in understanding our participants before beginning probe design by holding a preliminary workshop.

Part Two: Reflections on probe use

The framework provided valuable guidance on how to design and use our probes. Our participants were able to use the probes successfully and engage with it in the way we planned. For example, they were able to offer varying levels of responses – from quick responses to our icebreaker probe, to more reflective responses with the other probes.

Supporting engaging, quick, and easy responses

The framework provides guidance on how to offer participants fast, light-weight probes that can serve as ice-breakers. It recommends using these probes to act as a point of entry prior to more challenging probes. We designed Probe 1 *Family Experience Jar* to serve as an icebreaker and encourage regular, swift, direct, physical responses. Our material and aesthetic choices had helped to ensure that this intended role was accomplished. When we first presented the three probes during opening interviews, we noticed that almost all our participants immediately gravitated towards the jar. Later, when we visited our participants' homes to collect the completed probes, we observed that, as intended, jars had been placed in prominent positions such as on kitchen worktops, dining tables etc. Then, when we reviewed completed probes, we found our participants' responses to *Family Experience Jar* were the most consistent and comprehensive across all families.

When we asked participants to reflect on their overall experience of using the probes during closing interviews, most of them refer to this probe and, in particular, reference the visibility of the coloured notes. It appears that the view of coloured notes provided by the transparent glass jars, offered participants a visual representation of their experiences. This seems to have allowed them to more easily reflect and articulate their experiences easily.

Supporting creative and reflective responses

The framework offers guidance on how to explore more difficult phenomenon by providing participants the opportunity to reflect deeper through the probes we design. For example, it suggests using tasks with a slower pace or introducing imagined contexts. When compared to Probe 1, these probes required more creativity and imagination to complete.

When we reviewed the completed probes, we found that our participants understood the task of Probe 2 (*Digital Family Tree*). This probe asks participants to map relationships between

family members and their digital technologies. The task was designed to give participants the freedom to interpret the task in their own way. We saw this in the variety of response we received. For example, some showed which family members used which devices, some depicted the technologies used to connect family members and others chose to represent family members who they felt used a lot of technology by drawing a device instead of a person. The metaphor of family trees was easily understood and this probe productively facilitated fresh ways of thinking by our participants. During our discussions, they often became animated as they explained and elaborated on their creations.

Probe 3 (*Device Journal*) demanded the highest levels of imagination and creative-thinking. It was also designed to promote deeper reflection. It asks participants to write an imaginary journal of how their digital technologies might experience their home. When we reviewed responses, we realized that several participants had struggled with its open, slow and challenging nature. Some participants had not completed all the speech bubbles in the comic book. Some made very brief entries. Others wrote about their own experiences rather than the imagined experiences of their digital tech.

During our interviews, we discovered that most of these participants had not listened to the short audio clip that we had directed them to, to support this task. This highlighted the need to find suitable ways to scaffold probe tasks that are more challenging. Despite this, this probe inspired the most interesting and meaningful conversations during our interviews. Even participants who had struggled to complete the task could be prompted to reflect more deeply on their relationships with technology as we reviewed this probe together. These productive conversations reminded us of the importance of offering participants the freedom to not respond and to see this as a creative act in itself, as highlighted in the framework.

Supporting varying levels of reflection and realisations

The use of a varied collection of probes allowed participants to offer a range of responses about the phenomenon of interest. We designed our probes to vary widely in both thematic context and the types of activity. Regular tasks that require short bursts of reporting, tasks that require reflection about self and others, and finally, tasks that require greater imagination and creativity.

When we spoke to our participants about the probes, they described how the experience of completing this range of different probes had revealed aspects about their family's technology use that they found interesting, surprising and sometimes undesirable. They explained how the activities had provided an opportunity for them to 'take stock' of their situation and that this had allowed them to make discoveries about family life, their family members and themselves.

“It enabled me to reflect on all those negative things (laughs). How much conflict there is with my son and my daughter. I wasn’t aware how much that was taking up my energy, I guess...I am surprised at (my wife’s) self-opinion on her devices cos she’s actually on the phone a lot and she doesn’t think that she is. So, I was surprised by that and I guess doing these (probe) activities gave me a legitimate lens to have a look at that...I guess I had never really tied these automatic habits, like picking up my phone, to an emotional motivation.” (S2P9)

Some participants went further and concluded that the process of completing the probes had prompted them to consider actually making changes to their lives and their family.

“It made me really think about how to manage our time with the devices. I have actually thought about a once a month device-free day for the whole family...to be all together on a Saturday or Sunday.” (S2P2)

Most of our participants thanked us for the probes. They commented that the probes had provided them with an opportunity to think not only about their individual experiences, but to consider their family experiences more holistically and from different perspectives. This perhaps responded to the framework’s recommendation for designing probes that can offer participants some degree of personal benefit during and after use.

5.2.5 Discussion

As our findings highlight, Wallace et al.’s (2013) framework indeed fills a void within HCI by offering us useful and actionable guidance on probe design. It does this by offering generalizable probe design properties and providing clarity on how to affect these properties through design decisions. We found that it provides an extremely useful starting point when looking for advice on probes, and probe design in particular. Our efforts to follow the framework has produced engaging probes that have been useful to support the research inquiries of our project - the objectives of any successful probe (Boehner, Gaver & Boucher 2012; Gaver et al. 2004). While a few publications have described the approach taken to design specific probe tools (e.g., Boucher et al. 2018; Tsai, Orth & Hoven 2017), this framework offers detailed discussions on how design decisions affect probe properties and exemplify useful tactics. The lexicon introduced in the framework introduced a way to describe and discuss probes designs with some consistency into an otherwise ambiguous and diverse vocabulary used by different researchers/designers designing and using probes.

However, our use of this framework also revealed areas for improvement. In this section, we discuss how this framework might be better translated, extended and improved upon. We believe that efforts towards establishing a probe design framework will be helpful, especially to HCI and Interaction Design students and researchers new to designing and using probes as a

tool for inquiry (Wallace et al. 2013).

We first came across some ambiguity within the framework when we analysed the probe examples provided by Wallace et al. (2013), in our effort to distil a more actionable guide on how to design probes. The framework refers to *pace and challenge* as a single probe design property and yet the examples used, described these two as separate, though related properties. For instance, a light weight icebreaker activity is shown as taking less time to complete than a more challenging task. However, when we mapped the design decisions that affect probe design properties, we found that *pace* and *challenge* are affected by different design decisions. *Pace* is affected by decisions such as speed, duration and frequency, while *challenge* is affected by decisions such as commitment and creativity levels. We therefore recommend considering these two properties as separate, as we have done in Table 4.

When we put the framework to use, we also found it useful to think of the probe properties as something along a continuum (see Fig. 17). This was especially useful when visualizing the three probe design properties; *openness/boundedness*, *pace* and *challenge* together. Boucher et al. (2018) mention this continuous nature of probe properties when describing how to design engaging and productive probes; “They provide for a range of engagement...range from relatively neutral to playful.” Meanwhile, Tsai, Orth & Hoven (2017) use pairs of values to guide the design of their probes; familiarity-strangeness, definiteness-ambiguity and objective-subjective. These examples reiterate the usefulness of using continuums when conceptualizing the design properties of probes.

The importance of offering participants a diverse range of probes is widely acknowledged (Gaver et al. 2004; Mattelmäki 2006; Studio 2018) and we found that considering the set of probes along various continuums (Fig. 17) not only helps guide the design of engaging individual probes, but the strategic design of a more-balanced, varied and engaging probe collection that can more effectively steer a participant through varying levels of reflection. We made sure to include an icebreaker probe, a probe to promote deeper reflection and a probe to transition participants between these two (Fig. 18).

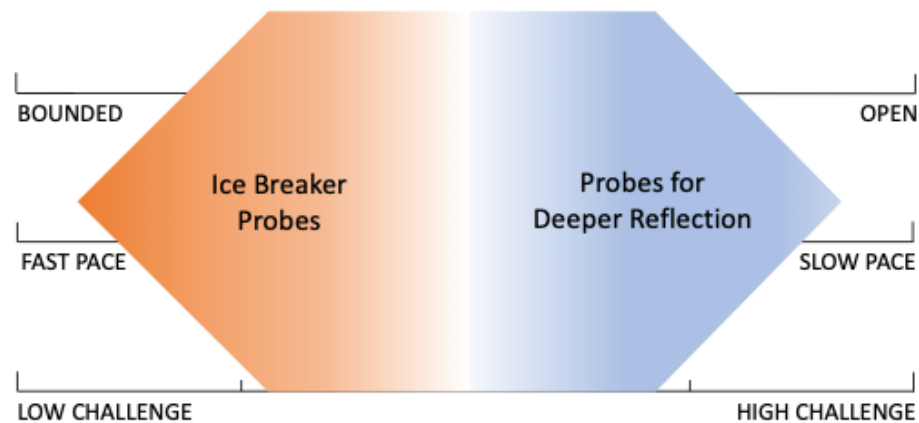


Figure 18. Study Two - Visualising how to design different types of probes by varying three design properties

We found that the more discrete property of *materiality* is useful to consider because of its potential to offer gift-like qualities in probes we give to participants to complete. This can foster participant engagement (Wallace et al. 2013). Take for instance, how participants gravitated towards the *Family Experience Jar* when we unpacked our three probes. Their attention was drawn towards the stylish clear glass jar we showed them and away from the other two (paper) probes. We also realized that *materiality* also has the capacity to affect the properties *openness/boundedness*, *pace* and *challenge*. An example is *Family Experience Jar*. While the *materiality* of the jar initially engaged participants, the choice to use colourful post-it notes to break up the otherwise lengthy diary task increased *pace* and lowered *challenge*. This in turn maintained engagement throughout the study.

In their original conception by Gaver, Dunne & Pacenti (1999), probes were designed with a ‘spirit’ of absurdity, ambiguity, mystery and playfulness in an attempt to provoke unpredictable responses from participants (Boehner, Gaver & Boucher 2012; Gaver et al. 2004). Elements of this ‘spirit’, such as playfulness, have been carried through by researchers/designers exploring how to adapt the method to engage participants (e.g., Battarbee, Soronen & Mäyrä 2004; Bernhaupt et al. 2007). Therefore, we were surprised that the framework did not feature explicit guidance about this ‘spirit’. However, given that the context of Wallace et al.’s work is limited to explorations of self-identity and personal significance, it is appropriate that their probe examples tend to be designed to embody sensitivity, and draw less on absurdity, mystery or playfulness etc.

While it was not explicitly mentioned in the framework, we found it necessary to look for ways to inject a sense of fun, humour and absurdity into each of our probes. For example, the lids of our *Family Experience Jar* were designed with a very thin opening so participants would have to fold their notes before they would fit. We also glued the lids so notes could not be removed. We anticipated the sense of secrecy, curiosity and even competition that might be introduced. As we piloted *Digital Family Tree* we were aware of the personal curiosity that

might arise from learning how a loved one had depicted aspects of family life. When we discussed responses to *Device Journal* with our participants, we found that the sense of absurdity and playfulness inherent in the design of our comic book had inspired the creativity, imagination and humour we had hoped for. We find Boucher et al.'s (2018) term 'affective tone' appropriate to describe a probe design property that relates to the 'spirit' of a probe. We find that it would be useful to extend the framework by including this additional property and to explore the decisions that might affect it, beyond how neutral or playful the probe is.

Participant engagement is affected not only by how we design the probes, but also how to use them (Boehner, Gaver & Boucher 2012). Here, we think that more guidance about how to initiate probes would be helpful such as, how to instruct participants to use our probes and how to offer support and communication while they are using them, and so on (e.g., Mattelmäki 2006; Studio 2018). So, a more useful framework should provide clearer guidance on the decisions involved with instructions. These might include choices on the level and format of any directions provided to explain a probe, whether to provide an example of a completed probe and whether to offer additional scaffolds such as sources of inspiration. Similarly, guidance on communication might include advice on whether and how to offer or require certain levels of communication with participants during the study.

In addition to the guidance from Wallace et al.'s (2013) paper, we now summarise some key points derived from our learnings. These points are some of our main contributions discussed in this paper. We hope that these ideas, when read with Wallace et al.'s (2013) framework can help extend and offer greater clarity and guidance when designing and using probes.

- Before embarking on probe design, invest in understanding participants by holding a preliminary workshop or similar activities to get to know the participants and their situations.
- When you are ready to design your probes, use Table 4 – our distillation and translation of the design properties, together with possible design decisions. This will support systematic considerations of the various design properties.
- Do not think about the design properties as binary states but rather characteristics on a continuum. This will give you greater flexibility and creativity when considering your probe designs (see Fig. 17).
- Consider *materiality* as a discrete property and consider how to use it to affect the design properties of *openness/boundedness*, *pace* and *challenge*.
- Consider the additional property *affective tone* to help guide the design of probes that are neutral, playful, absurd etc.
- When designing a probe collection, use the continuum of design properties to ensure that participants are offered an icebreaker probe and probes that offer varying levels of reflection (see Fig. 18).

Finally, we must acknowledge that the framework is informed by examples of probe use in which a single perspective is captured from an individual or family group. Hence, we are aware that designing our probes to capture differing perspectives held by parents within the same family introduced additional design decisions. We looked for advice within growing reports of probe use to explore families and aspects of family relationships, such as intimacy (Dalsgaard et al. 2006; Davis et al. 2007; Kjeldskov et al. 2004). Horst et al. (2004) provide valuable insights into the challenges of designing probes with families, such as the need to cater for the diversity of individual family members (e.g. genders, ages, interests, ability, motivation etc.) as well as the need to consider privacy. Guidance such as this helped inform our additional decisions about how to design and use probes to explore differing perspectives held by parents within the same family.

We first had to decide whether to initiate probes and to review probe responses with participants on their own or together (e.g. initiating probes with participants together, reviewing probe responses with each participant on their own). In designing our probes, we had questions about whether to provide participants with individual or shared probe tools (e.g. individual *Device Journals*, a shared *Family Experience Jar*). We also had to decide whether participants' responses to our probes would be shared or kept private (e.g. sharing responses to *Digital Family Trees*, private responses to *Family Experience Jar*). Finally, we varied the amount of communication, comparison and collaboration permitted or required by each probe.

The framework states that probes mediate the researcher-participant relationship. In our research project, where some probe tasks were shared between individual parent, we found that probes also mediated the relationship between these individual participants. To adapt probes to cater for the multiple perspectives that are inherent within families is not insignificant. However, as far as we are aware nobody has explicitly discussed the necessary design decisions involved in creating probes and probe activities when extending the method in this way. Emerging ubiquitous computing technologies demand that we will need to design probes that can be used productively to capture multiple perspectives within groups. Future work could provide more guidance regarding this.

5.2.6 Conclusions: Towards a Probe Design Framework

This paper presents our learnings from using Wallace et al.'s framework to guide the design and use of probes in a research inquiry. One aim is to ascertain its usefulness as a guide. Another, to see if we can contribute to clarify and extend their contribution, as well as suggesting possible future efforts that can advance us towards a more robust framework. While Wallace et al. acknowledge that their offering is "an example of what a framework for probe design and use might look like" (Wallace et al. 2013) rather than a definitive guide, we would argue that efforts

that can build upon their insightful work towards formulating a framework for probe design will be very useful for HCI and Interaction Design.

To be fair, we do agree with researchers who caution against being too didactic and prescriptive about how we design and use probes for fear of losing some of the creativity and designer-ly inspirations that can be seen in truly effective probes (Boehner, Gaver & Boucher 2012; Boehner et al. 2007; Studio 2018). However, we do see the benefit of more guided reflections without being overly prescriptive. This could reduce some of the misunderstandings and misinterpretation of how probes are designed and used. At the same time, it will provide (new) researchers and designers wishing to use probes, a more robust and actionable starting point.

(End of Publication II)

While this first methodologically-focused paper (**Publication II**) has considered the of use and development of a probe design framework during Study Two, the following two papers (**Publication III** and **IV**) also focus on methodological knowledge by providing more detail about the design and deployment of these probes, and reflecting their effectiveness in supporting my exploration into parents' individual perspectives on family technology use.

5.3 Introduction to Publication III

Publication III is the second paper that focuses on the methodological findings of Study Two. This paper explains how the approach to designing and using of probes was adapted to engage sets of parents and explore their individual perspectives on family technology use. This adaptation involved deliberately seeking a balance between more proven individualistic and collective approaches to designing and using probes. In prior research with families, probes have either been used to capture responses from a single 'representative' family member (e.g., Haines et al. 2007; Neustaedter, Elliot & Greenberg 2006) or to seek collective responses from the whole family (e.g., Dalsgaard et al. 2006; Voids & Mynatt 2005; Wallace et al. 2013). This paper describes the main components of this adapted approach including; designing a collection of probes that capture a combination of individual and collective responses from parents, providing parents with a range of opportunities to reflectively discuss their experiences together *and* on their own, and analysing individual and collective probe responses in various ways. It also explains particular ways in which this adapted approach to probes helped to explore the individual perspective that exist within sets of parents.

5.4 Publication III

Probes to Explore the Individual Perspectives on Technology Use that Exist within Sets of Parents

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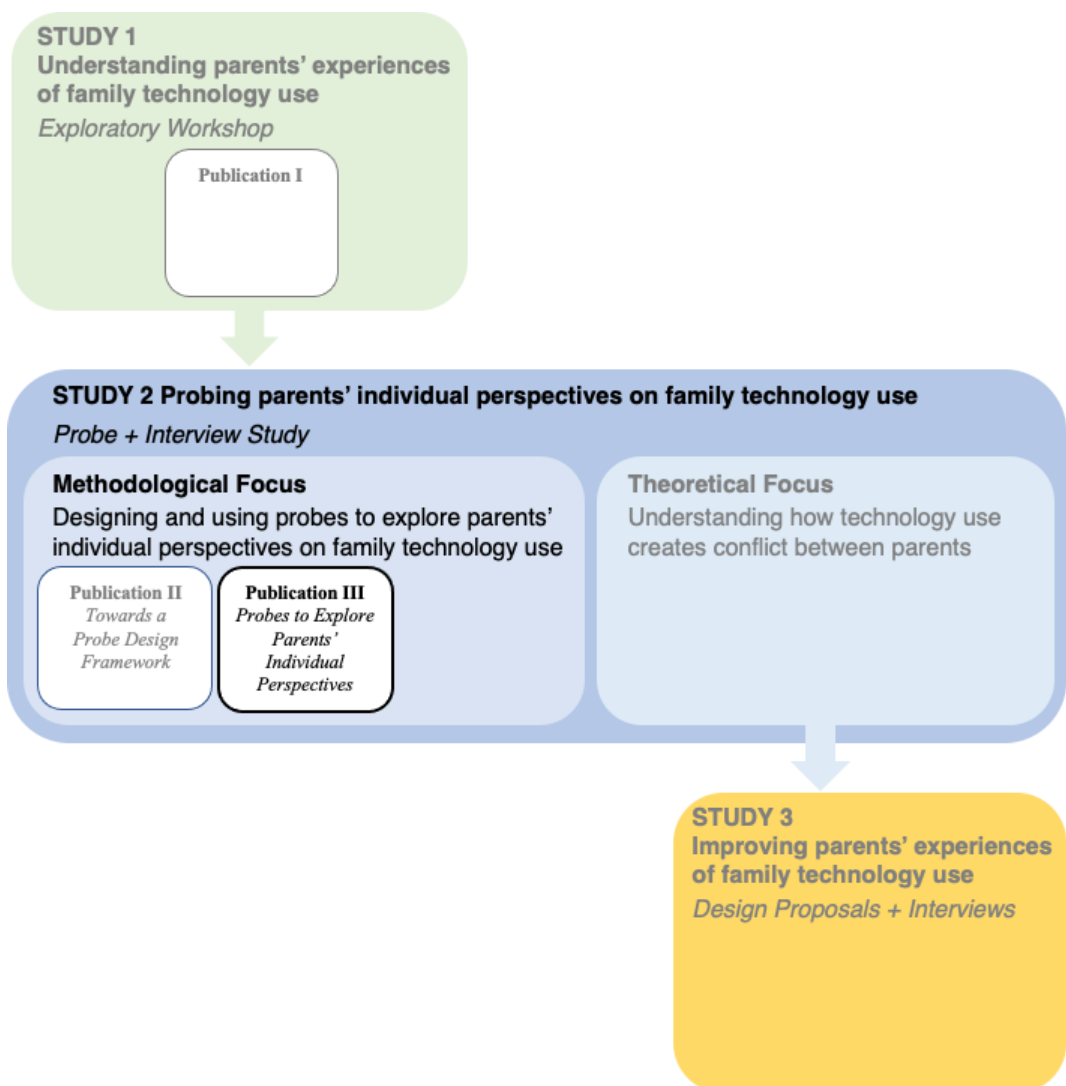


Figure 19. Position of Publication III within the context of the three empirical studies

*NB. This version of the publication has been edited to reduce repetition of content shared with **Publication II** and **Publication IV**, which also focus on the methodological findings of Study Two. This publication also shares some similarities with **Publication V & VI** (which report on the theoretical findings of Study Two).*

5.4.1 Introduction

The pervasive use of digital technologies is increasingly affecting the minutiae of family life (Harper, Rodden, Rogers, et al. 2008). Uncertainties regarding the effects of technology use on child development and family relationships have led to calls for the HCI community to better understand family experiences of digital technology (Hertlein 2012; Plaisant, Druin & Hutchinson 2002; Schiano et al. 2016). One trajectory is to explore the complexities associated with technology use within families (e.g., Blackwell, Gardiner & Schoenebeck 2016; Hiniker, Suh, et al. 2016; Kumar & Schoenebeck 2015). Research suggests that differences between the experiences, expectations and attitudes of individual family members can contribute to this complexity. Family conflict and tension can arise when parents differ in their approach towards their family's technology use (Ammari et al. 2015; Derix & Leong 2018; Mazmanian & Lanette 2017). It is therefore critical that we develop our understanding of these different individual perspectives within sets of parents, and how they are communicated or negotiated, within family life.

However, researching individual perspectives on family experiences presents significant challenges (Morley & Silverstone 1990). Firstly, we need to understand the complex social contexts of family relationships in which these experiences take place. In particular, understanding how the needs of individual family members are integrated within the needs of the whole family. Secondly, we need to encourage parents to reflect, not only on their own experiences, but also on each other's. Parents may not be fully aware of their own experiences, let alone each other's. They may hold incorrect assumptions about each other's perspectives on family technology use. They might also find it hard to reflect on apparently routine experiences of habitual technology use that occur within the busyness of family life. Furthermore, they could find it embarrassing or uncomfortable to discuss certain experiences (Desjardins, Wakkary & Odom 2015), such as those associated with family conflict, or dissatisfaction with aspects of being a parent.

In this methods paper, we present a novel approach to using probes to explore the individual perspectives that exist within sets of parents. While probes have been shown to effectively support research with families, prior work has tended to take either an individualistic, or a collective approach to using them. In other words, some efforts use probes to focus only on individual perspectives, while others design probes to explore the collective (family's) experiences. Instead, we designed our probes to capture a combination of individual and collective responses from each set of parents, in an attempt to reveal a more nuanced understanding of their experiences. We explain that comparing each set of parents' responses exposed the different ways in which they perceive experiences of family technology use.

Our findings show how our probes successfully helped to address some of the challenges posed by this research. Firstly, enabling us to discover family dynamics, roles and relationships.

Secondly, allowing us to reveal the individual practices and priorities of each parent. Thirdly, helping to raise parents' awareness of each other's perceptions. Finally, prompting parents to reassess their own perceptions. This approach to using probes helped elicit unexpected realizations and reflections on uncomfortable experiences.

Overall, this paper contributes an example of an effective approach to support explorations of domestic life that look beyond individual experiences of technology use, and consider some of the complexities, including co-experiences. Specifically, our probes enabled us to more deeply explore individual perspectives of parents, regarding their family's experiences of day-to-day technology use. We hope that the knowledge presented in this paper can add to researchers' understanding of how to develop more productive research tools to support inquiries of domestic HCI.

5.4.2 Related Work

We discuss three areas of literature that pertain to: (i) understanding the experiences of parents (ii) how probes have been used to explore experiences of family technology use (iii) the need to explore parents' individual perspectives on family technology use.

Understanding the experiences of parents

Technology use continues to be increasingly woven into the fabric of family life as it does in society (Livingstone 2007a). Meanwhile, uncertainty surrounds the potentially adverse effects technology use might have, especially on children (Kardaras 2016; McDaniel & Radesky 2018a) and family relationships (Boyd 2014; Mazmanian & Lanette 2017). This has led to efforts within HCI to develop deeper understandings of how families experience technology use within the messiness of everyday life (e.g., Fails et al. 2012; Schiano et al. 2016). However, exploring these experiences presents significant challenges (Desjardins, Wakkary & Odom 2015).

Some of the challenges associated with uncovering experiences of family technology use were first described by early researchers of television (Bryce & Leichter 1983; Morley & Silverstone 1990). They discussed the difficulties of exploring experiences that take place within the social contexts of personal relationships and private domestic settings. Understanding the social contexts of families is especially complex, as it requires us to consider people as individuals, and at the same time considering them as being part of a family. This is because, while families comprise of diverse individuals with different interests and needs (Horst et al. 2004), being a member of the family unit inherently involves reciprocity and a sense of shared aspirations.

When it comes to domestic technology use, individuals' different experiences, expectations, and attitudes may need to be balanced with those of other family members (Blackwell, Gardiner & Schoenebeck 2016; Yardi & Bruckman 2011). This builds on Battarbee's (2003) concept of the co-experience, in which she reminds us that 'people are both individuals and social beings'. This is particularly pertinent when considering parents, who not only need to balance their individual interests and desires, but also negotiate the responsibilities, demands and aspirations associated with parenting (Livingstone & Helsper 2008). This requires parents to consider shared views, modulate opinions, compromise and so on. In order to do this, parents develop expectations, hopes, assumptions and demands on one another (Hiniker, Suh, et al. 2016).

Understanding the individual perspectives on technology use within families is important. As recent research shows, a failure to balance and negotiate between different, even opposing outlooks of individual family members can lead to family tension and conflict (Blackwell, Gardiner & Schoenebeck 2016; Derix & Leong 2018; Yardi & Bruckman 2011). Tensions within sets of parents can be associated with technology use and the different individual attitudes that each parent has towards it (Ferdous et al. 2015; Moser, Schoenebeck & Reinecke 2016). A set of parents might have to negotiate contrasting individual approaches to implementing family technology rules, including how they each use technology (Ammari et al. 2015; Derix & Leong 2018; Moser, Schoenebeck & Reinecke 2016) as well as parenting of their children's technology use (Hiniker, Suh, et al. 2016; Vandewater et al. 2005b). In addition, children may also express their own views on how parents manage and use technology (Hiniker, Schoenebeck & Kientz 2016). So, with technology use occupying an increasing amount of individuals' time within everyday family life, many people come to associate it with complex, challenging experiences (Derix & Leong 2018; Hutchinson, Mackay, Westerlund, Bederson, Druin, Plaisant, Beaudouin-Lafon, St, et al. 2003; Shellenbarger 1999).

Efforts to explore the dynamics of family technology use offer valuable glimpses into parents' experiences. Traditionally, these predominantly considered the role of parents in mediating and controlling their children's technology use (e.g., Blackwell, Gardiner & Schoenebeck 2016; Mazmanian & Lanette 2017; Vaterlaus et al. 2014). However, as technology use has become more ubiquitous, research has also started to consider parents' own use of technology, such as mobile phones (Hiniker et al. 2015; Palen & Hughes 2007). Studies of 'digital motherhood' (Gibson & Hanson 2013) explore the ways in which technology use is changing parenting practices (Balaam et al. 2013; Madge & O'connor 2006). While these tend to focus on the use of specific technologies, such as social network sites (Morris 2014), they begin to reveal the finely balanced role that technology often plays in the lives of parents. For example, the same technologies that parents turn to when seeking or sharing information about their children, offer connection to non-parenting activities and interests (Gibson & Hanson 2013). This can help people avoid the isolation often associated with parenting but can also

distract them from looking after their children (Hiniker et al. 2015).

These efforts begin to construct an understanding of parents' increasingly complex realities of technology use in family life. However, researchers tend to take an individualistic approach to explore the experiences of parents when in fact, their attitudes and approaches to family technology use vary greatly, and are shown to be highly influenced by their relationships and social context. For example, the opinions of family members and friends can affect the types of technology rules set by parents (Ferdous et al. 2015; Hiniker, Schoenebeck & Kientz 2016; Moser, Schoenebeck & Reinecke 2016), as well as what they decide is appropriate to share about their children online (Ammari et al. 2015). The expectations of wider society affects parents' attitudes towards technology use in public, as demonstrated by studies of mobile phone use in family restaurants (Radesky et al. 2014) and of texting at children's playgrounds (Hiniker et al. 2015).

While researchers have highlighted how the views of others may affect family's technology use, what is especially lacking is an understanding of if, and how, sets of parents communicate, negotiate and collaborate on their approach towards their family's technology use (Derix & Leong 2018). This need for a deeper understanding of the experiences of parents correlates with specific calls for a more holistic view of parents' evolving experiences of technology use (Fails et al. 2012; Isola & Fails 2012) and, more broadly, for HCI research to more thoroughly consider the social elements of experience (Battarbee 2003).

Probing experiences of family technology use

New tools are required to support research into co-experiences of family technology use, given the significant challenges it presents. In particular, (Mazmanian & Lanette 2017) discuss the risk of parents wanting to provide socially desirable responses rather than disclosing family experiences that they might feel uncomfortable or embarrassed about. Furthermore, they highlight the critical need to consider the different expectations of individual family members, as well as potential power differentials between them. In addition to these fundamental challenges, others note that intimate contexts require an awareness of privacy concerns (Fails et al. 2012). Finally, it has previously proved challenging to integrate research into the busy day-to-day lives of families e.g. due to work commitments of parents (Weibert & Schubert 2010). It is perhaps challenges such as these that have encouraged a number of HCI researchers to turn to probes in order to support their inquiries of family technology use (Desjardins, Wakkary & Odom 2015).

Probes are playful and open-ended tools (Gaver, Dunne & Pacenti 1999) used to access aspects of participants' lives by allowing participants to express themselves through collected information (Mattelmäki 2006). This is often used to support and stimulate discussions between

researchers and participants during contextual interviews. This dialogical approach has been demonstrated effectively within families, promoting the articulation of experiences and behaviours that are usually taken for granted and thus go unnoticed by participants (Horst et al. 2004). The ambiguity of responses can also offer participants privacy, which has led to the use of probes in sensitive settings or with populations that require sensitivity (Boehner et al. 2007). Their capacity to surface experiential and emotional aspects of interaction design has also been well demonstrated (Leong et al. 2010). In this way, a dialogical approach to probes is well placed to help researchers to address some of the challenges presented by exploring co-experiences of technology use within families.

In researching family technology use, one approach has been to design probes to be completed by, and discussed with, an individual family member (e.g., Haines et al. 2007; Neustaedter, Elliot & Greenberg 2006). However, Isola & Fails (2012) advise against taking an individualistic approach when researching families, as it risks promoting Turkle's (2017) notion of 'being alone together'. Instead, they suggest taking an approach that considers the needs of the family as a whole. Similar suggestions have been made for more holistic approaches to developing more complete accounts of family experiences with technology (Fails et al. 2012; Horst et al. 2004; Isola & Fails 2012). Another approach to researching families has considered the whole family unit. This collective approach involves designing probes as collective family tasks, to be completed by the whole family, in preparation for a collective family interview (e.g., Dalsgaard et al. 2006; Volda & Mynatt 2005; Wallace et al. 2013). However, seeking a collective response from families assumes that families are homogeneous and overlooks the differences between the individual perspectives of family members (Horst et al. 2004).

When exploring communication in families, we find that Horst et al. (2004) describes an attempt to balance these two approaches by designing one probe to capture the collective perspective of the whole family and another to capture the individual perspective of one family member. Allowing multiple family members to complete the individual probe is recommended, in order to produce a more complex and complete view. We found another example in which probes seem to have been used in a way that combines individual tasks and collective tasks (e.g., Vetere et al. 2005). However, this approach is not explicitly described, nor is it taken in order to understand how families are currently experiencing their everyday technology use. Rather it is taken to support the design of technologies that mediate intimacy between couples.

As more technologies are brought into homes and the pervasive use of technologies within families is increasingly scrutinised, it becomes critical to adapt our methods to develop a more complex and complete view on these experiences. That is one of the motivators behind our design of a probe study to explore the individual perspectives of family members, in this case, sets of parents.

The need to explore parents' individual perspectives

As we have discussed elsewhere (Derix & Leong 2018), as a precursor to this work we previously held a workshop with parents, to explore their experiences of technology use within family life. This revealed how parents' differing approaches to technology use can result in negative experiences and family conflict. Exploring this further addresses wider calls for better understandings of the interplay between technology use and the complex family dynamics between parents (Hiniker, Schoenebeck & Kientz 2016; Hiniker et al. 2015; McDaniel & Radesky 2018a). To the best of our knowledge, there are no explicit examples of methods that explore individual perspectives on family technology use that might exist within sets of parents.

In order to start understanding the social contexts in which parents experience family technology use, we need to take an approach that considers them not only as individuals, but also as part of a set of parents. Our method must also be capable of encouraging parents to reflect on experiences that might seem unremarkable within the habitual technology use of everyday family life. Therefore, we anticipate the significant challenge of encouraging sets of parents to reflect on their own experiences of technology use, and also on each other's.

5.4.3 Method: Creating Opportunities to Compare

We will now describe how we designed our probe study to create opportunities to compare sets of parents' individual perspectives on their family's technology use. Specifically, we will discuss the design of our probes and decisions behind their deployment.

Probe Design - Individual and collective responses

In the absence of explicit examples of how to use probes to explore the individual perspectives of multiple family members, we referred to broad guidance on effective probe design (see Derix & Leong 2019). However, this guidance tends to be informed by examples in which researchers either take an individualistic or a collective approach to probes. Therefore, probes are either designed to capture individual responses from single participants, or collective responses from multiple participants. When considering how to adapt the use of probes to explore the individual perspectives within sets of parents, we sought to balance these two approaches. This meant designing our probes to capture a variety of individual and collective responses from each set of parents. This approach built upon suggestions that probe collections work well when they offer participants varying opportunities to respond (Mattelmäki 2006; Wallace et al. 2013). We now describe how this approach informed the design of our three probes (i) Family Experience Jar, (ii) Digital Family Tree, (iii) Device Journal (Fig. 20).

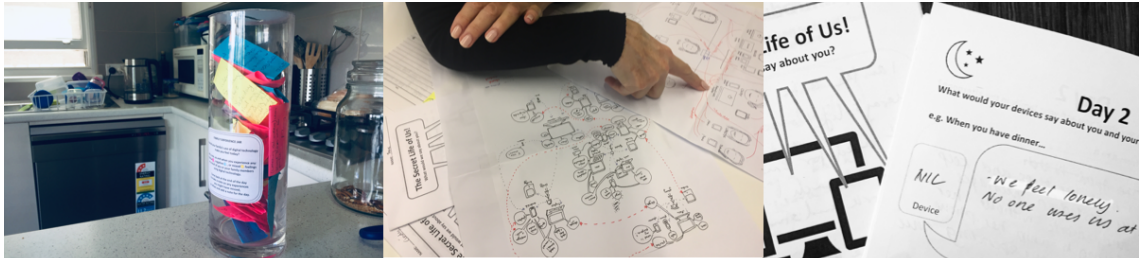


Figure 20. Three probes: Probe 1. Family Experience Jar (left), Probe 2. Digital Family Tree (centre), Probe 3. Device Journal (right) (for reference only; identical to Figure 16)

Probe 1: Family Experience Jar

This probe is designed to encourage sets of parents to log their individual experiences of technology use within family life, throughout the study. Each set of parents receives a Jar (Fig. 20, left), along with three small paper notepads which are coloured to denote the type of experiences being logged: pink for logging positive experiences, blue for negative experiences and yellow for experiences perceived to have both positive and negative aspects. We asked each parent to submit at least one note per day for the duration of the study, inviting them to make additional contributions as-and-when such experiences occurred.

The Jar is designed in such a way so as to prevent the details of the notes inside being read: notes are inserted through a small slit cut into the lid of the Jar, meaning that they must be folded in order to fit. The lid is also glued onto the Jar, meaning that notes cannot be removed once they are inserted. Whilst the details of the notes cannot be read, by choosing Jars made of clear glass, participants are able to see contributions amassing over time. The visible colour of the notes inside the Jar provides ‘at-a-glance’ idea of the types of experiences that had been logged. We hoped this might generate curiosity between parents as to what the other has contributed; encouraging reflection and further participation. Finally, we asked each parent to initial and date their notes to assist us in identifying and comparing their logged experiences.

This probe is inspired by Andell et al.’s (Mattelmäki 2006) stress-relaxation bottle and captures individual responses within a collective container. This is intended as a physical analogy of how we considered participants as being part of a set of parents, and also as individuals. While completing this probe, participants would be able to compare the amount and the general ‘mood’ of each other’s individual responses. We anticipated being able to compare the individual responses of each set of parents when reviewing this completed probe.

Probe 2: Family Tree

This probe is designed to encourage each parent to express how they see themselves in relation to their family members, as well as in relation to the technologies used within everyday family life. Provided with a piece of A3 paper, participants are asked to create a Family Tree diagram (Fig. 20, centre) to illustrate the relationships both between their family members and also the

technologies used in everyday family life. We hoped this would help surface insights into how each parent perceives these relationships and into aspects of co-experience. Including technologies in these relationships was intended to play into people's tendency to anthropomorphize (Epley, Waytz & Cacioppo 2007) and assist them to think differently about their family's (often routine, mundane or habitual) technology use.

During the first week of the study, each parent is asked to complete a Family Tree. During the second week, sets of parents are asked to compare their individual responses with one another. Then they are asked to collaborate with each other to complete a shared Family Tree. We asked participants to make a note of any shared outlooks, differences in opinion or even points of contention that might emerge during this process.

Of our three probes, this is the probe that most explicitly considers participants as being part of a set of parents, and also as individuals. It is designed to capture individual responses from each parent, and then a collective response from each set of parents. To complete this probe, participants would need to compare their individual responses and also collaborate on a collective response. These steps are intended to highlight the way in which individual perspectives of parents are communicated and negotiated upon within family life. When reviewing this completed probe, we anticipated being able to compare each set of parents' individual responses with each other, and with their collective response.

Probe 3: Device Journal

This probe is designed to encourage parents to reconsider their usual perspective on family life. Inspired, in-part, by artefact ecology (Jung et al. 2008), we devised a comic-style Journal (Fig. 20, right) that introduced a fictional context (Wallace et al. 2013) by asking each parent to imagine how their devices experience family life. We hoped this playful probe would enable parents to take a different viewpoint, with a refreshed perspective of their family unit and their family's experiences. We hoped that by comparing each parents' individually completed journal, deeper insights of habitual technology use would surface that might have otherwise been taken-for-granted, unremarkable, uncomfortable or even socially undesirable.

This probe captures individual responses from each parent within their own Journal. Participants could pick any two days on which to complete this probe and sets of parents were not asked to align, or discuss this task with each other. We anticipated being able to compare the individual responses of each set of parents when reviewing this completed probe.

Probe Deployment - Individual and collective interviews

When planning how to deploy our probes, we sought to create a balance between offering opportunities for individual responses and opportunities for collective responses, as we had

when designing our probe collection. We intentionally held a combination of individual and collective interviews, to consider the individual perspectives within each set of parents.

We decided to hold collective Opening Interviews with each set of parents. We would introduce our probe collection and provide instructions. These instructions would include details about how and when to complete each probe, which probes required individual or collective responses, and which responses could be discussed or compared. Collective Opening Interviews are particularly appropriate when introducing single, shared probe artefacts such as our Family Experience Jar. In addition, it would allow our participants to identify and introduce themselves as part of a set of parents, and part of a family. This was important given the overall research topic of understanding experiences of family technology use.

We decided to hold individual Closing Interviews with each parent on their own, rather than with sets of parents. This decision was informed by the findings of our preliminary workshop. We hoped it would encourage participants to be more candid and ensure that we were able to explore the different individual perspectives of each parent. In case a parent might be less candid through fear of us disclosing their opinions during the other parent's Closing Interview, we assured them that their discussions would remain private.

Study Two: Probe & Interview Study - Participants

This research was conducted in accordance with ethics approval from the University of Technology Sydney. We recruited 17 participants (S2P1-S2P17), representing eight families (S2F1-S2F8) in which there was at least one child under the age of twelve years (see Table 5). We were cognizant of the broad and diverse range of family compositions (Fails et al. 2012) and, as is standard in HCI, defined family either as a unit of people living in a home together, or who are related to each other (Isola & Fails 2012). We acknowledge that many arrangements of parenting exist. For example, F8 consists of a single mother, aunty and grandmother who live together and share responsibility for raising three children.

Table 5. Study Two: Probe & Interview Study - Participant Details

| Sets of Parents | Age | Current Occupation, (Part-Time/Full-Time) | Cultural Background | No. of Kids (Age) |
|--|----------------|---|--|-------------------------|
| 1: S2P1 (Mother) S2P2 (Father) | 46 52 | Customer Service Assistant (PT) Management Consultant (FT) | Indonesian British Indian | 2 (9yrs, 7yrs) |
| 2: S2P3 (Mother) S2P4 (Father) | 36 38 | NA (Parenting full time) Software Developer (FT) | Japanese French | 3 (7yrs, 5yrs, 3yrs) |
| 3: S2P5 (Mother) S2P6 (Father) | 42 48 | Biologist (PT) Software Engineer (FT) | Indonesian Australian | 3 (7yrs, 5yrs, 3mos) |
| 4: S2P7 (Mother) S2P8 (Father) | 39 42 | Engineering Draftsperson (PT) IT Consultant (FT) | Iraqi Iraqi | 2 (15yrs, 3yrs) |
| 5: S2P9 (Mother) S2P10 (Mother) | 47 45 | IT Technician (PT) Lawyer (FT) | Vietnamese Australian | 2 (5yrs, 3yrs) |
| 6: S2P11 (Mother) S2P12 (Father) | 34 36 | Veterinarian (PT) Veterinarian (FT) | British Spanish | 2 (6yrs, 2yrs) |
| 7: S2P13 (Mother) S2P14 (Father) | 48 51 | Physiotherapist (PT) IT Consultant (FT) | Australian Australian | 1 (6yrs) |
| 8: S2P15 (Mother) S2P16 (Grandma) S2P17 (Aunt) | 41 74 44 | Transport Planner (FT) NA (Retired) NA (Living with disability) | Australian Australian Australian | 3 (9yrs, 7yrs, 5yrs) |

Study Two: Probe & Interview Study - Outline

The study was conducted over 14 days (see Fig. 21). On Day 1 we conducted semi-structured Opening Interviews with each of the eight set of parents. This took place at their family home and lasted between 60-90 minutes. Each parent introduced themselves and their family, before briefly discussing aspects of technology use within broader family life, including routines, attitudes and expectations. We then introduced our probe collection to participants and explained that they had 10-12 days to complete the probes, before we would collect them.

After collecting completed probes, we conducted an initial review of responses to identify interesting questions that could be discussed during the semi-structured Closing Interviews, held with each of our 17 participants on Day 14. Each Closing Interview lasted between 50-70 minutes and took place, once again, at family homes. This was a researcher-participant co-exploration of the completed probe activities, to make sense and to reflect, retrospectively, on their use of the probes. This interview also gave us the opportunity to seek clarifications of certain responses we found interesting when reviewing the completed probes.

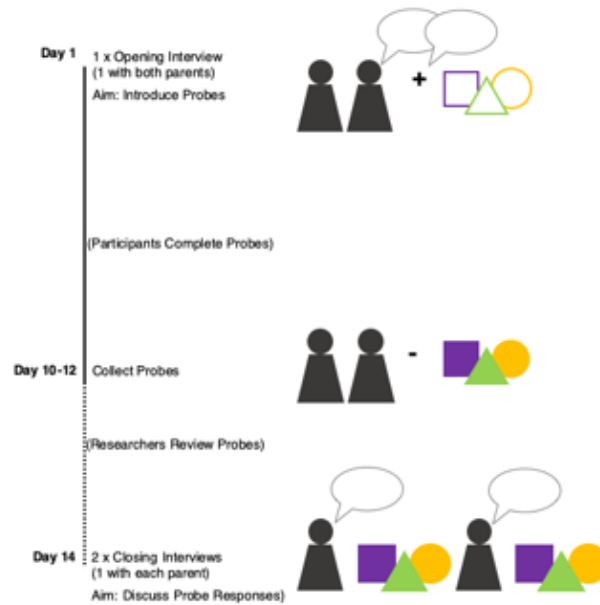


Figure 21. Study Two - Probe & Interview Study Outline

Study Two: Data Collection and Analysis

After collecting the completed probes, we reviewed them in order to inform Closing Interviews. Firstly, we reviewed the responses of our 17 participants individually. Secondly, we reviewed them as eight set of parents, comparing one parent's responses with the other's. As such, we began to build a picture of, and identify questions relating not only to 17 individual parents, but to eight distinct sets of parents, and to some extent, eight distinct families.

We audio-recorded all interviews and took handwritten notes to support analysis. We used open coding to analyse these data and generated codes to reflect a variety of attitudes and approaches to their family's technology use. These codes combined to create themes that will be reported in future work. For the purpose of this methods paper, we focus on how our approach to using probes helped us to explore the individual perspectives on technology use that exist within sets of parents.

5.4.4 Findings: Probing into Parents' Individual Perspectives

In order to highlight the effectiveness of our probe study in enabling us to develop deeper understandings of parents' individual perspectives on their family's technology use, we draw on how participants responded to our probes, as well as on how they reflected upon these responses during Closing Interviews.

As anticipated, when we received and reviewed completed probes, we were able to compare the individual responses of each set of parents. We found that our probes were able to capture the internal dialogues of each parent, by encouraging them to reflect from different (sometimes novel) perspectives. For example, by asking them to imagine how technologies perceive family life, our Device Journal probe prompted them to consider and even reassess

their views, revealing usually hidden experiences of family technology use. We were then able to compare these internal dialogues and discuss them during Closing Interviews.

In the case of our Family Tree probe, we were also able to compare each set of parents' individual responses with their collective response. As well as enabling us to compare the individual perspectives that exist within sets of parents, this also allowed us to identify ways in which these different perspectives might be communicated and negotiated within family life. Participants had been asked to take notice of any interesting conversations, surprising realisations or tensions while completing this probe. This enabled us to ask them about their experience of this process, as we highlighted interesting similarities and differences between their responses during Closing Interviews.

When we interviewed participants, we heard many stories about the differing ways that each parent might perceive technology use, and its role within their family. We also surfaced conflicting attitudes about the ways in which technology use might affect their family's relationships. This included elaborate, unexpected realisations that participants sometimes found to be emotional, and even surprising. During these discussions it became clear that our collection of probes had been used successfully to overcome some of the challenges posed by attempting to compare parents' individual perspectives on their family's technology use. Firstly, discovering family dynamics, roles and relationships. Secondly, revealing parents' individual practices and priorities. Thirdly, raising parents' awareness of each other's perceptions. Finally, prompting parents to reassess their own perceptions.

Discovering family dynamics, roles and relationships

Comparing parents' individual responses to our probe collection enabled us to garner a sense of the dynamics within each set parents, and their family, insofar as how technology is integrated into their daily practices and routines. Responses to our Family Experience Jars were particularly helpful at revealing clues about the role of each parent within their family. We discovered, for example, that one parent tended to log more work-related experiences while the other focused on social, domestic or child-related experiences.

This influence of familial roles was also evident, though perhaps less explicitly, when comparing the degree to which each parent had engaged with the probes overall. In almost all households, one parent responded more comprehensively than the other. This tended to be the parent who spent more time at home with the children compared to the other parent, who was usually out at work during weekdays. This was visible, for example, in the significant difference between the number of notes each parent contributed to their Family Experience Jar, or by the disparity between the care and detail with which each parent had drawn their Family Tree.

While we had asked each set of parents to work together to create a collective Family

Tree, we found that several collective responses looked very similar to one parent's individual response. We also noticed that some collective responses were missing. During Closing Interviews, several parents explained that on comparing their individual Family Trees with each other, one parent had conceded that the other parent's diagram was actually more accurate than their own. This individual response had then been redrawn as a collective response, or used in lieu. In all of these cases, the individual response that was reappropriated as a collective response was created by the parent who held most domestic and child-caring responsibilities. While these explanations might give rise to suspicions of a lack of time or engagement, they may also hint at the true nature of contested opinions and complex negotiations that exist within families, such as one parent's views being more dominant.

By comparing the individual responses of each set of parents, we were also able to identify and interrogate instances in which a set of parents describe the same act of technology use. In some instances, we discovered clues about our participants' relationships, or how they perceive their relationships. For example, correlating notes in S2P7 and S2P8's Jar, both written on pink paper, describe a shared, intimate experience that both perceive to be positive,

"watched Netflix with P7 in bed together" (S2P8, Jar)

"watched a nice movie on Netflix, me and S2P8, 2 nights in a row! ☺" (S2P7, Jar)

By contrast, another set of notes expose their conflicting perceptions, with S2P8's pink note positively describing

"binge watching Netflix (alone time)" (S2P8, Jar)

and S2P7's blue note logging her negative perception of the same experience

"S2P8 spent the whole evening after work watching Netflix" (S2P7, Jar)

Clues about family dynamics and relationships could also be found when comparing differing individual attitudes of parents towards experiences of technology use involving their children. For example, S2P11's pink notes describe her positive experiences,

"we all watched some kids TV in bed having a cuddle" (S2P11, Jar)

"while I showered, the boys played games on my phone" (S2P11, Jar)

Meanwhile S2P12's blue notes portray these experiences as negative

"using TV for calming kids down" (S2P12, Jar)

"using phone to calm kids" (S2P12, Jar)

By comparing each set of parents' individual responses, our probes allowed us to more thoroughly explore how each parent perceives their experiences of technology use in family life. This helped to surface deep, candid and interesting reflections by our participants that we could in turn, also compare. For example, during each of their Closing Interviews, we asked P7 and P8 to expand on entries they have made in their individual Journals and uncovered contested beliefs:

"I can confidently assume that if I became S2P7's phone for a week I wouldn't be uncovering anything." (S2P8, Interview)

"My phone would know that S2P8 is spoilt, he's a lucky guy to have a family like us...he would know that from the amount of searches I do trying to work him out." (S2P7, Interview)

Disclosures such as these provide insights into family relationships and also highlight the extent to which technology use plays a role within them.

Revealing Parents' Individual Practices and Priorities

Comparing the individual responses to our probes also helped to reveal the different individual practices and priorities within each set of parents, regarding technology use. For instance, we found Device Journal entries portraying each parent's smartphones as having very different experiences to one another. For example:

"I am the centre of S2P1's life!...I never leave his side or get switched off." (S2P1, Journal)

"I am so quiet. S2P2 almost always mutes me...the grubby little hands (of the kids) that use me sometimes can be rough and have dropped me sometimes." (S2P2, Journal)

Comparing such responses also helped to reveal the different attitudes of each parent.

Almost all parents describe the television as the device that would know most about their family. Their Journal entries concerning television use also reveal similarities and differences between the individual practices and priorities that exist within sets of parents. For instance, in S2P5 and S2P6's Journal entries, we find clues that monitoring their children's technology use is primarily the concern of S2P5. She imagines their TV to say,

"The kids get to watch me while Mum (S2P5) makes dinner, or in the afternoon on weekends, but not in the mornings...Sometimes Mum streams Cosmic Kids or GoNoodle so that she doesn't feel guilty about kids' screen-time." (S2P5, Journal)

In contrast, P6 focuses on the functionality of technology and writes,

“I’m the TV, I’m supposed to be part of the smart home setup but all I do is cartoons before dinner.” (S2P6, Journal)

By comparing individual responses to our Family Tree probe, we were able to reveal broader perceptions of technology use within family life. For instance, one parent often took a more people-centric view by drawing connections between faces of family members, while the other took a more technology-centric view by drawing connections between devices.

Raising parents’ awareness of each other’s perceptions

The Family Tree probe involved the sharing and discussion of individual responses within each set of parents, before each set could collaborate on a collective response. During Closing Interviews, we found that this process had helped to raise parents’ awareness of each other’s perceptions on technology use. For instance, in S2P5’s interview, she explained:

“When I put together my Family Tree, the relationships are always in terms of the people relationships. The devices facilitate those relationships...whereas S2P6’s is more about the connections between the devices themselves. It was hard to marry them together because of that. They were similar but they had such different focuses.” (S2P5, Interview).

By becoming aware of how the other parent had illustrated their Family Tree, some of our participants had been prompted to re-examine family technology practices that they had previously taken for granted. Several parents talked about how this task had spurred conversations with each other that had led to various new-found realisations about family technology use. For example, S2P8 explained how collaborating on a collective Family Tree had prompted him to reassess:

“I thought that it was a family desktop, but our Family Tree made me realise that it’s really just me who uses it. I recognise now that these devices are more personal than shared. I realised that everyone in the family has their own (technological) companion” (S2P8, Interview).

Other participants discussed how these conversations had exposed conflicting perspectives of technology use. For example,

“S2P10 will tell you a different story...I am surprised at S2P10’s self-opinion of her own use. She doesn’t think she uses (her smartphone) that much, but I really do. The (probes) gave me a legitimate lens to have a look at that.” (S2P9, Interview)

Several participants expressed similar appreciation of the opportunities that this probe had created, to discuss perceptions of technology use with the other parent in their family.

Prompting Parents to Reassess Their Own Perceptions

Asking our participants to collaborate on a collective response to our Family Tree probe demanded a deeper level of comparison by parents of each other's individual efforts. Though challenging, this negotiation of individual perspectives encouraged greater understanding and reflection, not only of one another's perceptions, but also of their own. We found that this facilitated more interesting discussions and surfaced realisations during our Closing Interviews.

It also prompted some parents to reassess assumptions they had made about their families' technology use. For example, S2P12 described how he was surprised to learn about the central role TV played in his family, recognising that his family spent more time watching TV in his absence than he had previously imagined,

"I saw that the TV is central to the family, though I don't have any connection to it personally" (S2P12, Interview).

We noticed several participants were similarly surprised to learn that their assumptions about their families' technology use were not always right. For example, S2P2, who allows her children to access her phone, had always assumed that her husband did the same. However, in her Closing Interview, she described her surprise at noticing that her husband's Family Tree showed no connection between his phone and their children. This had prompted her to ask her husband about this and learn for the first time that he did not, in fact, allow their children to use his phone since he considered it to be a work tool. In this way, asking parents to compare their individual responses had created opportunities for conversation between parents and raised awareness of different perspectives on technology use that tend to be overlooked within day-to-day family life.

5.4.5 Discussion

Our work suggests that using probes in a way that both considers participants as individuals, as well as being part of a family unit, can help to uncover challenging but important aspects of the family dynamics surrounding technology use. This is evident from our participants' responses presented in the findings, which illustrate the extent to which our probe study enabled us to compare, explore and unpack the individual perspectives on technology use that exist within sets of parents. As such, this paper provides HCI researchers and interaction designers with a valuable example of how to use probes to productively research the complex experiences of multiple people within family groups.

Our findings describe how our novel way of using probes helped us to address several challenges posed by this research. Firstly, discovering family dynamics, roles and relationships. Secondly, revealing parents' individual practices and priorities. Thirdly, raising parents'

awareness of each other's perceptions. Finally, prompting parents to reassess their own perceptions. This enabled us to surface a more complex and complete view of technology use within the lives of our participants and their families. As well as allowing us to compare the individual perspectives on family technology use that exist within sets of parents, our probes helped us to examine how these perspectives are communicated and negotiated within families.

Our review of related literature acknowledges an established practice within HCI of using probes in a dialogical approach to support and stimulate discussions between researchers and participants in follow-up interviews (Desjardins, Wakkary & Odom 2015). This approach was developed by primarily considering individual experiences of technology. Yet, when working with families, relying solely on responses from individual participants overlooks complex family dynamics, and ultimately, the needs of the whole family (Horst et al. 2004). While researchers have sought to correct this by taking a collective approach in which multiple family members complete probes together before discussing responses in group interviews, this neglects the diverse and potentially conflicting perspectives of individual family members (Horst et al. 2004). In our efforts, we sought a balance between an individualistic and a collective dialogical approach to probes.

This balanced approach considered participants, not only as part of a set of parents, but also as individual people. Therefore, as we have described, our use of probes slightly adapted the conventional dialogical approach by designing a probe collection capable of capturing a combination of individual and collective responses. Heeding advice on how to create varied probe collections (Wallace et al. 2013), we designed each of our three probes to capture this combination of responses in different ways, and to varying extents. We had hoped that this would create a range of opportunities to compare the responses of each sets of parents.

Combining individual and collective probe responses

While probes that ask people to log their individual experiences are commonly designed as personal diaries (Mattelmäki 2006) our Family Experience Jar probe provided each set of parents with a shared receptacle in which to deposit their individual notes. This physical analogy of the individual perspectives that exist within each set of parents helped to communicate the research topic to participants, thus helping to create an easy entry point for participants to start engaging with our probe collection. By making the notes visible within the Jar, we allowed sets of parents to get a sense of how much one another was engaging with the probe, and the types of experiences that they were logging. Our findings show that this aroused curiosity in our participants and helped to raise parents' awareness of each other's perspectives. We believe that designing probes that capture individual responses within a shared physical object can help to engage multiple people when working with families.

When attempting to compare individual responses from multiple people that are captured in a shared receptacle, it is of course necessary for researchers to be able to identify each participant's individual contributions. We asked participants to initial each of their notes, which allowed us to easily compare the extent to which each parent had engaged with the activity and the types of experiences that each parent had recorded. This helped in revealing the individual practices and priorities of each parent. By also asking participants to include the date on each of their notes we were able to more precisely compare each set of parents' individual responses, and to identify correlating notes describing each parent's version of the same incident. As described in the findings, this allowed us to interrogate differing individual perceptions of a particular co-experience and to discover aspects of family dynamics, relationships and roles. Although occasional examples do exist of probes that capture individual responses from multiple people (Mattelmäki 2006), accounts of their use do not explicitly discuss the use of probes to explore the individual perspectives of multiple family members, or to compare their perceptions of the same experience.

In contrast to our Family Experience Jar probe, each parent recorded their responses to the Device Journal probe in their own individual booklet. This Journal deviates from conventional diary probes (Mattelmäki 2006) by asking participants to record the imagined experiences of devices regularly used by members of their family. Using probes to introduce fictional contexts in this way has been discussed as a means of enabling participants to remove themselves from the constraints of reality, and to express complex ideas (Wallace et al. 2013). Whilst we have found no explicit accounts of using such probes to explore the individual perspectives within families, our findings indicate that fictional contexts might indeed help encourage family members to consider each other's perspectives. By allowing parents to take a more detached position, this probe also revealed clues about sensitive subjects, such as family conflict. These responses helped us to broach these subjects with participants during Closing Interviews, and to elicit revelations about family dynamics, roles and relationships.

In addition, asking each parent to complete their Journal on their own, and without discussion, exposed the different ways in which individuals interpreted this rather unconventional probe. As illustrated in our findings, this helped to reveal more about the individual practices and priorities of each parent.

In addition to capturing individual responses, our Family Tree probe also asked each set of parents to compare and negotiate their individual responses with each other, in order to create a collective response to the same task. This was intended to understand how parents might communicate and negotiate their individual perspectives within family life. As far as we are aware, this is the first time that a combination of individual and collective responses to the same probe have been used to explore the individual perspectives of family members. By comparing individual and collective Family Trees, we were able to discover aspects of family dynamics

and relationships that would have been otherwise challenging to expose, had we relied solely on either individual or collective responses. As described in the findings, this process of asking sets of parents to first complete a task individually, and then to repeat it as a collective exercise, spurred interesting dialogues between them. The opportunities for collaborative dialogical sensemaking (Leong et al. 2010; McCarthy & Wright 2004) created by this task helped to raise parents awareness of each other's perceptions, and their own. This awareness sometimes led to unexpected realisations that even surprised some of our participants. Though somewhat inadvertently, these realisations went on to play a pivotal role in surfacing subsequent discussions during Closing Interviews.

A probe approach to explore complex family experiences

Reflections of our findings have led to a number of methodological insights. These insights pertain to the various ways in which to effectively use probes to tease out complex, tacit and even conflicting experiences that take place within families. Our approach to probes sought to find a balance between the individualistic and collective focus previously given when working with families. Our findings show that by taking this balanced approach, our probes helped us to address some of the challenges posed by exploring family experiences of technology. Now we discuss these findings more broadly to provide those researchers, interested in exploring the individual perspectives on technology use that exist within families, with more general insights into how to approach the use of probes.

Capturing individual responses from multiple family members is required before we can compare them. Thus, allowing multiple family members to respond individually to probes is essential when attempting to explore their different individual perspectives on technology use and to establish a more a complex and complete view of their experiences within everyday family life (Horst et al. 2004). However, we acknowledge that this presents researchers with additional considerations. Firstly, this requires us to recruit multiple family members and to engage them in our probe activities. As discussed, family life is busy (Mazmanian & Lanette 2017) and individual family members have different interests, needs and priorities (Horst et al. 2004). Therefore, while researchers can intend to engage with all family members equally, it should be accepted that their individual levels of interest, effort, abilities and overall engagement may vary. This is heightened when including children's responses (Horst et al. 2004). While this might limit the precision and confidence with which individual probe responses can be compared, the varying ways in which individual participants interpret probes can actually provide clues and stimulate interesting discussions about the attitudes of family members and the dynamics between them. Secondly, allowing multiple family members to respond individually to probes introduces a need for two stages of data-analysis; considering

each participant's responses individually, and then amongst the responses of their family members. This adds complexity and time to this process.

While it is also essential to capture collective responses from multiple family members, relying solely upon their collective responses limits our ability to develop complete views on family experiences. This is because collective responses overlook the perspectives of individuals and may instead amplify the views of more powerful, assertive or vocal family members (Mazmanian & Lanette 2017). Also, when attempting to capture collective responses, it is important to note that some probes are better suited to capture collective responses than others. These are usually creative, fun, collaborative tasks that allow participants to express themselves within a relatively short and flexible timeframe. Given the shared, public nature of these tasks, collective responses will likely require more interpretation by researchers and offer limited depth. Therefore, to make these responses more useful, researchers might look for ways in which to offer participants a sense of privacy within these collective tasks. Probes designed to incorporate a sense of individual and collective duality might go some way to achieving this, as shown by our Family Experience Jar and Family Tree probes.

Including a probe that asks multiple family members to compare their individual responses to a task, and then to collaborate on a collective response, significantly enhanced our approach. This is primarily because this process sparked discussions between family members, helping to raise their awareness of each other's perspectives, and of their own. These discussions also prepared participants for follow-up interviews in which we could more easily encourage and support participants to reflect on highly personal, sensitive and sometimes uncomfortable experiences of family technology use. Our approach also incorporated a combination of collective and individual interviews. Collective interviews are more suited to introduce probes. They ensure that individuals see themselves as part of a family unit and prompt them to reflect on experiences within family life. In contrast, individual interviews allow candid reflection on personal experiences of family life that might be considered embarrassing or socially undesirable (Desjardins, Wakkary & Odom 2015). While this aspect of our approach is beneficial, it introduces further time requirements, both in conducting probe studies and in analysing data.

As discussed, existing guidance on the use of probes (e.g., Mattelmäki 2006; Wallace et al. 2013) tends to either consider an individual or collective approach to the method (Horst et al. 2004). Seeking a balance between these two approaches surfaced additional considerations, some of which we have discussed. These considerations of how we can approach the use of probes to better understand family experiences of technology provide a significant contribution to researchers wishing to research co-experiences of technology use in families, and in other social groups.

5.4.6 Conclusions

Family experiences of technology use have been shown to be complex and messy. In particular, conflict and tensions can arise when sets of parents have differing attitudes and approaches to family technology use. This paper presents an example of how to effectively use probes to explore and compare the individual perspectives that exist within sets of parents. It describes the novel approach we took to using probes, by considering parents not just as being part of a set of parents, but also as individuals. It explains how we achieved this by designing our probe collection to capture a combination of individual and collective responses from each set of parents, and to stimulate discussions between them.

This novel approach to using probes helped to address some of the significant challenges posed by researching complex family experiences of technology. Firstly, developing our understanding of the social contexts in which these experiences take place. Secondly, raising our participants' awareness of each other's perspectives, as well as their own. Our approach allowed us to effectively use probes to tease out complex, tacit and even conflicting experiences that take place within families. This demonstration of how we can advance methods in HCI to help develop our understandings of the social experiences of technology use that increasingly permeate everyday life.

5.4.7 Limitations and Recommendations

Our work has demonstrated the utility of using probes to collect a combination of individual and collective responses from multiple family members. We plan to extend this approach to include all family members e.g. children, and to explore a wider range of family configurations e.g. separated parents. This approach to using of probes could also consider how family boundaries and technology adoption evolve over time (Petronio 2002), for example, as children grow up.

Given the lack of explicit guidance on how to design probes to explore social experiences of technology, we see value in adapting this approach to develop more complete understandings of the perspectives of multiple people. We believe this a critical step in advancing methods to support the design of increasingly social interactive systems.

(End of Publication III)

This paper (**Publication III**) has explained how an adapted approach to designing and using probes in Study Two helped to explore parents' individual perspectives on family technology use. The following paper (**Publication IV**) focuses on describing specific probe design tactics that were found to be effective during this Study.

5.5 Introduction to Publication IV

Publication IV is the third and final paper that focuses on methodological knowledge developed during Study Two. It explains particular design tactics that were implemented within the collection of three novel probes. Furthermore, it reflects on how these tactics helped to overcome some of the challenges involved in identifying differences in parents' perspectives and uncovering frustrations, tensions and conflict in their relationships.

One of the key challenges that Study Two presented, was in designing probes that would be capable of considering each parent as an individual, and yet also as part of a set. Another challenge was that parents might not be fully aware of their own attitudes and assumptions relating to technology use, let alone of each other's. This is because some aspects of device use have become so routine, even habitual, and might not be something parents explicitly discuss. In addition, parents might be less willing to share details about technology use that they fear might be perceived as socially undesirable. This reluctance could extend to parents wishing to avoid discussing family conflicts.

This paper describes two probe design tactics that had been especially effective at addressing these challenges. These tactics are (i) creating opportunities for conversation between parents and (ii) shifting parents' individual perspectives.

5.6 Publication IV

Tactics for Designing Probes to Explore Parents' Differing Perspectives on Family Technology Use

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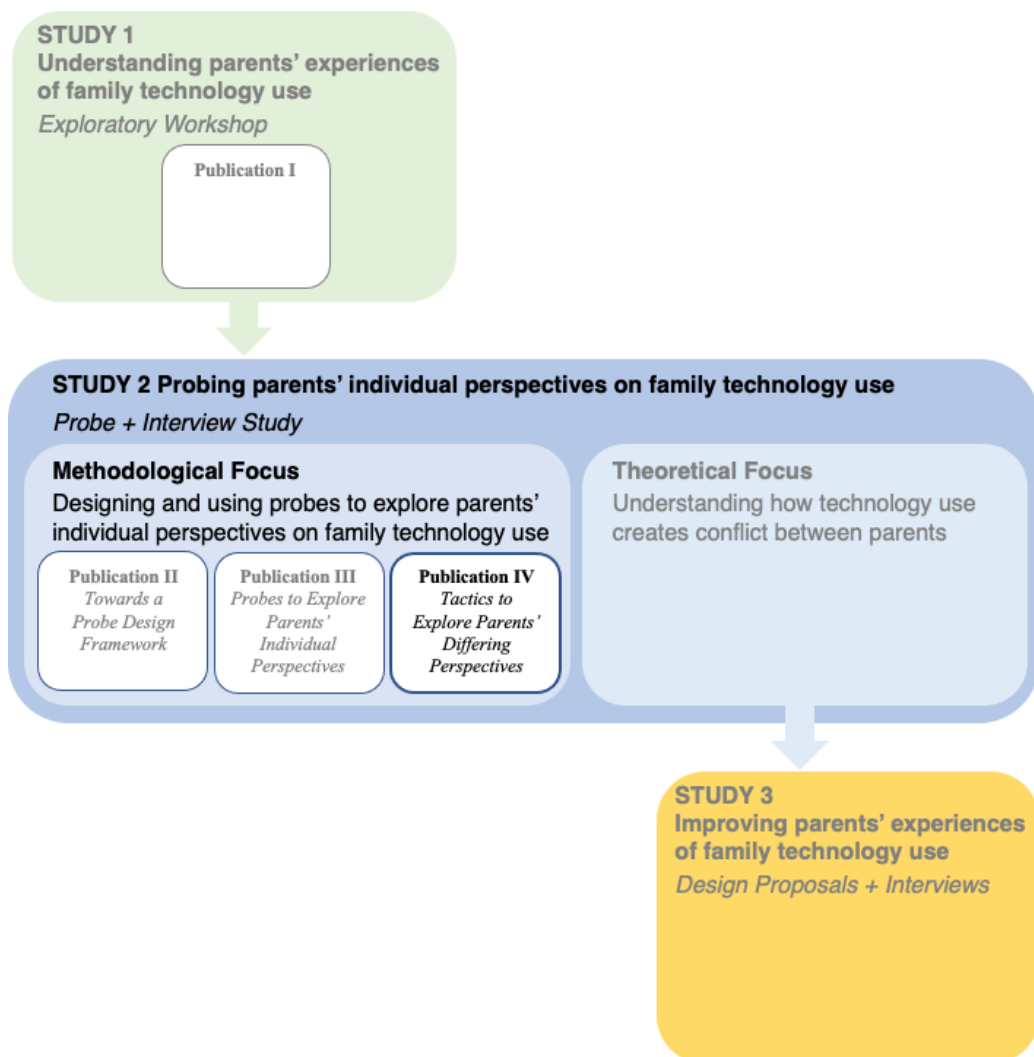


Figure 22. Position of Publication IV within the context of the three empirical studies

*NB. This publication has been significantly edited to reduce repetition of content shared with **Publication II** and **Publication III**, which also describe methodological findings of Study Two. It also shares some similarities with **Publication V** & **Publication VI** (which report on the theoretical findings of Study Two).*

5.6.1 Introduction

This methods paper contributes to our understanding of how probes can be used to better understand some of the complex experiences associated with technology use within families (Blackwell, Gardiner & Schoenebeck 2016; Hiniker, Suh, et al. 2016; Kumar & Schoenebeck 2015). Specifically, the differing individual perspectives that exist within sets of parents, regarding their family's experiences of day-to-day technology use (Ammari et al. 2015; Derix & Leong 2018; Mazmanian & Lanette 2017). To explore these differing perspectives, we designed a collection of probes that incorporated two particular design tactics: (i) to create opportunities for conversation between sets of parents, and (ii) to shift the perspectives of our participants.

These tactics were used to help explore the different experiences, attitudes and expectations of parents. In addition, they helped to uncover the tensions involved while remaining sensitive to any existing conflict. Our probes also enabled reflection of socially undesirable, uncomfortable and even hypocritical situations. We also highlight the value of using these distinct design tactics in combination, within our probes collection, by demonstrating how the cumulative learnings revealed richer, unexpected reflections when compared to the sum of the learnings derived from the use of each individual probe.

Overall, this paper contributes to an understanding of how probes can be designed and used to productively support explorations of individual and co-experiences of technology use within domestic life. We hope that the design tactics and overall approach presented in this paper can help encourage researchers' efforts to develop more productive research tools to support inquiries of domestic HCI and, more broadly, of co-experiences within social groups. We hope that the knowledge presented in this paper can add to researchers' efforts to develop more productive research tools to support inquiries of domestic HCI.

5.6.2 Related Work

*N.B. This section has been significantly reduced to avoid repetition, primarily with the Related Work section in **Publication III** (see 5.4.2) . In its original format, this section included literature relating to three main areas: (i) how family technology use has been researched in HCI (ii) how probes have been designed and used to explore family technology use (iii) the need to explore parents' complex experiences of family technology use (see Appendix 1.3) . The original review concludes with:*

Many researchers have recognised the need to build a more holistic view of families' evolving experiences of technology use (Fails et al. 2012; Isola & Fails 2012). This includes developing our understanding of the interplay between technology use and the complex dynamics within sets of parents (see Derix & Leong 2018). To do that, we require tools that can assist in

exploring the different experiences of individual parents, regarding their family’s technology use. Ideally, these tools would allow us to disentangle the individual perspectives within sets of parents in a way that captures any associated conflict or tension, while remaining sensitive to them. We anticipate that this involves being able to prompt parents to reflect on a wide range of positive, negative, neutral and ambiguous experiences with technology, as well as those that go unnoticed. Next, we will describe a set of three probes designed to address this challenge.

5.6.3 Method: Probe Design and Deployment

In their work with families, Isola & Fails (2012) recommend that researchers should also consider the family as a group besides focusing on individual members. As such, we believe that Battarbee and Koskinen’s (2005) notion of co-experience, to attempt to understand both the individual and also the social user experience to be a useful theoretical concept to keep in mind when exploring family experiences. Desjardin et al.’s (2015) review of HCI approaches to researching domestic experiences provides another source of inspiration for the design of our probes, suggesting researchers consider how different personal experiences of the same home might differ. They also propose considering the perspective of objects within the home, posing questions like, ‘*how does a fridge experience domestic life?*’ (Desjardins, Wakkary & Odom 2015). Guided by these recommendations, we considered ways to design a collection of probes that could support sets of parents to reflect upon the complexity that might exist within ordinary experiences of family technology use with a focus on surfacing and disentangling their individual perspectives. We found three different perspectives to explore (Fig. 23).

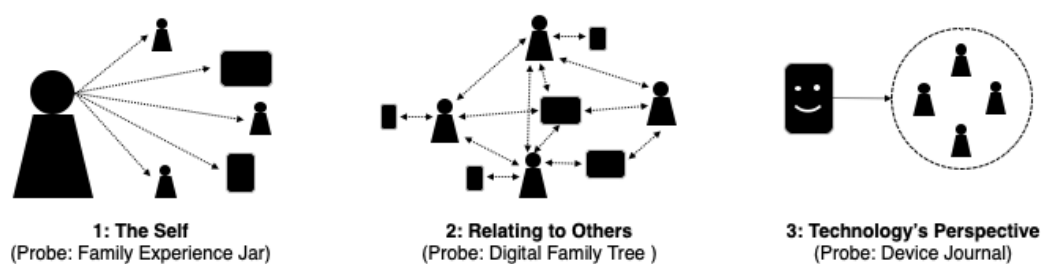


Figure 23. Study Two: Three different perspectives guiding the design of three probes

Perspective 1 – The Self

We wanted to encourage sets of parents to reflect upon their family’s technology use. This includes each parent’s individual perceptions of their own use of technology and their family member’s technology use. This also involves habitual or routine uses of technology, given its prevalence within everyday life.

Perspective 2 – Relating the Self to Others

We also wanted to encourage sets of parents to reflect upon the relationships they have with their family members and the relationships they have with the technologies commonly used within everyday family life. We hoped that guiding parents towards this perspective would enable us to explore how people within the same family perceive that technology is used.

Perspective 3 – Imagining Technology’s Perspective

Finally, we wanted sets of parents to imagine how their technological devices might experience domestic life. This meant encouraging participants to reconsider their default point-of-view (The Self) and to take on a different point-of-view. This was intended to promote reflections of the family unit; to surface more detached, candid considerations that might include any socially undesirable, or uncomfortable aspects.

Designing our probes

*NB. The design of the three probes have also been described in **Publication II & III***

We designed three probes, (i) Family Experience Jar, (ii) Digital Family Tree, and (iii) Device Journal (‘The Secret Life of Us’). Next, we describe how the design of each of our probes was intended to position the participant to reflect from these different perspectives.



Figure 24. Three probes: Probe 1. Family Experience Jar (left), Probe 2. Digital Family Tree (centre), Probe 3. Device Journal (right) (for reference only; identical to Figure. 16)

Probe 1: Family Experience Jar

The Family Experience Jar probe (Fig. 24, left) is intended to encourage parents to log their individual experiences of everyday family technology use, from the perspective of ‘The Self’ (Fig. 23). We gave each set of parents a Jar and a pad of post-it notes to denote the type of experiences they have. Pink for recording positive experiences, blue for negative and yellow for experiences perceived to have both positive and negative aspects. We asked each parent to submit at least one note per day for the duration of the study, inviting them to make additional contributions as-and-when such experiences occurred. Parents were instructed not to discuss their contributions with one another. Finally, we asked each parent to initial and date their notes.

- *Aesthetics*: By designing the Jars in an aesthetically pleasing way, we hoped to encourage parents to position them in visible locations in their homes, which might help remind them to make regular contributions.
- *Transparency*: By choosing Jars made of clear glass, participants could see contributions amassing over time. The visible colour of the notes inside the Jar would also provide ‘at-a-glance’ idea of the types of experiences that had been logged. We hoped this might generate curiosity as to what the other parent had contributed; encouraging reflection and further participation.
- *Single Slot Opening*: We cut a small slot into the lid of each Jar, meaning notes could only fit through if folded. Gluing the lid onto the Jar meant that notes could not be removed once they had been inserted. This prevented the details of each parent’s notes being read by the other.
- *Size*: We chose Jars large enough to contain several notes per day from each parent. We anticipated that visible empty space would promote more participation.

Probe 2: Digital Family Tree

We designed the Digital Family Tree probe (Fig. 24, centre) to explore parents’ perceptions of relationships between technologies and their family. Each parent was asked to create an individual Family Tree diagram to illustrate the relationships between their family members *and* to illustrate the relationships between the technologies used in everyday family life. During the first week of the study, each parent was asked to complete an individual Family Tree. During the second week, sets of parents were asked to compare their individual responses to the probe with each other. They were then asked to collaborate on a collective Family Tree.

Including technologies into these diagrams was intended to play into people’s tendency to anthropomorphize (Epley, Waytz & Cacioppo 2007) and assist them to think about their family’s relationships with technology differently. At the same time, we were interested in the differences between these perceptions and any resulting tensions. We explained that we would be especially interested in discussing how participants perceived the differences between each other’s individual Family Trees, and how they negotiated and collaborated when completing their shared Family Tree.

Probe 3: Device Journal

The Device Journal probe (Fig. 24, right) was designed to encourage parents to completely reconsider their usual point-of-view and instead to take on the viewpoint of the technologies used in everyday family life. Inspired, in part, by artefact ecology (Jung et al. 2008), we devised a comic-style Journal called ‘*The Secret Life of Us*’, in which characters are technological

devices, rather than humans.

We asked each parent to imagine how their devices experienced family life and individually journal them for two days. We hoped this playful probe would enable each parent to take a different viewpoint, with a refreshed perspective of their family and experiences. We hoped the tool could help surface insights of habitual technology use that might have been taken-for-granted, unremarkable, uncomfortable or even socially undesirable. Given the abstract nature of this task, we tried to support and inspire the participants by playing a short clip of 'Everything Is Alive' (Chillag 2018), a podcast series of fictional interviews with personified everyday objects, played by actors.

Research design and probe deployment

This research was conducted in accordance with ethics approval from the University of Technology Sydney. Our study involved 17 parents of young children, from eight families. For each participant, the research spanned across 14 days.

On Day 1, we conducted an Opening Interview at each of the eight family homes. This lasted 60-90 minutes. Each parent briefly introduced themselves and their family, and discussed technology use within broader family life, including routines, values, aspirations, and expectations. We then introduced parents to our probes and provided detailed instructions on how and when to complete them. We specified which probe activities were to be completed individually and which were to be completed collectively (Fig. 25).

Participants were told that they had 10-12 days to complete the probes. Between day 10-12, we collected completed probes and reviewed participants' responses, identifying interesting questions to be discussed during the Closing Interviews. On day 14 we held Closing Interviews with each of the 17 parents, individually. The choice to discuss the completed probes with each parent on their own, rather than with sets of parents, was a conscious one. We hoped it would encourage parents to be more candid, ensuring we captured their different perspectives. Each Closing Interview lasted between 50-70 minutes. This was a researcher-participant co-exploration of the completed probes; to make sense and to reflect, retrospectively, on their use of the probes. This interview also gave us the opportunity to seek clarifications of certain responses we found interesting when reviewing the completed probes.

Participants

We recruited 17 parents to participate (S2P1-S2P17), from eight families with at least one child under the age of twelve. All parents had between one and three children, ranging between 1 month and 15 years. Participants held a range of occupations and a broad spectrum of outlooks and experience of technology. Participants were ethnically diverse. We should also note that one

set of parents included three participants, a mother, aunt and grandmother, living together and raising three young children. Participant details are summarised in **Publication III** (see Table 5 in 5.4.3).

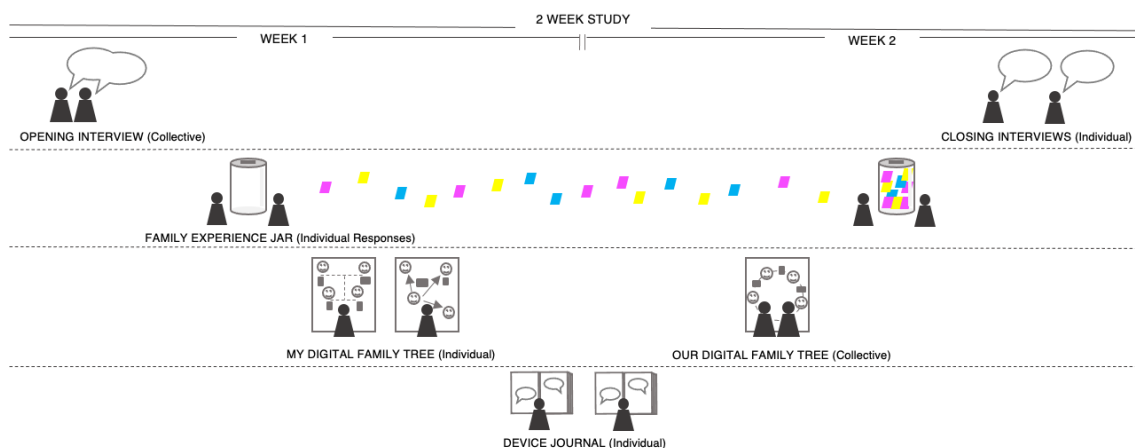


Figure 25. Study Two: Probe Deployment Plan (For reference only; identical to Figure 4)

5.6.4 Findings: Effective Tactics for Designing our Probes

During the Closing Interviews, we found that our probe collection was successful in prompting varying levels of reflections about family experiences with technology. During our discussions, we heard many stories about the differing ways each parent perceived experiences of technology use within their family’s everyday life. This included unexpected realizations that participants sometimes found to be emotional, and even surprising.

Within the messiness of family life, habitual, routine interactions with technology, and the experiences that result can seem automatic and inconsequential. Our probes were able to shift the perspectives of participants: for example, by inverting the conventional individual-centric point of view to imagine how technologies perceive family life. By reflecting from different perspectives, our participants began to interrogate aspects of their family’s experiences and even reassess their views. The probes helped to reveal usually hidden experiences of family technology use, in particular, the way people perceive the role of technology, and the way it affects relationships within family life. The effectiveness of our probes was due to two distinct design tactics. The first tactic is to create opportunities for conversations. This means designing probes that can spur conversations between sets of parents, as well as self-reflections – internal conversations of the self. The other design tactic is to shift the perspectives of participants. This means designing probes that require sets of parents to see things from different perspectives, including each other’s. Finally, our probes were found to be most effective when designed and put to work as a probe collection, combining these two distinct tactics.

Tactic 1: Creating opportunities for conversations

Our first tactic, of effectively creating opportunities for conversations, was employed in several

ways through the design of our probe collection.

Probes that create opportunities for internal dialogue.

By asking participants to make regular contributions to the Experience Jar, we found that people became inadvertently more mindful of their technology use. Logging thoughts about their experiences of technology made people's internal dialogue explicit. This led them to be more aware of the relationships they have with technology, which also led to realisations that were sometimes uncomfortable. For example, S2P13 left some notes in the jar that described her realisations about her technology use:

"Wasting time! Realised surfing Facebook is a habit and not very satisfying...", *"Frustrated that I keep almost compulsively) checking the weather app..."* and *"It has been a real struggle...not using technology as a babysitter"* (S2P13, Jar).

When interviewed, S2P9 described how the Family Jar probe had resulted in some surprising realisations of her habits with technology,

"I'd never really tied these automatic habits like just picking up your phone to an emotional motivation. What surprised me was thinking about the emotions around those experiences, rather than just going through the motions without really thinking about it." (S2P9, Interview)

We believe that, had we not used this probe, it is unlikely that our participants would have had the opportunity to recognise or question their more complicated relationships with technology.

We also used the Journal to prompt participants' internal dialogue. Over two days, participants were told to imagine how their devices would experience everyday domestic life. Interestingly, most of our participants' journal entries consisted of what they imagined their devices would say to them. For example, S2P12 had imagined that before bed, his smartphone would tell him,

"I can take you anywhere you want..." and *"...let me help you sleep, and tomorrow I will wake you up again"* (S2P12, Journal)

Such entries hint at the unspoken conversation or expectations participants have of their devices. They also reveal how much people felt dependent on their personal technologies.

When exploring these Journal entries during interviews, most participants further elaborated upon what their device would say. For example, when S2P15 described how she imagined how her smartphone would feel when not being used,

"It would be calling out to me; Use me! Use me more!" (S2P15, Interview)

Encouraging participants to put themselves in their device's 'shoes' led some people to unwittingly reveal the lure they felt towards technology, especially personal devices, like smartphones.

Probes that allow sets of parents to compare their responses.

We designed our probes to allow sets of parents to compare their individual responses with one another. This was done more subtly with the Family Experience Jar probe. While each parent was prevented from reading the details of what the other(s) had written (since notes had to be folded to fit through the Jar opening) the transparency of the Jar meant that the number and colour of the notes inside were visible. This enabled each parent to deduce the frequency and the nature of each other's experiences (positive, negative or ambivalent).

In the design of the Family Tree probe, the act of comparison was made more explicit. Sets of parents were asked to compare their individual Family Trees with one another, and to note any similarities or differences. In our interviews, we found that this aspect of the probe had enabled sets of parents to realise some of the assumptions they had made about their family's technology use. This allowed them to become more aware of each other's perspectives on technology use. For example, S2P12 was surprised to learn about the central role TV played in his family, realising that his family spent more time watching TV in his absence than he had previously imagined,

"I see that the TV is central to the family, but I don't have any connection to it personally"
(S2P12, Interview)

We noticed that several of our participants were surprised to learn that their assumptions about their families' technology use were not always right.

By comparing their individual Family Trees, some parents were prompted to re-examine family technology practices that they had previously taken for granted. For example, S2P2 who allows her children to access her phone had always assumed that her husband did the same. However, in her interview, she described her surprise at noticing that her husband's Family Tree showed no connection between his phone and the children. This had prompted her to ask her husband about this and learn for the first time that he did not, in fact, allow their children to use his phone since he considered it to be a work tool. In this way, we had designed a probe capable of creating opportunities for conversation between parents and raising awareness of different perspectives on technology use that tend to be overlooked in day-to-day family life.

Probes that allow sets of parents to collaborate.

After comparing individual Family Trees with each other, sets of parents were then asked to

work together to create a collective Family Tree. By introducing collaboration into this probe, parents had to negotiate their individual perspectives on family technology use with each other. This created opportunities for a different kind of conversation, which we found, included interesting discussions, realisations, and challenges. Our participants told us that this probe led to some new-found realisations.

For example, S2P8 explained how this task had spurred conversations within his family that led him to reassess the assumptions he had about their technology use:

“I thought that it was a family desktop, but our Family Tree made me realise that it’s really just me who uses it. I recognise now that these devices are more personal than shared” (S2P8 Interview).

Similarly, S2P9 discussed realisations they had made during the study,

“S2P10 will tell you a different story...I am surprised at S2P10’s self-opinion of her own use. She doesn’t think she uses (her smartphone) that much, but I really do. The (probes) gave me a legitimate lens to have a look at that.” (S2P9, Interview).

This appreciation of the opportunities, provided by our probes, to discuss perceptions of technology use with one another, was also expressed by other participants.

Tactic 2: Shifting perspectives (using personification)

Our second tactic of shifting the perspectives of participants, was achieved through the design of probes that attempted to do this either explicitly or subtly.

Explicit use of personification to shift perspectives.

We used personification in the Device Journal probe to invert the human-centric view of seeing the world, by asking parents to journal experiences from the technology’s point of view. Imagine how their devices might experience family life, to complete journal entries in the imagined voice of those devices.

Each journal required an introduction, in which individuals had to write about themselves in the third person, from the point of view of a device that would know them well. Almost all parents identified this device as their smartphone. When we read our participants’ journal entries, we found that this probe activity revealed the strong agency these devices had in their lives. For instance, S2P13 imagined that her smartphone would write,

“I do everything for her” (S2P13, Journal)

Meanwhile, S2P7 had imagined what her smartphone would say of her,

“She can’t be separated from me” (S2P7, Journal)

S2P1 had imagined that his smartphone would declare,

“I am the centre of his life!” (S2P1, Journal)

Entries like this reveal how central the smartphone is in shaping the experiences of domestic life for many parents.

Using personification when designing this probe provided our participants with the opportunity to confer a character, a voice, opinion and a life to a technology. As a result, they were better able to reflect on their domestic lives from a different point of view. What we read were vivid and colourful descriptions of technologies having relationships with individuals. Such accounts are not usually the kinds we often read or encounter in HCI. For instance, the imagined envy that one device would feel towards another,

“I’m a bit jealous that I have to sleep downstairs...the other phone gets to sleep in the bedroom and seems to get much more attention” (S2P13, Journal).

Entries like these highlight how personification can lead participants to inadvertently divulge clues about how technology use shapes family relationships.

During our discussions, parents explained how the ‘inversion’ of hearing what the device would say about them led them to new perspectives of themselves. This includes new realizations about their relationships with these technologies and with their family members, as well as the role these technologies had in their domestic life. Discussions of their journal entries also often triggered parents to reassess their relationships with their devices. For instance, S2P1 read a Journal entry aloud (written in the imagined voice of his smartphone),

“I am a new addition to my Master’s life” (S2P1, Journal)

S2P1 looked at us and grinned,

“Actually, it’s probably the other way round!” (S2P1, Interview)

S2P7 also reassessed the relationship she had with her smartphone when discussing one of her journal entries,

“It would call me its mother...or maybe, actually, not a mother, a daughter. The phone is my mother. I am the daughter” (S2P7, Interview)

Similarly, S2P13 considered,

“My smartphone is like a colleague, not a buddy - I’d go for a coffee with him, but not a beer!”
(S2P13, Interview).

Using personification gave license to people’s imaginations and certainly added a sense of playfulness to this probe. It also helped surface a more detailed picture of participants’ technology practices. In our interviews we noticed how some participants really enjoyed the task and injected humour into their responses. For instance, S2P15 laughed as she explained why she imagined her smartphone to be female,

“It’s too intelligent and sensitive to be male. It listens to me! It’s is too organised (to be male) ! It’s addictive though. It distracts me from doing other things.” (S2P15, Interview).

We also saw how effective personification was at freeing the imaginations of participants less eager to express their reliance on, and attachment to technology. For instance, asked about the relationship she had with her phone, S2P10 initially replied,

“My imagination is struggling...I don't have that sort of relationship with my phone; it's just a thing” (S2P10, Interview).

When urged to consider an object that she felt more enthusiastically about, she conceded,

“My bike would describe me as a hard taskmaster...but then, so would my phone, I reach for it compulsively. I feel physically anxious when the battery is low. I’ve never personified it before. It’s a bit more of a boss, in that I must respond to it. I feel very apologetic if I stuff up something (e.g., miss an appointment by neglecting it) ” (S2P10, Interview).

Using personification in this probe helped to reveal emotional and ambivalent aspects of people’s relationships with technology. In general, this allowed usually more concealed aspects of people’s technology use to surface. As such, this probe reveals how people often take their relationships with technology for granted without explicitly reflecting upon it. These revelations would also have been much more challenging to pursue just using interviews.

Subtle use of personification to shift perspectives.

The Family Tree probe asked parents to illustrate relationships between family members and the technologies used in everyday family life. We felt that this is a more subtle form of personifying the technologies. Yet, we were still able to prompt valuable insights. This probe shifted our participants’ perspectives (from the conventional view of ‘the Self’ to ‘the Self in relation to others’) and also allowed them to rethink the role and relationships that technology has in family

life. When we asked our participants to review their completed Family Tree probe, they often compared the relationships between family members and devices to relationships between family members. For instance, S2P8 pointed to how he had positioned his wife's smartphone between him and his wife when drawing his Family Tree, concluding,

“her device probably knows more about her than I do.” (S2P8, Interview)

His wife came to a similar conclusion in her interview, when she reviewed the way she had completed her own Family Tree,

“my phone probably knows more about me than my family members” (S2P7, Interview)

Reflecting on Family Trees in this way revealed the surprising ways that technology use both mediates and shapes family relationships.

Combining distinct tactics within a probe collection

In designing our probes, we viewed them as a collection that would guide participants to look at family technology use from a range of different perspectives. By combining the responses to each probe, we hoped to not only build a more complete picture of individual perspectives on family technology use but to also build a more complete picture of the multiple perspectives that exist within families.

During our Closing Interviews, we asked our participants to reflect retrospectively on their experience of completing this probe collection. What they told us made us realise that, by altering the perspective of our participants and prompting them to detach and de-familiarise themselves from situations, people had begun to interrogate habitual behaviour that had been accepted as an inherent part of everyday family life. For example, S2P9 explained that the degree of conflict associated with her family's technology had become apparent to her as a result of completing the probes,

“Overall (the probes) enabled me to reflect on all the conflict there is because of technology use. I guess I wasn't aware how much that was taking up my energy” (S2P9, Interview).

In addition, when our participants reviewed their completed probes as a collection, they sometimes noticed contradictions in how they had responded to different probes. This challenged their preconceived ideas about their family's technology experiences. For example, S2P5 reacted to having a majority of pink notes in her Jar, which denote positive experiences,

“I expected more blue notes” (S2P5, Interview)

S2P5 paused, while considering the less positive tone of responses she had made to the Family

Tree and Device Journal probes. These had raised her awareness of her ongoing efforts to limit her children's screen-time. Reflecting on her responses to these varied responses, she deduced,

"I guess I'm happy with the way we interact with technology...I'm more disturbed by the extent of it" (S2P5, Interview).

We found that by asking participants to review their probes as a collection, participants were able to consider their various responses at a more high-level and relational view, maybe even noting inconsistencies and mistaken assumptions about the role that technology plays in the lives of their families. In turn, this resulted in more nuanced reflections about the phenomenon.

5.6.5 Discussion

Our review of related literature acknowledges an established practice within HCI of using probes in a dialogical approach to support and stimulate discussions with participants in follow-up interviews when working with families (e.g., Horst et al. 2004; Hutchinson, Mackay, Westerlund, Bederson, Druin, Plaisant, Beaudouin-Lafon, St, et al. 2003; Mattelmäki 2006). We use probes in a similar fashion - as a dialogical tool to explore family experiences of technology.

This paper adds to HCI's scholarship by demonstrating how probes can be designed and used productively to support research inquiries, especially when seeking better understandings of technology use in families. We make this claim after examining our participants' responses to our probes, and after interviewing them about their use of our probes. Reflections of our findings have led to a number of methodological insights. These insights pertain to the two distinct design tactics we have found to be effective when employed to design probes aimed at surfacing richer and more holistic understandings of family technology use. The three probes we designed, deployed and presented in this paper, exemplify how these distinct tactics can be combined and used successfully. First, we will reiterate why we need tools that can support researchers to better explicate the multiple perspectives that surround technology use in families.

As many researchers remind us, families are not homogenous units but can be viewed as diverse communities with differences in age, gender and so on (Horst et al. 2004). As such, the achievement of shared family aspirations requires the juggling of different individual roles, responsibilities, expectations, and attitudes. To achieve shared understandings within families requires compromise, negotiation, and reciprocity between individuals. Meanwhile, the increasing adoption and pervasive use of personal technologies in the domestic life of different individuals can and will continue to have significant effects on family dynamics (Ammari et al. 2015; Blackwell, Gardiner & Schoenebeck 2016; Hiniker et al. 2015; Hiniker, Suh, et al. 2016;

Schiano et al. 2016). As such, any HCI efforts to design digital technologies (especially personal mobile devices) that could be used in ways that are supportive of domestic dynamics, will greatly benefit from deeper understandings of the individual attitudes that family members have towards technology use in domestic life. This involves understanding the various roles of individual family members, as well as the different and shared perspectives they have towards technology use. To develop this understanding, we will require effective tools to help surface and explicate the complex dynamics that surround family technology use. Asking questions through surveys and interviews may help, but there are also many aspects of family dynamics surrounding technology use that are not easily surfaced through these methods.

One challenge of exploring family experiences of technology is that people might not be totally aware of their own assumptions, approaches, and attitudes with regards to technology use. This is especially the case, with personal practices surrounding technology and with personal technologies in particular. This may be because technology use has become so habitual that individuals take them for granted. As a result, people are often unaware of their own perceptions, attitudes, and approaches to technology use. This leads people to make assumptions (whether accurately or not) about their own technology use and that of other family members. As illustrated in our findings section, many of our participants were surprised when confronted with unexpected realisations about themselves and also of other family members.

Another challenge is getting individuals to disclose the cause of tensions that might exist in their family as a result of technology use. Participants may find it uncomfortable or embarrassing to discuss private and possibly socially undesirable topics such as family conflict. The participants may not be fully aware of the underlying causes, or degree of the tension they experience. This is especially true in families where tension around technology use has become an accepted part of domestic life.

Our work reveals the utility and effectiveness of using probes, or more specifically, probes that use certain tactics to help surface and explore these challenging but important aspects of family dynamics surrounding technology use. Next, we discuss the two distinct tactics we used to design our probes.

Discussing Tactic 1: Encouraging dialogue

The first tactic we used when designing our probes was to create opportunities for conversation. This can be seen in various ways within our probe collection. In its core, these conversations are occasions for 'dialogue' (in Bakhtinian terms). For Bakhtin, we are always in dialogue, not only with others and with everything in the world but also, internal conversations we have with ourselves (Holquist 2003). Thus, this tactic can be seen in the design of probes that can *make explicit individuals' internal dialogue*. The Jar probe encouraged individuals to reflect upon their own technology use. This resulted in deeper awareness and greater (and sometimes

uncomfortable) realisations about one's use and relationship with personal technologies. The Journal took a completely different approach by challenging individuals to rethink their relationships with their devices; asking them to reimagine the relationship and the agency their devices might have on their lives. This resulted in surprising and colourful reconceptualisations of the sometimes intimate and emotional relationships people have with their personal technologies. Their responses to these probes and the interviews also provided further insights into the individuals' dialogical sensemaking process with regards to their technology use (McCarthy & Wright 2004).

This first tactic also involved the design of probes that make explicit one parent's relational sensemaking process to the other. In other words, surfacing how parents perceive and in turn, makes sense of their technology use in relation to one another. This approach was used in the Family Tree probe where sets of parents compared their own responses about technology use with responses from one another. This probe activity led to self-awareness and also an awareness (or at the very least, a consideration) of how one another perceives family technology use. This first tactic is also seen in the design of probes that try to make explicit collaborative dialogical sensemaking (Leong et al. 2010; McCarthy & Wright 2004). The Family Tree probe involves sets of parents collaborating to complete a probe about their family's technology use. The probe aimed to surface both individual and shared perspectives. This probe reveals not only realisations of similarities, but also recognition of differences in perspectives, assumptions, and gave sets of parents insights into how one another made sense of their own technology use.

By designing our probes to engage sets of parents in activities to compare and talk about individual perspectives; to collaborate and to negotiate a common perspective, they were prompted to rethink the assumptions they had about each other. Using different approaches to provide opportunities for dialogue and collective sensemaking have surfaced discussions regarding the way technology use can trigger family conflict.

Of course, there are many other ways to provide opportunities for conversations. When designing probes, it will be helpful to think strategically on how to find ways to spur conversations; not only to help individuals to be aware of their own perspective towards technology use but also to surface their perceptions of how others in their family perceive and approach technology use. Finding productive ways to support families to explicate these different perspectives is crucial if we wish to develop a richer and more holistic understanding of family technology use.

To the best of our knowledge, we have not come across any explicit discussions in HCI of how probes can be designed strategically to support such explorations. Of course, there are many researchers who have used probes when researching families. Some designed probes for families to complete together (Dalsgaard et al. 2006; Horst et al. 2004; Volda & Mynatt 2005). For example, Horst et al.'s (2004) probes, designed to explore empathy and to elicit inspiration

from families, asked family members to work together to provide a single response. A follow-up interview was then conducted with all family members present to discuss their response. However, in their case, individual perspectives regarding empathy were absent.

There are researchers working with families who have asked individuals to complete probes independently. For example, in studies of intimacy between couples (Kjeldskov et al. 2004; Vetere et al. 2005) and between children and their grandparents (Davis et al. 2007), where individuals were asked to complete some of the probe activities independently. However, the interviews to explore the probe responses were conducted with the participants together, instead of separate interviews with individual participants. Their work did not seek to explicate differences of perspectives but sought agreements to inform designs. In that respect, potential tensions and differences between individual perspectives were not explored. In this study, we found that these opportunities for conversations also benefited families beyond the value they provide for researchers. For our families, having these conversations have helped to reduce assumptions and potential misunderstanding about technology use, that could lead to conflict.

Discussing Tactic 2: Shifting perspectives

The second tactic we used was to design probes that help to shift an individual's perspectives of experiences of technology use within everyday family life. We found this to be particularly useful when trying to explicate practices and attitudes surrounding technology use that have become habitual and taken for granted.

One effective approach to this tactic was to use the personification of personal devices. As we have described, the Device Journal asked people to give a voice and personality to their personal devices. Asking them to imagine how these devices would experience their family life was an effective strategy to shift (or even invert) the perspective of participants – from that of 'the self', to how an inanimate object such as their smartphones might experience their family life. This shift in perspective was able to reveal greater insights into roles, relationships and the agency that people ascribe to their personal technologies (e.g., smartphone as a mother-figure, TV as a peacekeeper), as well as the strong emotional pull their technologies seem to play, both in the lives of individuals and families.

We also attempted to shift our participants' perspective through the Family Tree probe. Here, the approach is to instigate a slightly subtler shift in perspective (when compared to the Device Journal). We accomplished this by tapping into people's natural tendency to anthropomorphise (Epley, Waytz & Cacioppo 2007), asking individuals to consider their relationships with their devices, if these devices are seen as part of the family.

These two probes helped to free people's imagination and allowed them to rethink their relationships with their technologies. They are successful because our participants found these

tasks to be playful and engaging. Our participants injected humour into their responses and provided all kinds of elaborate details such as the imagined feelings, relationships, and even gender that their technologies might have. More importantly, the probes were able to reveal surprising and unthought of realisations and insights for both researchers and participants. Many of our participants were surprised when they ‘discovered’ their routine, and habitual use of technology, through the voice of their technologies. As researchers, these probes encouraged our participants to disclose aspects of their families’ technology use that they were less enthusiastic about, such as conflict and parenting challenges.

Researchers have used probes to get participants to see things in a new light. For example, Berkovich (2009) asks people to imagine themselves at some point in the future to explore their financial goals. While Berkovich’s approach guides participants to think about their finances in different ways, individuals remain in the point-of-view of ‘the self’ throughout the seven probe activities. As we explained, when exploring technology use, there is definitely value in ensuring that our understandings and inquiries shift beyond human-centric views. Only through gaining multiple perspectives (including that of our technologies) can we paint a more holistic picture of our complicated relationships with technologies, especially within domestic lives.

In HCI, defamiliarisation has been offered as a useful strategy to help designers reimagine the design of domestic technologies (Bell, Blythe & Sengers 2005). However, we have not found any explicit discussions of how defamiliarisation can be used productively to reveal hidden aspects of people’s relationships and experiences with technologies. As Shklovsky (Davis) suggests, defamiliarisation can provoke and refresh people’s perception by heightening it through unfamiliarity and strangeness. By making something familiar (and taken for granted, such as one’s habitual use of personal technologies) strange, people are compelled to examine their automated perception. The Journal and the Family Tree were able, to a different extent, trigger reassessments that led to surprising realizations about their own practices and attitudes surrounding technology use.

On a side note, we also see the potential usefulness of using personification as a design tactic beyond our work. This design tactic has the capacity to prompt people to imagine the agency of technology, and to become aware of the potentially active and strongly emotional roles technologies can play in domestic life. As such, we posit that this tactic may be very useful in explorations of domestic connected devices such as the IoT, and imaginations of how we can design future IoT devices that can be more supportive of family life.

Discussing combining tactics: to understand the collective

Finally, another contribution we offer is to highlight the value of combining distinct tactics within a probe collection. Working with participants to review and consider their responses – comparing and contrasting responses they provided from one probe to the next, and as a whole collection, – shifted participants’ perspectives of the phenomenon. This led to deeper reflections about technology use in their family because they can start to see patterns and inconsistencies. Designing a probe collection that combines two distinct tactics allowed insights to be built cumulatively and gradually from one probe to another, with the overall findings greater than the sum of the insights gathered from each probe.

While the use of probe collection is common within HCI (Wallace et al. 2013), with the exception of Berkovich (2009), designing probe collections to intentionally combine two distinct tactics has not been explicitly described. Our work provides yet another example of how probes can be designed and used productively as a collection. Berkovich (2009) used a number of probes to guide participants to take different perspectives on a certain topic, and added the responses of each probe to “build a holistic understanding of the participant’s perspective”. We also used our probes to guide participants towards different perspectives. However, our probes were used to consider the different perspectives of individuals towards shared experiences. In addition, our probes were used to raise participants’ awareness of the perspectives of other family members. While Berkovich (2009) uses a probe collection to build a better understanding of individuals, we use our probe collection to build a better understanding of not only individuals but also of the collective. This is because our probes enabled reflection on co-experiences and other family members’ experiences with technology, even when our participants were absent.

Many researchers have used probes as a source of data triangulation. However, when designed, conceptualised and put to work as a set, the sum of the insights can add to probes’ potential value for triangulation within research inquiry (Volda & Mynatt 2005). That is why we have a newfound appreciation for the value of designing and putting probes to work as a collection, rather than viewing probes as a series of separate artefacts used to capture fragmented aspects of a phenomenon of interest. We recommend that this approach is considered in any research involving the use of probes, not only when exploring families.

5.6.6 Limitations and Recommendations

Our work has demonstrated the utility of a probe collection to effectively explore the differing perspectives within sets of parents, on their family’s technology use. This collection is designed to both encourage conversation between sets of parents, whilst shifting their perspectives through the use of personification. This requires a reflective and skilled designer/researcher, able to conceptualise how individual probes can be designed to work synergistically, to elicit

insights that are greater than the sum of their parts. It also requires probes to be deployed strategically to allow a combination of individual and collective responses to be captured. While probes that use personification to shift the perspective of participants can be insightful, their abstract nature may demand a certain level of imagination of participants. Mindful of this, we suggest the need to support participants by providing some type of scaffolding material, in our case, the use of a podcast. When designing a probe collection, these more abstract probe activities should be preceded by probe activities that require less imagination and provide an easy entry point. While this method helped to reveal deeper understandings of parent's perspectives on family technology use, we suggest further work into how to utilise such design tactics to explore the experiences of all family members, including children, and wider social groups such as within workplaces.

(End of Publication IV)

I now draw on the findings presented in **Publications II, III and IV** to summarise the methodological findings that emerged during Study Two.

5.7 Methodological Findings from Study Two

Study Two contributes methodological guidance on how to think about designing and using probes, especially to explore individual perspectives that exist within families. It also demonstrates an example of an effective approach to support explorations of domestic life that look beyond individual experiences of technology use, and consider more complex social experiences, including co-experiences. Specifically, it demonstrates how the design and use of probes can be adapted to engage with sets of parents in order to capture and tease apart their individual (and differing) perspectives on family technology use.

Explicating and extending existing probe guidance

Critically reflecting on the process and value of using Wallace et al.'s *Making Design Probes Work* as a framework to designing and using probes during Study Two helps to clarify and develop existing guidance on the method. It also demonstrates how this distilled, more generalizable framework can help HCI researchers and designers to think more strategically about probes – especially those turning to the method for the first time. In particular, this process (as explicated in **Publication II**) includes:

- Defining four probe design properties (*openness/boundedness, materiality, pace and challenge*)
- Describing how probe design properties can be affected by various design decisions
- Explaining how probe design properties can influence participant engagement
- Suggesting how to visualize these probe design properties
- Recommending how to balance these design properties within a probe collection
- Identifying additional considerations required when probing into individual perspectives within families (e.g. whether to capture individual or collective responses)

Adapting the design and use of probes to explore individual perspectives within families

Reflecting on the effectiveness of the probes that were designed and used during Study Two helped to extend our understanding of how the design and use of probes can be adapted to capture multiple individual perspectives, especially when engaging with families. The adapted approach to probes that was developed in this study, primarily involved capturing a combination of individual and collective responses from each set of parents. This deviates from more standard approaches, which either seek to capture individual responses from a single (representative) family member, or to explore the collective perspectives (of the whole family).

The adapted approach (as explained in **Publication III**) included:

- Designing a collection of probes that capture a combination of individual and collective responses from parents, including:
 - probes that are completed by each parent *on their own and in private*
 - probes that are completed by parents individually and then *shared* or *compared*
 - probes that are completed *collaboratively* by parents together.
- Providing parents with a range of opportunities to reflectively discuss their experiences together *and* on their own, including:
 - Interviewing each set of parents when they are *together* (initiating study)
 - Interviewing parents *individually* to discuss completed probes, privately (closing study)
- Analysing individual and collective probe responses in various ways:
 - considering parents as individuals within an entire group of study participants
 - considering parents as part of a set by comparing their individual responses
 - considering parents as part of a set by comparing their individual responses with collective responses

This adapted approach to designing and using probes in Study Two was found to help elicit unexpected realizations and prompt parents to reflect on less desirable experiences by:

- *Revealing family dynamics, roles and relationships*

When analysing completed probes, it was found that comparing parents' individual responses with one another - and with their collective responses - could reveal clues about family dynamics. Comparing individual responses also helped to identify situations in which a set of parents described the same instance of technology use.
- *Surfacing the individual practices and priorities of each parent*

Comparing the individual responses to our probes also helped to reveal the different individual practices and priorities within each set of parents, regarding technology use. It also helped to identify differences between each parents' broader perceptions of technology use within family life.
- *Raising parents' awareness of each other's perceptions*

Probes that involved communication and collaboration helped raise parents' awareness of each other's perceptions on technology use. In turn, this prompted participants to re-examine and re-assess family technology practices that they had previously taken for granted.
- *Prompting parents to reassess their own perceptions*

Asking parents to collaborate on a shared response prompted them to compare each other's individual efforts more deeply. Though challenging, this encouraged greater understanding and reflection, not only of one another's perceptions, but also of their own.

Probe design tactics to study parents' differing individual perspectives

When further reflecting on how the probes used during Study Two had helped to capture and tease apart parents' differing perspectives, two probe design tactics were found to have been especially effective. As described in **Publication IV**, these two tactics are:

Tactic 1: Creating conversations between sets of parents

This tactic was implemented by:

- Designing probes that create opportunities for internal dialogue
- Designing probes that create opportunities for parents to compare their individual responses
- Designing probes that create opportunities for parents to collaborate on a joint response

Tactic 2: Using personification to shift the perspectives of participants.

This tactic was implemented by:

- Use personification to design probes that prompt a subtle shift in participants' perspectives
- Use personification to design probes that prompt a more explicit shift in perspective

Finally, reflecting on the method used in Study Two demonstrated the value in combining these two distinct tactics when designing and using probes to explore parents' individual perspectives.

5.7.1 Moving on to the Theoretical Findings from Study Two

The methodological findings that have been presented in this section emerged when reflecting on the design and use of the probes developed during Study Two. The ultimate goal of this probe and interview study was to generate theoretical understandings of how parents' individual perspectives on family technology use are communicated, negotiated and might contribute towards conflict in parents' relationships. I now move on, in Chapter 6, to focus on the theoretical findings that were surfaced during Study Two.

CHAPTER 6

Study Two

Theoretical Focus

CHAPTER 6. Study Two | Theoretical Focus: Understanding Conflict in Parents' Relationships

While Chapter 5 concentrated on the methodological knowledge that was developed when designing and using a novel set of probes in Study Two, this chapter considers the theoretical understandings that were surfaced by conducting this two-week probe and interview study. These theoretical findings pertain to the way in which parents' responses to the probe and interview study helped to address:

RQ3 How does technology use within families contribute towards conflict in parents' relationships?

This research question arose from findings of the workshop conducted during Study One (see Chapter 4). Specifically, that parents often describe their attitudes, expectations and approaches relating to technology use by comparing or contrasting them with that of the other parent in their family. Furthermore, that parents' differing attitudes towards how technology is used within the family could contribute towards conflict in their relationships – something that had not been previously explored explicitly in HCI research. Thus, Study Two was intended to explore these findings in more detail through a two-week probe and interview study which engaged with eight sets of parents (a total of 17 participants).

The theoretical findings established during Study Two have been reported in two publications (**Publications V & VI**):

- **Publication V** *“It's The Same Conflict Every Day, On Repeat” How Digital Technology Use Can Contribute Towards Conflict in Parents' Relationships*, first published in the Proceedings of the *CHI Conference on Human Factors in Computing Systems* in 2021.
- **Publication VI** *Family Technology Use: Sources of Conflict in Parents' Relationships*, published in the *Proceedings of the Australian Conference on Human-Computer Interaction* in 2021.

After presenting these publications, this chapter concludes by summarising the theoretical findings of Study Two and explaining how these informed the design of my final study.

6.1 Introduction to Publication V

The first paper that I include to describe the theoretical findings from Study Two is **Publication V**. This paper illustrates how conflict between parents can arise from, or be amplified by, the way in which technology is used within the family. It focuses on the especially candid responses of two sets of parents, whose experiences were found to be good exemplars and representative of those reported by the other parents who took part in Study Two. Their responses help to illustrate how four key factors can help enable, or amplify conflict between parents, as a result of technology use.

6.2 Publication V

“It’s The Same Conflict Every Day, On Repeat.” How Digital Technology Use Can Contribute Towards Conflict in Parents’ Relationships

Derix, E.C., Prior, J. & Leong, T.W.

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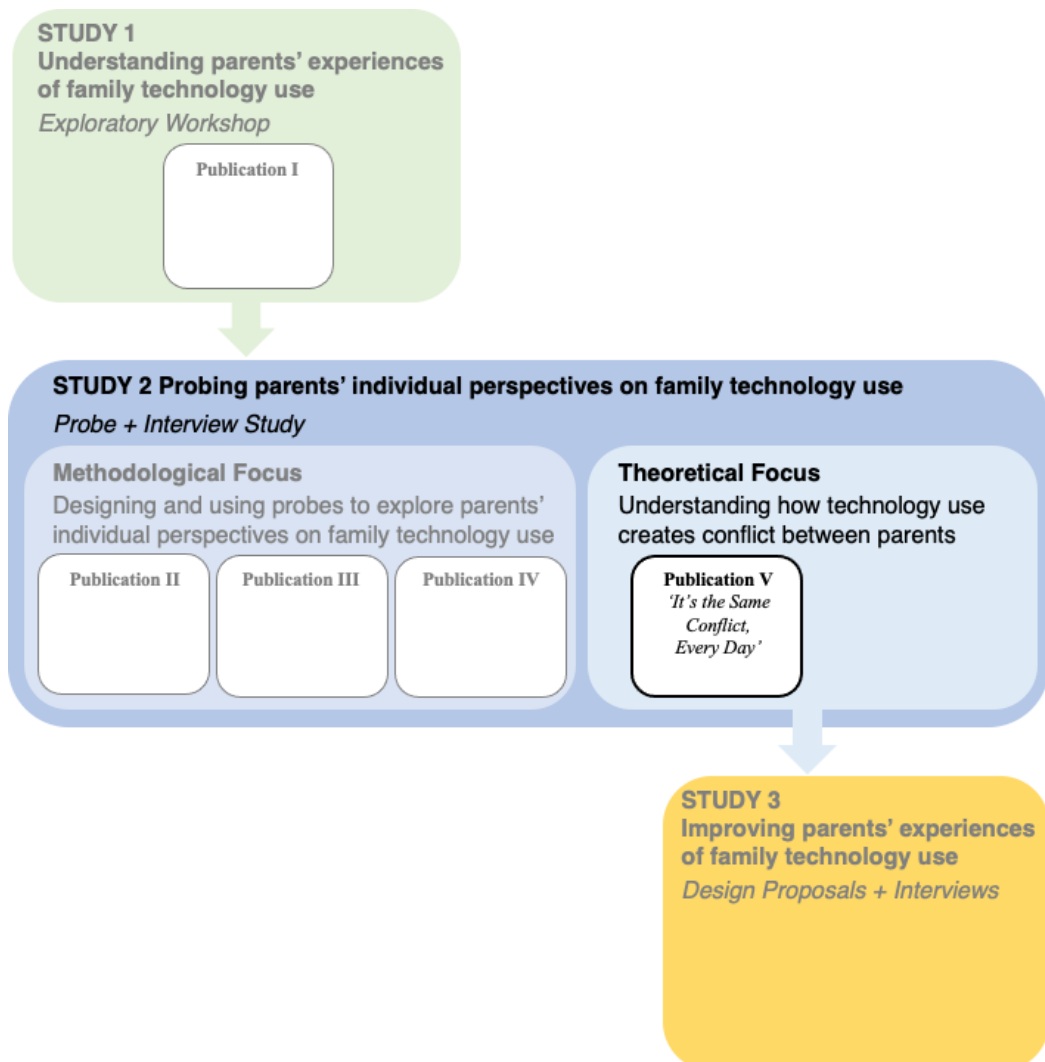


Figure 26. Position of Publication V within the context of the three empirical studies

*NB. This publication shares some similarities with **Publication II - Publication IV** (which report on the methodological findings of Study Two) and with **Publication VI** (which also reports on the theoretical findings of Study Two).*

6.2.1 Introduction

Digital technology use has become an integral part of the lives of children and parents. As such, many in HCI have been interested in exploring how technology use can impact family dynamics (Beneteau et al. 2020; Oduor et al. 2016). Researchers have found that managing pervasive technology use within families can be a considerable source of stress for parents and contribute towards tension and family conflict (Hiniker et al. 2015; Radesky et al. 2014). Substantial research has revealed conflict in parent-child relationships; arising primarily from parents' attempts to mediate their children's technology use (Blackwell, Gardiner & Schoenebeck 2016; Hiniker, Schoenebeck & Kientz 2016; Hiniker, Suh, et al. 2016).

Recent work also indicates that conflict in families can result from children's disapproval of how their own parents use technology (Hiniker, Schoenebeck & Kientz 2016; McDaniel & Radesky 2018b). On the other hand, very little research has explored how family technology use can foster conflict in parents' relationships. This is despite recent indications that parents might have differing expectations, either of how one should manage their children's technology use or how one another uses technology at home (Ammari et al. 2015; Derix & Leong 2018; McDaniel et al. 2018). Furthermore, disagreements (over technology use) between parents have been linked to lower overall relationship satisfaction and perceptions of less parenting support (McDaniel et al. 2018). Yet, we lack more nuanced understandings of how and why technology use within families might negatively affect relationships between parents.

We conducted a two-week probe and interview study to explore how family technology use affects the dynamics between eight sets of parents who have at least one child aged 12 years or under. This paper reports on the data from two particular sets of parents. This is because data from these two families were found to exemplify the ways in which technology use can foster tension and conflict in the relationships of all the other parents in our study. We found four key factors that enabled technology use to foster conflict, or to amplify existing conflict, between parents. They are: (i) *differing parenting values*, (ii) *misperceptions*, (iii) *imbalance* and (iv) *inconsistency*. We describe how this conflict can play out between parents within everyday family life. In doing so, we provide a more nuanced understanding of the ways in which technology use can lead to conflict within families. We also discuss directions of future work that would help designers of future domestic technologies to address the conflict that parents associate with technology use.

6.2.2 Related Work

We discuss two areas of related work within HCI that investigate ways whereby technology use can contribute towards tension and family conflict: (i) efforts to understand parents' attitudes towards their children's use of technology, and how conflict can arise from their attempts to

mediate (ii) efforts to understand how conflict can arise from parents using technology themselves.

Family Conflict: Parenting Children's Technology Use

Managing children's technology use at home is an increasingly complex endeavour and can present a significant source of stress for parents (Clark 2011; Livingstone & Helsper 2008; Yardi & Bruckman 2011). Many have described how parents' efforts to mediate children's technology use can lead to tension and conflict within parent-child relationships (Blackwell, Gardiner & Schoenebeck 2016; Hiniker, Suh, et al. 2016; Silverstone 2003; Vandewater et al. 2005a). For instance, when parents try to limit children's exposure to screen-based devices (Hiniker, Suh, et al. 2016; Schiano et al. 2016), when parents try to work out what their children are using personal devices for, especially online (Blackwell, Gardiner & Schoenebeck 2016; Yardi & Bruckman 2011), or when parents try to maintain authority when engaging with voice-activated speakers (Porcheron et al. 2018). Studies have described how conflicts can arise when parents and children have different expectations as to how much, when and what kind of technology use is appropriate (Blackwell, Gardiner & Schoenebeck 2016; Chen et al. 2019; Hiniker, Schoenebeck & Kientz 2016). When children reject, or are found to have broken technology use rules, disagreements abound.

Further work has suggested that parents' experiences of mediating children's technology use is highly nuanced and that their different approaches depend on the specific complexities and dynamics of individual families (Mazmanian & Lanette 2017). The individual approaches of parents can also vary; suggesting that tension and conflict can arise between sets of parents who are raising children together when their individual attitudes on how to manage children's technology use don't align (Derix & Leong 2018). But technology use has also become more pervasive in the lives of parents themselves (Bartholomew et al. 2012; Morris 2014; Palen & Hughes 2007; Toombs et al. 2018).

Family Conflict: Parents' Use of Technology

Parents turn to technology to support their parenting goals and to fulfill their individual needs (Bartholomew et al. 2012; Morris 2014; Palen & Hughes 2007; Toombs et al. 2018). However, parents must also consider how much time and attention they are giving to their digital devices, especially when spending time with their children (Hiniker et al. 2015; Yurman 2017). They must also consider how family members might feel about certain aspects of their technology use, such as privacy (Ammari et al. 2015). For many parents, the challenge is trying to manage their own use of technology, at the same time as attempting to mediate their children's use of technology (Blackwell, Gardiner & Schoenebeck 2016; Derix & Leong 2018; Palen & Hughes

2007). This can lead to tension and conflict within families especially when parents struggle to adhere to the rules around technology use that they themselves have established for their family (Ammari et al. 2015; Derix & Leong 2018; Hiniker et al. 2015; Kumar & Schoenebeck 2015).

Tension and conflict can cause parent-child relationships to suffer when children disapprove of their parents' inability to stick to their own rules around family technology use (Hiniker, Schoenebeck & Kientz 2016; McDaniel & Radesky 2018b). However, there are also suggestions that the relationship between parents can suffer when one parent's technology use is perceived by the other parent as undermining family technology rules, setting a bad example for children or disrupting family interaction and communication (Ammari et al. 2015; Derix & Leong 2018; McDaniel et al. 2018).

A recent survey of over 400 participants has shown that when parents use technology in ways that create conflict between them, it impacts negatively on their overall relationship satisfaction and on perceptions of how supported they are in raising their children together (McDaniel et al. 2018). Yet, very little qualitative research has been conducted to provide more detailed and nuanced descriptions, as well as explications of how and why parents' technology use can actually contribute towards such conflict between sets of parents (McDaniel et al. 2018). Both these areas tend to concentrate on parent-child relationships. This study addresses a gap in knowledge about how and why family technology use can contribute towards tension and conflict in the relationships of parents who are raising children together.

6.2.3 Method: Probe and Interview Study

Our two-week probe and interview study was designed to tease apart the individual attitudes towards family technology use that exist within sets of parents. We recruited eight sets of parents (with at least one child aged 12 years or under) to participate in our study. Our collection of three probes offered each set of parents opportunities for individual as well as shared responses. It also prompted parents to reflect on positive as well as negative aspects of their family's technology use.

We first conducted joint, semi-structured, opening interviews with each set of parents in which we introduced our probe collection. Later, we held individual, semi-structured, closing interviews with each parent, to discuss their probe responses in private. We clearly informed parents about which responses would be shared, and which would be kept private. This study was conducted with ethics approval from the University of Technology Sydney. For more information on our method, especially the design of our probe collection, see (Derix & Leong 2020a, 2020b).

Data collection and analysis

We audio-recorded interviews and took handwritten notes to support our thematic analysis of these data. Next, we draw on the responses of two particular set of parents, to exemplify the ways in which technology use can generate experiences of conflict and tension within sets of parents, and how this can play out within everyday life. Study Two participant details are summarised in **Publication III** (Table 5).

6.2.4 Findings: Tension and Conflict in Parents' Relationships

We focus our reporting on two of our eight sets of parents, because their experiences are good exemplars and representative of experiences reported by the other parents who took part in our study. We found 4 key factors whereby technology use fostered conflict, or amplified existing conflict, within parents' relationships.

First, we report on our findings from S2P9 and S2P10 to explain how (i) *differing parenting values* and (ii) *misperceptions* enable aspects of family technology use to create tension in their relationship. Later, we report on our findings from S2P7 and S2P8 to describe how (iii) *imbalance* and (iv) *inconsistency* allow family technology use to create conflict between them.

Differing values and Misperceptions (S2P9 & S2P10)

S2P9 (47yrs) and S2P10 (45yrs) are a married couple raising their son (6yrs) and daughter (2yrs). They described home life as busy, even chaotic; shaped mostly by the needs of their children and their work. S2P10, a lawyer, works full-time, and often during evenings and weekends at very little notice. Meanwhile, S2P9, who had just returned to a full-time position in IT has shorter, more regular working hours. She is relied upon as the children's more primary caregiver.

Of all our participants, S2P9 and S2P10 were the most explicit about the ways in which technology use contributed to family conflict. They were particularly candid about how aspects of technology use created ongoing disagreements between them. We found that the main factors that led to conflict between S2P9 and S2P10 are their *differing parenting values* and *misperceptions* about one another's attitudes regarding their family's technology use. As we will show, these two factors play out in a variety of ways within this set of parents' day-to-day life.

Differing parenting values

We found that S2P9 and S2P10 had different values regarding the use of digital technology within the family, which contributed to persistent conflict between them. A major difference,

that frequently triggers conflict, relates to using screen-based devices to placate or entertain children. P10's view on children's technology use was,

"I'm generally more negative...I just don't like it very much" (S2P10)

Meanwhile, S2P9 stated,

"I like the convenience of it" but "it drives S2P10 nuts that I'm so lenient when it comes to the screens...and it's the same conflict every time, on repeat." (S2P9)

S2P10 concurred,

"It's just the same old arguments, an ongoing struggle really. The parenting challenge, for me anyway, is keeping it under control so that everyone is not just sitting around looking at different devices." (S2P10)

While S2P10 voiced her negative opinion of using technology to entertain children,

"it's just a way to get them to sit down and shut up, by distracting them with a screen" (S2P10)

P9 described feeling,

"judged (by S2P10) on my abilities to parent...and that its lazy parenting" (S2P9)

Additionally, S2P10 believed that S2P9 spent too much of her time using technology while at home. S2P9 was aware of this and explained,

"I don't feel judged about my own use of technology by anyone apart from S2P10...because she hates it" (S2P9)

These stories suggest that S2P9 and S2P10's differing values can lead them to make judgments that are, in turn, perceived as disapproval. Both parents acknowledged that this judgment and disapproval frequently triggers conflict within their relationship. Given the associations they each drew between family technology use and judgments on parenting approaches, it was easy to imagine how technology use could become the contentious issue within their relationship that both S2P9 and S2P10 described.

Misperceptions

Sometimes, conflict between S2P9 and S2P10 is caused by their lack of awareness of one another's attitudes and practices, especially with regards to technology use. For example, when we initially interviewed this set of parents together, S2P10 immediately dismissed the idea of

their children having their own smartphones. S2P9 was clearly surprised to hear this, instead, suggesting it was an inevitability that might even support some aspects of parenting. Later, in the same interview, S2P10 claimed that neither she nor S2P9 used social networking sites. S2P9 hesitantly contradicted her,

“But...as someone who’s home a lot with the kids, I have been surprised how much I rely on Facebook” (S2P9)

This indicated a lack of awareness and assumptions within this set of parents about one another’s attitudes and practices surrounding technology use, which were confirmed when we interviewed S2P9 and S2P10 on their own in the Closing Interviews.

Misperceptions could arise when parents were unaware of the reasons behind one another’s differing individual attitudes to technology use, leading them to feel isolated or unsupported by each other. During our Closing Interviews, we learned how S2P9 had come to rely more on technology since becoming a parent, owing to feelings of loneliness and a sense of *“missing out on everything else”*, especially while S2P10 was working. As she explained her enthusiasm towards family technology use, she admitted to using technology *“as a babysitter”* and turning to her phone with *“a feeling of hope”* in an effort to distract herself from a sense of housebound isolation.

S2P9 felt that S2P10, unable to understand this, frequently overruled her decisions on technology use in front of their children, and described this as an isolating experience as well. Meanwhile, S2P10 justified her stricter attitude towards their children’s use of technology, by revealing that it was based on various fears, including those triggered by her upsetting experience of finding her young son watching inappropriate content online. She perceived S2P9 to have dismissed her fears, leaving her to manage their family’s technology use alone,

“It’s frustrating and isolating. It would be more of a positive experience if it felt like something we were united on.” (S2P10)

This lack of awareness between parents, and the resulting misperceptions, judgements or disapproval, can lead to parents not only feeling alone and unsupported, but also resentful of each other. With S2P9 and S2P10, we saw that this resentment can build up over time and eventually culminate in conflict. Both S2P9 and S2P10 mentioned that another source of resentment came from compromising on aspects of family technology use. For instance, S2P9 revealed that despite wanting to share photos of her children on Facebook, she reluctantly resisted out of consideration for S2P10’s privacy concerns. On the other hand, S2P10 expressed that she regularly suppressed her dislike at returning from work to find all her family members engaged in technology use.

We observed that conflicts over technology use had become such an accepted part of

everyday family life that it often went unnoticed. S2P9 recognised the extent to which technology use contributed to family conflict,

“I wasn’t aware how much conflict (over technology use) was taking up my energy” (S2P9)

We also noticed that both S2P9 and S2P10 seemed relieved at having discovered some of the misperceptions and misunderstandings they had about one another’s attitudes towards family technology use. For instance, when S2P9 reflected on what she had learned about S2P10’s feelings, she said,

“I was surprised by that, and I guess doing this study gave me a legitimate lens to have a look at it” (S2P9)

This might suggest that within the “*everyday chaos*” of the family life described by S2P9 and S2P10, they might not usually find opportunities to share, communicate and negotiate their individual attitudes on technology use with one another in a rational manner.

Overall, S2P9 and S2P10’s responses offer insights into how differing parenting values and misperceptions of one another’s attitudes towards family technology use can foster ongoing conflict within sets of parents. We now turn to a second set of parents, to provide an example of other key factors that enable family technology use to contribute to conflict, and how this plays out within everyday life.

Imbalance and Inconsistency (S2P7 & S2P8)

S2P7 (39yrs) and S2P8 (42yrs) are a married couple raising their two daughters, aged fifteen and three. They described themselves as an aspirational, yet time-poor family, who often found everyday life to be tiring and tense. Despite S2P7 working four days a week as an engineering draftsman, she is relied upon as the children’s primary caregiver, and to manage most aspects of domestic life. Meanwhile, S2P8 focuses on running his IT company, which involves regular business travel. This set of parents described how patterns of technology use within family life gradually contributed to growing tensions within their relationship. We saw that when these tensions built up over time, they eventually culminated in conflict between S2P7 and S2P8. We now explain the different ways in which this can play out in their relationship.

Imbalance

We found that apparent imbalance in the way that responsibilities are distributed within S2P7 and S2P8’s relationship might encourage technology to be used in ways that can foster tension and conflict between them. Specifically, S2P8 regularly spends long periods of time alone, on his personal devices, while S2P7 is left to continue with domestic chores and attending to their

children while S2P8 described how his habit of spending most of his evenings watching Netflix on his laptop developed as a way to unwind,

“I’m addicted...the only way to switch off after work is to put my headphones on and isolate myself from everything...” (S2P8)

S2P8 also mentioned that his wife, S2P7, strongly dislikes this behaviour, yet we found that he was not fully aware of the reasons behind this.

While technology use is how S2P8 unwinds from his daily stresses at work, for S2P7, it reminds her of the uneven distribution of their parenting responsibilities, where she is responsible for a much greater share of parenting and domestic duties than he is. S2P7 explained that she also used to enjoy watching movies in the evening with her husband, but that since having children, she had become too busy to join him,

“to be honest, there’s no free time for me anymore” (S2P7)

S2P7 revealed that while she tolerates the way that S2P8 regularly uses technology on his own, she does find his behaviour to be excessive and selfish. She described feeling like it also allowed him to disengage from her;

“with his Netflix, laptop on his lap, headphones on, that’s it, he’s out. Even if I talk to him he can’t hear it. I have to come to him, to nudge him.” (S2P7)

She went on to describe how his habit prevents their children from engaging with him, thus makes them even more reliant on her for attention. At the same time, S2P8 admitted feeling guilty for wasting time that could be better spent with his daughters.

S2P7 acknowledged feeling jealous of S2P8’s preoccupation with technology, and expressed her desire to spend more time with him. Finally, she revealed the tension that builds up between them over the course of the week, and how this often culminates in conflict,

“our only free time together is Saturday and Sunday...but by then we’ll be lucky if there wasn’t a fight between us, then everyone’s tense, we don’t talk and just start again on Monday” (S2P7)

Both parents agreed that the way in which S2P8 regularly uses technology alone disengages them from one another and is therefore detrimental to their relationship. S2P8 said he had tried to reduce the amount of time he spent alone on his devices. But, at the same time, he still maintained his need to unwind after a stressful day at work, and that technology promised him with the most convenient means to do this. This lure of technology, to provide personal entertainment as described by S2P8, can encourage technology practices to form that allow parents to disengage from one another. We see that when parents regularly use their devices in

this way, it can amplify existing imbalance in relationships, causing tensions to grow over time and eventually creating conflict in parents' relationships.

Inconsistency

S2P8's habit of using technology to unwind and entertain himself while at home with his family also compounds the difficulties S2P7 and S2P8 already have in agreeing on, and enforcing, rules around their children's device use. Both parents agreed that ideally, they would prefer their daughters to spend less time using screen-based devices. Yet, S2P7 explained that she sometimes found it helpful to relax technology rules, especially to make aspects of domestic life easier and less stressful. For instance, she described allowing her younger daughter to use an iPad while she prepared dinner, or to allow her daughter to play with a smartphone while drying her hair. On the other hand, S2P8 claimed that relaxing rules and using technology to placate his daughter in this way reflected badly on their parenting,

"we put our daughter on there to watch something when we're lazy and bad parents" (S2P8)

However, hearing S2P8's opinion prompted S2P7 to highlight the inconsistency between his expectations of his daughters' behaviour and the behaviour that he role-models to them by regularly watching Netflix alone, on his laptop with his headphones. Furthermore, S2P7 feels especially justified in relaxing technology rules to afford her the peace and quiet to tend to the domestic chores and household routines that she is left to deal with alone, while S2P8 uses his devices. In such a situation, we could see how S2P8's requests for S2P7 to uphold technology rules appeared hypocritical and frustrating to S2P7.

S2P8 admitted having difficulty reconciling his own use of technology with his parenting views,

"I know it might not be the healthiest habit, yet I'm giving it to my daughter" (S2P8)

He expressed his guilt at having failed to break his habit, but conceded apathetically that,

"I'm too lazy (to stop) because I'm too tired from working 10 hours a day and I just want to switch off" (S2P8)

He also perceived his own technology over-use to be part of a wider problem in society, in which people's dependency on technology use created a challenge within family life,

"balancing the relationship of the family over the needs of the individuals - it's a struggle, we try, try, try and fail." (S2P8)

We observed that existing tensions between S2P7 and S2P8, over how to mediate their daughters' technology use, are exacerbated by the inconsistency between S2P8's own overt use of personal devices and his stricter parenting views on how children should use technology. We saw that such inconsistency can contribute towards conflict in S2P7 and S2P8's relationship.

6.2.5 Discussion

Our findings confirm that family technology use has the potential to negatively affect the relationships of parents who are raising children together. We have revealed four key factors that were found to enable technology use to create conflict between two exemplar sets of parents, and how this played out within their everyday lives. We now discuss how our findings might relate to parents in general and suggest directions of future work to address the conflict that parents associate with technology use.

When parents have (i) *different parenting values* they might have differing individual expectations of how their family uses technology. This can lead to each parent setting different rules around technology use and/or enforcing them to varying extents. We have demonstrated that tension and conflict can then arise between parents who disapprove of the different ways in which they each manage their children's technology use.

Our findings also demonstrated that parents might have (ii) *misperceptions* about one another's attitudes towards family technology use. This can lead to parents making incorrect assumptions about each other's actions and give rise to misunderstandings. This can create conflict between parents and lead to tensions in their relationship because they feel unsupported by one another, and of being alone in their efforts to manage their children's technology use.

We revealed that (iii) *imbalance* in parents' relationships can encourage parents to use technology in ways that actually amplify this existing imbalance. For instance, domestic work was unevenly distributed between S2P7 and S2P8, and this allowed S2P8 to spend a lot of time alone on his personal devices, disengaging from his family. In turn, this reminded S2P7 of the fact that domestic work was not shared equally, and led to her feelings of frustration. This contributed towards tensions in S2P7 and S2P8's relationship that culminated in conflict between them. This supports McDaniel et al.'s (2018) suggestions that the way in which parents use technology can reduce the quality of their relationship.

This example of differing attitudes might support suggestions that traditional gender norms can help to explain differences in how parents utilize technology (Ammari, Schoenebeck & Romero 2018; Lukoff, Moser & Schoenebeck 2017). While HCI's tendency to study mothers and fathers separately provides valuable glimpses into how they might manage family technology use differently (Ammari & Schoenebeck 2015; Ammari, Schoenebeck & Lindtner 2017; Åsenhed et al. 2014), our initial results show that more work is needed to

understand how sets of parents do this together.

Parents use technology extensively at home, while at the same time attempting to manage their children's technology use. We found that (iv) *inconsistency* between a parent's own behaviour, and the expectations they set out around how their family should use technology can contribute towards tension and conflict between parents. This is because parents look to one another to provide positive role-modelling for their children, and can feel undermined, and less supported by each other when messaging around technology use is inconsistent.

Contexts of technology use

Parenting is usually a collaborative endeavour, and when parents have very different individual attitudes on how one should manage children's technology use and/or on how one should use technology (especially in front of children), we see that family technology use can indeed become a contentious issue within parents' relationships (Ammari et al. 2015; Derix & Leong 2018; McDaniel et al. 2018). Our findings indicate that whether or not a particular use of technology leads to tension and conflict between parents depends on a variety of contextual considerations, such as what device is being used, by whom, where, with who else present, how often, and for what purpose. While this aligns with findings of previous work on parent-child relationships (Hiniker, Suh, et al. 2016; Yurman 2017), further work is needed to examine how these contexts of technology use can contribute towards conflict between parents.

One-off instances of technology use vs. recurrent behaviour

Our findings indicate that one-off instances involving technology use can lead directly to arguments between parents, or instead, recurring behaviour might contribute over time to growing tensions that eventually lead to conflict. We observed that parents make comparisons, assumptions and judgments about how they each use technology, and how they each manage their children's technology use. When it comes to parents disapproving of each other's technology use, it seems more likely that recurrent behaviour contributes to disengagement, resentment, frustrations that grow over time and build to eventually result in conflict. On the other hand, one-off instances involving children's technology use are more likely to directly lead to disagreements between parents about how to manage them. We acknowledge that more work is needed to verify these observations.

Lack of opportunities to communicate

Overall, our findings demonstrate that within the messiness of everyday life, parents lack opportunities, a framework or even a language with which to calmly and constructively

communicate and negotiate upon their individual perspective towards technology use. Given that conflict between parents over technology use can be detrimental to their overall relationship, and parenting satisfaction (McDaniel et al. 2018), we strongly encourage further work to explore how we might assist sets of parents in regularly reflecting on, and sharing their views on family technology use with one another. This would be a valuable enterprise, especially since parents need to constantly adapt their attitudes to consider growing children and the adoption of ever-evolving technologies (Clark 2011).

6.2.6 Conclusions

Our work found four key factors that could enable family technology use to create conflict in parents' relationships. By exploring how family technology use affects parents' relationships, it complements current understandings of conflict in parent-child relationships (Blackwell, Gardiner & Schoenebeck 2016; Hiniker, Schoenebeck & Kientz 2016; Hiniker, Suh, et al. 2016), thus helping to create a more complete picture of how technology use can impact on family dynamics. This work demonstrates that a variety of contextual factors determine whether or not technology use might lead to conflict between parents. It also reveals that one-off instances of technology use can trigger conflict between parents, and that recurrent technology use can cause tensions to accumulate over time within their relationships.

The issues raised within this work suggest a need for further exploration of how sets of parents work together to manage their family's use of technology. In particular, we need to examine strategies that might help parents to better communicate and negotiate on their individual attitudes on family technology use. Overall, our results indicate that design opportunities exist to address the conflict that parents report is created within their relationships, as a result of family technology use.

(End of Publication V)

This paper (**Publication V**) has described the initial theoretical findings of Study Two by focusing on the responses of two specific sets of parents. The following paper (**Publication VI**) expands on these initial findings by drawing on the responses of all the parents who participated in the probe and interview study.

6.3 Introduction to Publication VI

The second paper that I include to describe the theoretical findings from Study Two is **Publication VI**. This paper expands on the initial findings presented in **Publication V** by drawing on the responses of all the parents who participated in the probe and interview study. It finds that conflict between parents can arise from the different ways in which parents use digital technology themselves, and how they manage their children's use of technology. Specifically, it identifies four main sources of this conflict in parents' relationships and suggests that we might consider how this issue of conflict might be addressed through alternative approaches to the design of interactive technologies.

6.4 Publication VI

Family Technology Use: Sources of Conflict in Parents' Relationships

Derix, E.C., Prior, J. & Leong, T.W.

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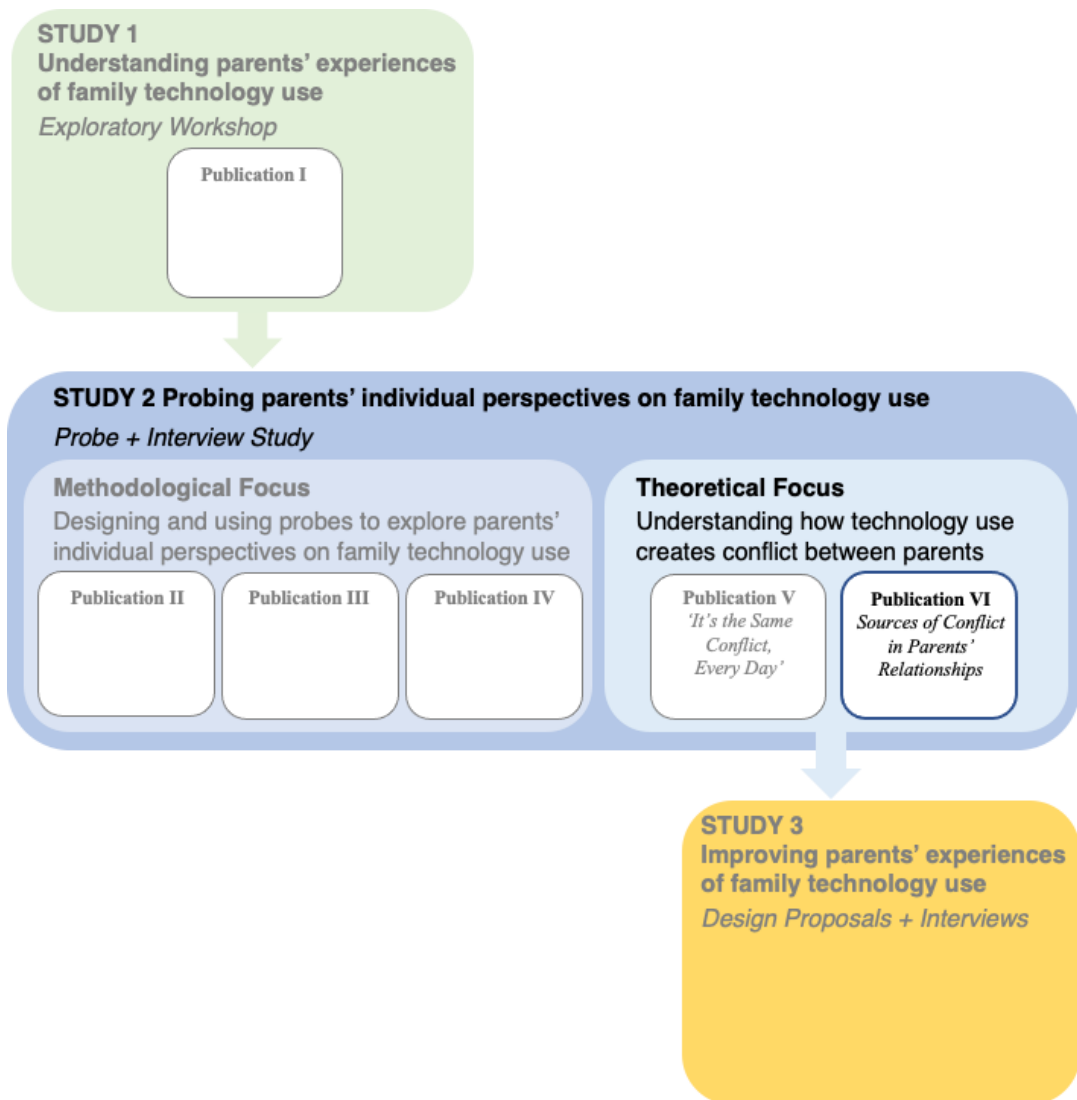


Figure 27. Position of Publication VI within the context of the three empirical studies

*N.B. The edits that have been made to this version of the publication are more substantial. For instance, the Abstract and Related Work sections have been removed and the Introduction and Method sections have been abridged. These edits aim to avoid unnecessary repetition given that **Publication II** through **Publication IV** report on the methodological findings from Study Two and **Publication V** has reported on the initial theoretical findings from Study Two.*

6.4.1 Introduction

To explore how and why family technology use might contribute to conflict in parents' relationships, we conducted a two-week probe and interview study with eight sets of parents. Our probe study was designed to tease apart the individual perspectives that exist within sets of parents, and we have previously reported initial findings of how this conflict between parents can play out, in which we focused on the responses of two particular sets of parents (Derix, Leong & Prior 2021).

This paper expands on these initial findings, by drawing on the responses of all our participants, and identifying four main sources of conflict in parents' relationships:

(i) *Monitoring each other's technology use*, (ii) *Using technology as escapism*, (iii) *Regulating children's technology use* and (iv) *Using technology to placate children*. We explain how these sources of conflict relate to how parents themselves use technology (when with their family) and to how parents manage their children's technology use. We also consider how we might approach the design of digital technologies, in order to help to address this issue of conflict between parents. By exploring how technology use can affect parents' relationships, we complement existing work that predominantly focuses on parent-child relationships, and thus contribute more nuanced understandings of the ways in which technology use can lead to conflict within families.

6.4.2 Method

We designed a two-week probe and semi-structured interview study with eight sets of parents. (Participant details are summarised in Table 5 of **Publication III**). This included a collection of three probes, intended to tease apart their individual attitudes towards technology use. On Day One of our study, we conducted in-home interviews with each set of parents. These semi-structured, opening interviews were designed to gain an initial understanding of each parent dyad, their attitudes and experiences of integrating technology use into their family's everyday life. We also introduced each set of parents to our research topic and explained our probe collection. On Day 14, we collected our participants' completed probes for review. Given our aim of teasing out the individual perspectives within sets of parents, we decided to conduct semi-structured Closing Interviews with each parent, to discuss their probe responses with them, alone.

Data Collection and Analysis

We audio-recorded interviews and took handwritten notes to support the thematic analysis of our data. We iteratively analysed these data using an open-coding approach, initially coding instances in which family technology use contributed towards any kind of misunderstanding,

tension, disagreement or conflict between parents. Finally, we developed categories relating to the causes of conflict that can arise between parents because of how they use technology, or how they manage their children's technology use.

6.4.3 Findings: Sources of Conflict in Parents' Relationships

Our study confirmed that parents rely on, and embrace, the use of digital technologies within their families. Yet, it also revealed that family technology use (particularly the use of mobile devices, such as smartphones and tablet computers) can contribute to tension and conflict in parents' relationships. Within the stories we heard from our eight participating sets of parents, we identified four sources of conflict that relate either to how parents use technology when spending time with their family, or to how parents manage their children's technology use. These sources of conflict are; (i) *Monitoring each other's digital technology use*, (ii) *Using technology as escapism*, (iii) *Regulating children's technology use* and (iv) *Using technology to placate children*.

Source 1: Monitoring Each Other's Technology Use.

We discovered that parents often monitor one another's mobile device use at home, and that this can contribute towards conflict in their relationships. Examples of monitoring were found within the responses of all eight participating sets of parents, and included parents making observations, assumptions and comments regarding the other parent's device use. Furthermore, we found that parents often make comparisons between the other parent's device use, and their own device use. Our participants tended to mention these comparisons when reflecting on responses to the Digital Family Tree probe.

As an example, we can turn to S2P15 and S2P17, two sisters who live together with their mother (S2P16), and share the parenting responsibilities of S2P15's three young children. As S2P15 elaborated on the sketched connections in her Digital Family Tree, she claimed to use her phone much less than her sister,

"S2P17's (my sister's) phone is hard to get out of her hot little hands!" (S2P15)

Interestingly, when S2P17 came to review the same sketches, she suggested that it was actually S2P15 who used her phone excessively,

"I would prefer her to put it down, I can't imagine there's anything so desperately important that it can't wait half an hour while we all have dinner and bathe the children." (S2P17)

She also suggested that S2P15's claims about device use were hypocritical,

“I get very frustrated with S2P15 about technology...(she) will stand there talking about how much she hates screens, while scrolling through her phone! I don’t think she’s conscious that she’s actually (doing it)” (S2P17)

Furthermore, S2P17 was sceptical of S2P15’s assertion that her phone use at home was solely necessitated by the demands of her job,

“She says it’s just work but it’s not...I’ve no idea if she’s on work, or Facebook, LinkedIn, or scrolling the news” (S2P17)

We noticed that when sets of parents misunderstand, or distrust, each other’s intentions for using devices, they might monitor one another’s device use more closely.

That conflict can occur between sets of parents who are unable to fully appreciate, or to accept, each other’s different motives for using devices, was also demonstrated by S2P9 and S2P10. Of all our sets of parents, S2P9 and S2P10 were particularly candid about their struggle to align contrasting perspectives on technology use, and how this could cause conflict in their relationship. S2P10 vehemently expressed her disapproval of what she perceived as S2P9’s excessive technology use, describing her as,

“umbilically connected to her phone and the TV” (S2P10)

However, S2P9 claimed that since becoming a parent, her reliance on technology had increased, owing to feelings of loneliness and a sense of *“missing out on everything else”* which she felt were exacerbated by S2P10’s absence while working long and often unsociable hours. S2P9 recognised that she had developed *“automatic habits”* - predominantly scrolling through feeds on social networking and news sites - that she had less awareness of, and thus found difficult to control.

On the other hand, S2P10 argued that her smartphone use stemmed solely from a need to be contacted for professional reasons. While she admitted that she sometimes found it difficult to *“switch off”* from work completely, S2P10 claimed to reduce her device use drastically when spending time with the couple’s two young children. However, when S2P9 reflected on what she had learned about S2P10’s feelings by completing our probes, she said,

“I was surprised by that, and I guess doing this study gave me a legitimate lens to have a look at it” (S2P9)

She went on to question S2P10’s self-awareness and her honesty,

“I am surprised at S2P10’s self-opinion of her device use ‘cos she’s actually on the phone a lot and she doesn’t think that she is” (S2P9)

She also accused S2P10 of frequently using her iPad for online shopping during mealtimes, and expressed her dislike of S2P10 flouting the very rules around technology use that she, herself, had imposed. S2P9 revealed that completing our probes had prompted her to confront S2P10 about using her iPad in this way, to which, S2P10 had denied doing so. Reflecting on this, S2P9 suggested that neither herself, nor S2P10, remained fully aware of their own actions when using technology, and even proposed that they paid more attention to each other's device use than they did to their own.

While S2P9 and S2P10 were particularly sceptical about one other's ability to reflect accurately, or honestly, on their own device use, we heard all eight sets of parents express a degree of uncertainty around each other's use of devices. Some participants justified their uncertainty by citing certain examples in which the other parent's device use had been proved to be unwarranted. However, we observed that parents' doubts about one another's ability to remain aware and intentional while using devices, were largely informed by their own experiences of losing track of their time and attention while using devices, which they then tended to project onto the other parent. We heard all 17 parents express a degree of frustration at continually struggling to control their own use of devices, especially smartphones.

These examples conveyed the particular importance that parents typically place on limiting their device use when spending time with children, in order to demonstrate desired behaviour. For example, reflecting on his responses to the Device Journal probe prompted S2P2 to acknowledge that he struggled to adhere to rules he himself had set for his family, by using his phone during dinnertime,

"I'm not always successful, I tend to yield to temptation." (S2P2)

We observed that parents' ongoing struggles to balance their own technology use within the competing interests of family life can lead to sets of parents questioning the necessity of each other's device use, motivating them to monitor each other, and thus introducing opportunities for tension and conflict.

Source 2: Using Technology As Escapism.

We found that when parents use technology in ways that are perceived as attempts to escape from the realities of family life, tension and conflict can arise in their relationship. This was evident in four sets of parents, including S2P9 and S2P10. As S2P9 reflected more deeply on how her mobile device use had changed since becoming a parent, she explained that feelings of boredom and loneliness fuelled her anticipation at checking for messages, social media notifications and news. She described these behaviours as attempts to escape from what she described as *"housebound isolation"* (S2P9). This sense of using technology as escapism was

echoed as she discussed her evening routine of watching television after putting her children to bed,

“It’s just about getting lost in it...free of that role, that responsibility.” (S2P9)

While S2P9 justified using technology in this way, she acknowledged that S2P10 disapproved of it,

“she sees it as me distracting from her but I’m just really tired because it’s been a long day, the kids were a nightmare...I want to feel disconnected, disengaged...to totally escape, but she hates it.” (S2P9).

S2P9 claimed that she felt judged by S2P10’s vocal criticism of her technology use, even when with friends and family, and that this added to the tension and conflict in their relationship.

We discovered various reasons why parents sought to use technology as escapism, and various ways in which this could create conflict in their relationships. For instance, S2P7 and S2P8 described how patterns of mobile device use within their family life contribute to tensions in their relationship that can build up over time, eventually culminating in conflict.

Specifically, S2P8 admitted to a particular habit of devoting most evenings to watching Netflix, alone, on his laptop,

“I’m addicted...the only way to switch off after work is to put my headphones on and isolate myself from everything” (S2P8).

S2P8 justified this behaviour as necessary in order to *“unwind after a stressful work day”*.

While his wife, S2P7, tolerates this conduct, she complained that it leaves her alone to continue attending to their two children and domestic chores. She also perceived that her husband’s device use allowed him to disengage from her, and from family life,

“sitting with his Netflix, laptop on, headphones on, that’s it - he’s out. Even if I talk to him he can’t hear it, I have to come and nudge him.” (S2P7)

S2P7 disclosed that she considers S2P8’s behaviour to be excessive and selfish and suggested that it prevents their children from engaging with him, thus making them even more reliant on her for attention. She also revealed feeling jealous of S2P8’s preoccupation with his devices and expressed a desire to spend more time with him. Furthermore, S2P7 revealed that it can create a sense of ongoing tension between them that builds up over the course of the week,

“by the weekend we’ll be lucky if there wasn’t a fight between us” (S2P7)

Both parents independently stated that the way in which S2P8 regularly uses mobile devices alone, disengages them from one another, and is thus detrimental to their relationship.

We found that even when a parent's heavy device use is motivated by work, rather than entertainment, sets of parents can become disengaged from one another, and tensions can arise in their relationships. We observed that using mobile devices for professional reasons contributed to some level of dissatisfaction within seven of the sets of parents in our study. In particular, S2P11 and S2P12 portrayed a lifestyle that revolved around S2P12's ongoing need to respond to professional calls and emails throughout evenings and weekends. This typically left S2P11 caring for their young daughter alone, and turning to her own devices in an attempt to keep herself occupied. During her interview, S2P11 voiced her discontent at the extent to which she perceived her husband's device use to not only disrupt their family's dynamic, but to encourage her own increased device use. She suggested that the affordances of digital technology had introduced unrealistic expectations into her husband's work culture, that negatively impacted their family's lifestyle. These claims of technology's culpability continued, as she expressed her frustration at situations in which S2P12's video-conferencing schedule interfered with plans for him to spend time with their young daughter, *"(Our daughter's) aware that his job is taking her away from him, because of that technology"* (S2P11).

Despite her best efforts to support and justify her husband's behaviour, S2P11 revealed her dissatisfaction at a lifestyle in which connection and engagement with her husband had become scarce. We also noticed that several of S2P11's probe responses mentioned feelings of jealousy and neglect, similar to those voiced by S2P7.

Source 3: Regulating Children's Technology Use

We noticed that conflict can arise between parents who struggle to align their different individual approaches towards regulating their children's technology use. All 17 participants discussed the importance of providing children with appropriate supervision, and boundaries, while allowing them to use mobile devices. Yet we heard various individual attitudes and approaches.

On one hand, we heard parents express concern about the potentially negative impact that excessive device use might have on children's physical, social and emotional development. Parents typically justified these concerns by citing their own experiences, and observations, of undesirable behaviour in children who engaged in screen-based activities, such as playing games, or watching videos. Some parents raised specific fears such as children's online safety and access to inappropriate adult content. It was apparent that these concerns are also informed by messaging received from mainstream media and wider society, warning parents of the perils

of children using technology excessively. Our participants also discussed the negative social judgements that can be associated with parents who fail to curb children's device use, through terms such as, "*lazy parenting*" (S2P17). Despite parents complaining that such judgments were unhelpful and untrue, we observed that they made similar judgements themselves.

On the other hand, we heard parents assert that technology use plays an increasingly pivotal role in children's education, and social development, and that it was their responsibility to encourage and provide opportunities for this. Most parents pointed to the onus placed on them, and their children, to use mobile devices in order to actively participate in school and community life. Our participants also acknowledged the enjoyment that their children found when engaging in screen-based activities, and the resulting convenience and benefits that this brought to them, as parents. Overall, the stories shared by our eight sets of parents revealed varied attempts to manage children's device use in a way that reconciled these individual fears and motivations.

The eight sets of parents in our study all acknowledged that their relationships were impacted by the challenge of establishing common, consistent approaches to regulating children's technology use, given each parent's very individual attitudes, experiences and concerns. In particular, we found that this challenge was often intensified by sets of parents assuming fixed, opposing stances towards children's device use. For example, one parent might assume a role of being "*stricter*", "*cautious*" or "*resisting*" and the other of being "*more lenient*", "*techy*" or "*enthusiastic*". We discovered that taking such contrasting stances often introduces opportunities for conflict in parents relationships by exaggerating existing imbalances in individual attitudes, and in the distribution of parenting efforts. Thus parents' efforts to create cohesive approaches to regulating their children's device use can be hampered.

In some cases, parents referred to these individual stances during their joint opening interviews. For instance, as S2P5 and S2P6 considered the process they usually go through before purchasing a new device, S2P6 claimed,

"He (S2P6) is pretty much the initiator of technology...and then I end up being a resistor, well a regulator" (S2P5).

However, participants were usually prompted to discuss these individual stances in more detail when reviewing their responses to the Digital Family Tree probe. In particular, when considering the connections drawn between each parent's individual devices, especially smartphones, and their children. This is because each parent's individual stance towards regulating children's technology use often corresponded to the amount of smartphone access they granted children. For instance, when we asked S2P1 to elaborate on why lines had been drawn to connect children with her phone, and not her husband's, she replied,

“The kids wouldn’t use his phone” (S2P1).

On contemplating this, she asked her son (who was present during her interview),

“Why do you use my phone more than Daddy’s phone? I’m curious too. Because I am nicer? Will Daddy scold you if you use his phone?” (S2P1).

Her son nodded, substantiating both parents’ portrayal of S2P2 being *“less tolerant”* than S2P1 towards their children’s use of technology.

We found that sets of parents typically express their differing stances on children’s technology use by sharing their opinions about the appropriacy of children’s device use, in various contexts. The parents we spoke to were primarily concerned with the amount of ‘screen-time’ children were allowed at certain times, and under what level of supervision. Sets of parents can also differ on how to motivate children to meet these expectations, and enforcing consequences when they are not. Hence, regulating children’s technology use can become a contentious issue.

For instance, we discovered that S2P9 and S2P10’s relationship was negatively impacted by their struggle to align their very different attitudes towards regulating children’s device use. S2P10’s explained that her *“stricter”* approach was primarily based on various concerns she held about the potential negative effects associated with excessive screen time. However, S2P10 perceived S2P9 to dismiss these concerns, which left her feeling frustrated and unsupported. She described feeling alone in worrying about her family spending too much time engaged in individual, screen-based activities, rather than interacting with one another. She verified S2P9’s account of how their different approaches to managing their children’s technology use creates ongoing conflict in their relationship,

“It’s just the same old arguments, an ongoing struggle really. The parenting challenge, for me anyway, is keeping it under control so that everyone is not just sitting around looking at different devices – and that’s our family time.” (S2P10).

However, S2P9 claimed that S2P10’s attempts to intervene often included criticizing, or overruling her decisions, in front of their children, which she saw as only furthering the conflict within their family. She disclosed that these ongoing disputes about how to manage their children’s device use, and S2P10’s obvious disapproval of her approach, left her feeling,

“judged (by S2P10) on my abilities to parent” (S2P9).

Source 4: Using Technology To Placate Children.

We discovered that tension and conflict can also arise in the relationships of parents who hold significantly different attitudes on using mobile devices to entertain, distract or pacify their children. While all our participants considered it appropriate to do so in certain situations, attitudes on exactly which situations were appropriate varied greatly. We observed that within each of our eight sets of parents, one parent spent more time taking care of their children and managing domestic responsibilities, than the other. Though this differential varied considerably across our sets of parents, in all eight sets we heard that the ‘primary carer’ used devices to placate children on more occasions, and for longer durations, than the other parent. As anticipated, this was typically justified as a means of enabling parents to attend to other needs, as S2P11 put it,

“I would have used (devices) as a babysitter – for want of a better word, to enable me to cook the dinner, get the washing hung out.” (S2P11)

Parents often voiced feelings of guilt at using technology in this way, and some cited their concerns for encouraging children’s excessive device use. For instance, S2P17 who lives with, and cares for, her grandchildren, admitted to using screen-time as a way of entertaining them, despite their mother’s (S2P15) strong disapproval. She justified her behaviour by explaining that she lacks the energy to keep up with three young children. She also went on to express her own disapproval of what she perceived to be a generation of younger parents, unnecessarily encouraging their children’s excessive device use,

“They think that keeping their children quiet and well behaved in public, or even all of the time seems to be desirable. And to me, I think children are being cheated. It’s a pacifier and its preventing them from (having) more valuable experiences.” S2P17.

Meanwhile, we heard S2P15’s perspective, as she reflected on her completed probes,

“My mother (S2P16) uses (devices) as a bit of a babysitting device...so she can get on with cooking dinner or whatever she’s doing at times when I’m not there. Yes, I imagine it’s a free for all when I’m not there, whatever keeps the kids quiet. I try to get a gauge of what’s happening but I always get the kickback that I’m not there to impose it, so it’s not fair of me to make the rules.” (S2P15).

This corroborated the stories of recurrent compromises and complaints, around how to manage children’s device use, that we had first heard when interviewing S2P15 with her mother (S2P16) and sister (S2P17) at the start of our study.

Using technology to placate children had become a source of contention in at least six of the sets of parents we spoke to and we observed various ways in which it could play out. While S2P15 was resigned to relinquish control of her children's device use at times when she wasn't there, other parents felt that their wishes should still be respected even in their absence. For instance, S2P4 who also works full time, described intervening to prevent his wife (S2P3) from using her smartphone to placate their children in his absence.

During their Opening Interview, S2P3 and S2P4 revealed their disagreement over S2P3's decision to allow their oldest son to play games on her phone. S2P3 explained,

"With the three kids, it was convenient for me...so that (my son) was busy with something. So that's how he started to play those games" (S2P3).

Yet, she recalled how S2P4 had immediately objected to her decision,

"(My husband) S2P4 wasn't very happy about it" (S2P3).

S2P4 interjected to clarify,

"because there was no discussion, it was already decided by her" (S2P4).

We heard that S2P4's initial objections had become more vehement as he perceived that playing games was negatively affecting their son's behaviour.

"I think that's when S2P4 (my husband), started to comment about the games, again" (S2P3).

S2P4 claimed that despite his wife initially dismissing his concerns,

"She didn't believe that there was an issue" (S2P4)

According to S2P4, his wife had eventually conceded that he was right and agreed to disallow their son to play such games. Yet, while both parents claimed (in their Opening Interview) to have resolved the matter, we later discovered that this was not quite the case. As S2P4 reflected on his Digital Family Tree during his Closing Interview, he considered why his children were shown to be connected to his wife's phone, and not to his. He revealed,

"They know not to (play) with my phone, they know they are going to be in trouble. But of course sometimes mum (S2P3) puts a game on because she is busy with something, so it's convenient to help them stay quiet" (S2P4).

He further explained how he was aware of which devices his children used in his absence,

"Sometimes I hear them ask, 'Mama can I have your phone because I want to play that game', then I think 'Ah, OK', that's how I find out." (S2P4).

The way in which conflict could be triggered by sets of parents struggling to align their individual attitudes on using mobile devices to placate children was yet more palpable between S2P9 and S2P10. S2P9 admitted that she often considered screen-based devices to be “*a free babysitter*” and justified this approach with her need to make aspects of domestic life easier, especially since her wife (S2P10) spent so much time at work. However, S2P9 acknowledged that S2P10 disapproved of this approach,

“I like the convenience of it, but it drives S2P10 nuts that I’m so lenient when it comes to the screens...and it’s the same conflict every time, on repeat.” (S2P9).

When we interviewed S2P10, she confirmed that S2P9’s habit of using devices to entertain their children caused ongoing disputes in their relationship,

“Children’s technology use is contentious within our family because S2P9 (my wife) has quite different views from me and she’s very happy as a parent to use TV and screens as a way of buying time, as a bribe and to achieve other things, whereas I’m much stricter” (S2P10).

S2P10 explained that her stance was based on fears that using technology in this way might negatively affect their children’s behaviour and development. We found that concerns such as these were cited by other parents in our study who shared S2P10’s reluctance towards using technology to placate children.

Our findings have focused on illustrating four sources of the conflict that can arise in parents’ relationships, as a result of their family’s technology use. While our participants did mention several other causes of this conflict (e.g. adopting new technologies and managing privacy), these were found to be less prominent across the eight sets of parents in our study. Next, we discuss the implications of our findings, with a focus on how we might think about the design of digital technologies that are used within families.

6.4.4 Discussion

Our study revealed that, despite digital technology use being a critical and enjoyable part of family life, it can also contribute towards conflict in parents’ relationships. We identified four common sources of this conflict, that are primarily associated with the use of mobile devices (such as smartphones, tablet computers and laptops) when family members spend time with one another (often referred to as ‘family time’). We now discuss three areas of consideration, that might help to address this conflict between parents, when designing future technologies that are destined for use in domestic spaces. This includes considering ways in which we can; (i) *Help parents feel more in-control about how their family uses technology*, (ii) *Provide parents with a greater sense of certainty around their family’s technology use* and (iii) *Support sets of parents to manage their family’s technology use collaboratively*.

Helping parents feel more in-control

Almost all the parents in our study described their own struggles to maintain self-control when using technology, especially mobile devices. They voiced realizations about ‘unintentional’ and ‘distracting’ behaviour, and expressed regret at losing track of time while engaged in activities that they deemed as less necessary and meaningful. This supports recent suggestions that by over-prioritising user engagement, the design of mobile technologies might currently risk eroding user’s agency and autonomy (Lukoff et al. 2018). When parents struggle to feel in-control of their own device use, they can be motivated to *monitor each other’s technology use*. As parents typically consider it important to model desired behaviour in front of children (Ferdous et al. 2015; Mesch 2009), they tend to monitor each other’s device use particularly closely in situations in which children are present, and rules have been established around how technology should, or should not, be used (e.g. using devices at mealtimes). We also noticed that a sense of competition can develop between parents who are both keen to play down, and defend, the extent of their own device use. Parents often justify this monitoring as a necessary, and even supportive, means of helping each other curb excessive device use amidst the chaos of everyday family life. However, we observed that this monitoring often encourages comparisons, assumptions and critical comments, that can foster feelings of disapproval and distrust, and ultimately tension and conflict in parents relationships.

People often turn to devices in an attempt to break from their role and responsibilities (Lukoff et al. 2018; Oduor et al. 2016) and our study showed that parents are no exception. When parents who intentionally seek alone time by using technology for escapism, also have difficulty controlling their own device use, technology practices can form that foster tension and conflict in their relationships. This is because when one parent finds it challenging to be mindful of, or limit their own device use when with their family, it can create feelings of disconnection, disapproval and jealousy in the other parent. We also observed that when one parent regularly uses technology for extended periods of time, it can both highlight, and amplify, existing imbalances in the way parenting and domestic responsibilities are shared. This builds on recent studies that have revealed how conflict can arise when family members perceive that technology is overused when spending time together (Oduor et al. 2016; Salmela, Colley & Häkkinen 2019).

Parents’ own experiences of struggling to remain fully in-control when using devices often inform their assumptions that children are even less able to limit their own screen-time. These assumptions are often buoyed by parents’ unsuccessful attempts to monitor and regulate their children’s use of devices. These experiences can add to parents’ concern around the negative effects that technology use might have on their children’s development and behaviour, that are often established by the messaging of media and wider society. In addition, this messaging can instil a sense of social judgement, by implying that children’s technology use was indicative of lower parental interest or ability. This aligns with previous depictions of what

a complex, and morally loaded endeavour parenting can become in our technology-saturated world (Hiniker et al. 2015; Hiniker, Suh, et al. 2016; Mazmanian & Lanette 2017). Our study found that tension and conflict can arise in sets of parents who don't align on how tightly they need to *regulate children's technology use*, or how to go about this. This is because feelings of disapproval, frustration, stress and isolation can be introduced when parents make differing assumptions about their children's ability to control device use, or take different approaches to attempt to control it.

Similarly, tension and conflict can arise in sets of parents who disagree on the appropriacy of *using technology to placate children*. When deciding to put devices to use in this way, parents typically weigh up the immediate benefits that it might bring them, with their longer-term concerns about children developing technology practices that foster undesirable behaviour, or impede their development. These concerns are driven by assumptions that children become over-engaged in screen-based activities, and are thus unable to remain fully in-control of their device use. We observed that a parent who spends most time caring for children also tends to be responsible for a greater share of domestic work, and therefore feels more justified in using technology to placate children. Yet, another parent who spends less time at home with children often feels less enthusiastic about using technology this way and might assert a desire, even expectation, for the other parent to align with this. Furthermore, parents who feel judged for using technology in this way can also feel that their parenting abilities are being brought into question. Thus, using technology in this way can become a source of conflict in parents' relationships.

Overall, parents perceive that the use of mobile devices can be over-engaging, and that it is therefore difficult for themselves, or their family members, to remain fully in control when using them. Parents fear that this can disrupt their family's time together, and impact negatively on their children's development. These fears often drive parents' various attempt to intervene in order to control each other's device use and as well as their children's, and to associate family technology use with tension and conflict in their relationships. This aligns with Oduor et al.'s (2016)'s description of family dynamics being disrupted by technology use, and we repeat their calls for the ways in which device notifications and alerts are used to engage with people to be reconsidered. We are also encouraged by recent appeals and attempts to consider how technologies might be designed to support people to limit device use, or to remain more intentional when using them in the presence of others (e.g., Bruun et al. 2020; Hasan, Mondal, Ahlström, et al. 2020; Hiniker, Hong, et al. 2016; Hiniker et al. 2017; Lukoff et al. 2021). Our work suggests a need for further work to explore how such approaches to designing technologies might address some of this conflict that can arise in parents' relationships, by helping them to feel more 'in-control' of how they, and their family members, use mobile devices, especially during family time.

Providing parents with a greater sense of certainty

It is clear from our study that there are high levels of uncertainty involved in technology use, and that this presents parents with a major challenge when attempting to integrate it into family life. Parents rely heavily on the use of devices, especially mobile devices, and appreciate the benefits that this can offer their families. Yet at the same time, they perceive the use of such devices to disrupt the cohesion of family life by drawing individual family members away from each other. This aligns with observations made in families and couple relationships (e.g., Hasan, Mondal, Khatra, et al. 2020; Oduor et al. 2016; Salmela, Colley & Häkkinen 2019). Our study showed that this uncertainty around what family members are actually using devices for, and how long they intend to do so, can contribute towards conflict between parents, through the four sources described in our findings.

We found that a lack of certainty around what each parent was using their mobile device for led to parents *monitoring each other's technology use*. Parents often questioned the urgency and duration of the activities one another engaged in on their devices. Parents expressed their frustration at not knowing what the other parent was doing on their device, particularly when they perceived that family time was being disrupted. Parents monitored each other's device use more closely when children were present, for two reasons. Firstly, parents look to each other to model behaviour they want their children to emulate (Davis, Ferdous & Vetere 2017; Ferdous et al. 2015; Hiniker, Schoenebeck & Kientz 2016), and secondly, parents look to each other for support in attending to children and domestic chores (McDaniel et al. 2018). While monitoring each other's device use might help parents to ensure that they both participate fully in family life, parents expressed their frustration at feeling scrutinized and judged by the other. We observed that disapproving comments, as well as misassumptions that parents made about each other's device use could contribute towards feelings of tension and conflict in parents relationships.

We heard accounts of parents, such as S2P8, regularly using mobile devices alone to entertain themselves, for extended periods of time, while their family members are unable to easily see, or hear, what they were engaged in, and without providing any sense of how long they might spend. When one parent sought to unwind from their parenting, or work responsibilities in this way, by *using technology as escapism*, we observed that the other could easily become frustrated by their lack of certainty of what they were doing on their device, or their motivation for doing so. We heard that when one parent turned to technology this way the other parent might disapprove, feel ignored and even jealous, and that this could contribute towards conflict in their relationship. This was especially the case when children were present for the previously discussed reasons of role-modelling unwanted behaviour and disengaging from domestic responsibilities.

Our study found that parents' efforts at *regulating children's technology use* were also motivated by concerns that were driven, in-part, by the uncertainty that they associated with mobile device use. Parents feel responsible for monitoring children's device use and find it more difficult to keep track of what children are using smaller mobile devices for, as these can be easily moved away from view (e.g. to children's bedrooms) and tend to offer online connectivity. While parents tend to associate these devices with greater uncertainty, they concede that they are a convenient choice. This is because they are usually within reach and parents report that children prefer, and are easily able, to use them (Hourcade et al. 2015; Plowman, McPake & Stephen 2008; Yurman 2017). In contrast, parents discussed feeling less uncertain, and therefore less concerned, about their children using devices that offer greater visibility, such as TVs and desktop computers with larger displays, and devices with limited capabilities such music players and e-book readers. These different considerations highlight the role that uncertainty can play in parents' decisions on how to regulate children's technology use. Our study found that different levels of uncertainty regarding children's technology use, can lead to parents taking different approaches to limiting it, and this can provide a source of tension and conflict in their relationships.

Our findings show that this lack of certainty regarding what children are engaging in while using screen-based devices, also introduce various concerns for parents who are *using technology to placate children*. These include concerns about children accessing content deemed to be 'meaningless' or inappropriate. Parents' concerns were primarily driven by their own experiences and observations, yet also informed by messaging in media and wider society. This aligns with prior explorations into parents' motivations and attempts to curb children's device use (Hiniker, Suh, et al. 2016; Vandewater et al. 2005b; Yardi & Bruckman 2011). Our findings show that sets of parents can have differing levels of concern and uncertainty, and that this can create disagreements about how appropriate it is to use technology to placate children.

Overall, we have demonstrated that parents are often uncertain about various aspects of their family members' mobile device use. This uncertainty presents sets of parents with the challenge of keeping track of what one another, and their children, are using devices for, when, for how long, and why, and thus can be associated to the four sources of conflict identified in our findings. This aligns with Oduor et al.'s (2016) portrayal of tensions that develop between family members who struggle to deduce what someone is doing on a device, and whether or not they deem it to be worthwhile. As such, we echo Oduor et al.'s (2016) suggestion for designers to explore ways of providing more activity awareness in order to reduce this uncertainty. We are motivated by recent attempts to reduce this uncertainty by providing a greater sense of transparency and awareness (Hasan, Mondal, Khatra, et al. 2020; Jarusriboonchai et al. 2016; Olsson et al. 2020), and suggest further work to examine how such design approaches might help address the conflict we have identified in parents' relationships.

Supporting sets of parents to manage their family 's tech use collaboratively

Overall, our findings demonstrate that within the messiness of everyday life, parents lack opportunities, a framework or even a language with which to calmly and constructively communicate and negotiate upon their individual perspective towards technology use. Taking part in our probe study prompted several sets of parents to express their curiosity and surprise at discovering aspects of each other's perspectives on family technology use. These included various realisations about another parent's attitudes, practices and motivations. We also heard participants voice their gratitude for the chance to reflect on how technology is used in their family, and to share their thoughts with the other parent. This suggests that sets of parents might seldom find opportunities to communicate and negotiate their individual perspectives on technology use with one another in a constructive manner.

Instead, we heard of the misassumptions and misunderstandings between sets of parents, not to mention the criticism, frustration, distrust and disapproval that can be involved with their current attempts to integrate technology use into family's life. The differing individual attitudes of the parents we spoke to might also support suggestions that traditional gender norms can help to explain differences in how parents utilize technology (Ammari, Schoenebeck & Romero 2018; Lukoff, Moser & Schoenebeck 2017). While HCI's tendency to study mothers and fathers separately provides valuable glimpses into how they might manage family technology use differently (Ammari & Schoenebeck 2015; Ammari, Schoenebeck & Lindtner 2017; Åsenhed et al. 2014), our initial results show that more work is needed to understand how sets of parents do this together.

We suggest that there is an opportunity for designers to better consider the collaborative nature of parenting. This could include exploring how to provide sets of parents with more regular opportunities to reflect on, and to align their individual perspectives on various aspects of technology use. Our findings indicate that parents' relationships would benefit from better understanding, and appreciating, one another's individual expectations about how they each use technology (especially when with their family), as well as their individual attitudes to managing children's technology use. After all, we have shown that when sets of parents are unable to align these individual perspectives, they often disagree about *monitoring each other's technology use*, *using technology as escapism*, *regulating children's technology use* or *using technology to placate children*. Just as we are not aware of any prior work to explicitly explore these individual perspectives that exist within sets of parents, we are unaware of any specific efforts to support sets of parents in making more collaborative efforts to integrate technology use into family life.

Given that conflict between parents over technology use can be detrimental to their overall relationship and parenting satisfaction (McDaniel et al. 2018), we strongly encourage

this further work to explore how we might assist sets of parents in regularly reflecting on, and sharing their views on family technology use with one another. This suggestion builds on Bruun's (2020) argument for design interventions that allow us to consider how current technology practices introduce tensions within families, by encouraging family members to reflect on the issue, together. It also responds to those who have highlighted a need for more nuanced and dynamic solutions that can involve multiple family members within the varied and evolving contexts of family (Blackwell, Gardiner & Schoenebeck 2016; Hiniker, Suh, et al. 2016; Oduor et al. 2016). Encouraging designers to consider how to support the collaborative nature of parenting raises an open design issue, yet we consider it one well suited for future interactive design interventions and explorations. We also believe it is a valuable enterprise, given parents' attitudes must constantly adapt to consider both the changing needs of growing children, and the adoption of ever-evolving technologies (Clark 2011).

6.4.5 Limitations and Recommendations

Our findings are based on responses from the eight sets of parents who participated and are therefore limited in the extent to which they can be generalized across wider populations. While we took an inclusive approach to recruitment and a range of family structures and ethnic backgrounds are represented in our sample, the demographic diversity of our sample was somewhat limited since all 17 parents were recruited through a local network of schools and community groups in Sydney, NSW. To further investigate how technology use can create conflict in parents' relationships, we recommend engaging with a broader group of parents, from more diverse backgrounds (e.g. culture, age, income, education level). Finally, our study was conducted before the full effects of the COVID-19 pandemic were fully felt, and we suggest future work should also consider any potential effects that this might have had on how parents have had to adapt their attitudes and practices regarding family technology use.

6.4.6 Conclusions

This paper explores how and why family technology use can contribute towards conflict in parents' relationships. It reports on a probe study designed to tease apart the individual perspectives within eight sets of parents. By exploring how family technology use affects parents' relationships, our work complements current understandings of conflict in parent-child relationships (Blackwell, Gardiner & Schoenebeck 2016; Hiniker, Schoenebeck & Kientz 2016; Hiniker, Suh, et al. 2016). Thus it contributes to a more complete picture of how technology use can impact on family dynamics. We found that conflict can arise from the different ways in which parents use digital technology themselves, and how they manage their children's use of technology. Specifically, we identified four main sources of this conflict: (i) *Monitoring each*

other's technology use, (ii) Using technology as escapism, (iii) Regulating children's technology use and (iv) Using technology to placate children.

These sources of conflict involve sets of parents struggling to align their individual attitudes on how to integrate digital technology use within their family's everyday life. Overall, our findings suggest that we might help alleviate some of the sources of this conflict by considering how to design technologies in ways that help parents feel more in-control, and more certain, about how their family uses technology, and by helping sets of parents to manage their family's technology use collaboratively.

(End of Publication VI)

I now summarise the theoretical findings that emerged during Study Two.

6.5 Theoretical Findings from Study Two

The theoretical findings of Study Two contribute to a deeper understanding of how technology use shapes family dynamics by surfacing insights into how technology use can impact parents' relationships. In particular, by substantiating the suggestions that emerged from the findings of Study One, about conflict arising between parents because of the way in which technology is used within the family.

Factors that can enable or amplify conflict in parents' relationships

The probe and interview responses captured during Study Two help to confirm that technology use within families could indeed contribute towards tension and conflict in parents' relationships. Four factors were found to enable or amplify this conflict between parents, which arises from technology use. As described in **Publication V**, these four factors are:

- *Differing parenting values*
- *Misperceptions*
- *Imbalances in parents' relationships*
- *Inconsistency*

Sources of conflict in parents' relationships

Study Two demonstrates that conflict in parents' relationships can arise from the way in which parents use technology, and from the way in which parents manage children's technology use. As detailed in **Publication VI**, this study identifies four main sources of this conflict:

- *Monitoring each other's technology use*
- *Using technology as escapism*
- *Regulating children's technology use*
- *Using technology to placate children.*

The responses captured by this probe and interview study indicate that conflict in parents' relationships tend to relate to the use of mobile devices (e.g. smartphones and tablets) at times when family members are spending time together. Furthermore, they suggest that conflict between parents often arises from their struggles to communicate, negotiate and to align their individual perspectives on how the use of mobile technologies should be integrated into everyday family life.

6.5.1 Implications of Study Two

Study Two establishes that, while the use of digital technologies (especially mobile devices) plays an increasingly critical role within everyday family life, it can create conflict in parents' relationships. By developing an understanding of this conflict between parents, this study suggests a need for further explorations into how various approaches to designing digital technologies might help to improve parents' experiences of managing mobile device use during family time. For instance, by considering how to help parents feel more in-control and more certain about how their family uses technology, as well as by helping parents to manage their family's technology use more collaboratively. Thus, exploring how we might improve parents' experiences became the concern of Study Three, which is described in the following chapter.

CHAPTER 7

Study Three

CHAPTER 7. Study Three: Proposing Interaction Design Concepts to Improve Parents' Experiences

This chapter presents Study Three by including **Publication VII** and later summarising the findings from this final study.

7.1 Introduction to Publication VII

To present Study Three, I include an edited version of **Publication VII** “*It’s a Drag*”: *Exploring How to Improve Parents’ Experiences of Managing Mobile Device Use During Family Time*, which was published in the *Proceedings of CHI Conference on Human Factors in Computing Systems* in 2022. This paper reports on how Study Three addressed the following research question:

RQ4 How could the design of future technologies help to alleviate the problematic experiences that parents often associate with family technology use?

This research question arose from findings of the formative studies of this research. That despite being an integral part of family life, interactive technologies are often perceived by parents as contributing to a range of problematic experiences, including conflict in their relationships. In particular, parents struggle to align on how to manage the use of mobile devices in a way that supports their aspirations for the time that their family members spend together. Thus, Study Three aimed to explore how the design of interactive technologies might help to address some of these problematic experiences that parents had revealed during the earlier studies.

This study began by collaborating with 12 user experience (UX) designers to develop four proposals that reimagine the design of mobile technologies used in family homes. These design proposals were then illustrated as scenario-based storyboards and used during 14 interviews with parents, prompting them to discuss how they envisaged each proposal might improve their experiences and their relationships. These interviews revealed three design approaches that appealed to parents. This paper also describes seven benefits that parents envisaged these approaches would have, and discusses ways in which they should be further explored.

7.2 Publication VII

***“It’s A Drag”*: Exploring How to Improve Parents’ Experiences of Managing Mobile Device Use During Family Time.**

Derix, E.C., Prior, J. & Leong, T.W.

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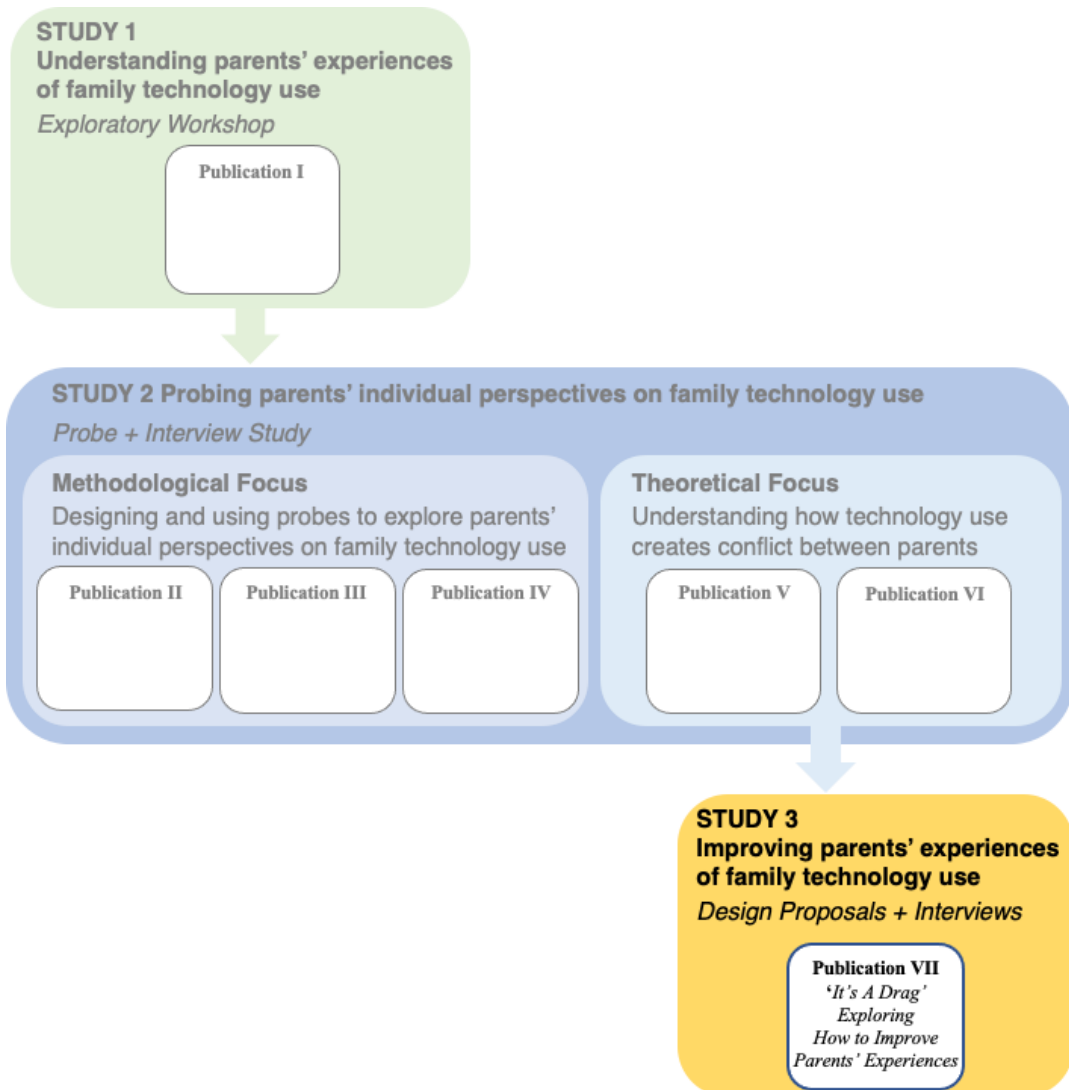


Figure 28. Position of Publication VII within the three empirical studies

NB. Detailed documentation of the artefacts relating to Study Three can be found in Appendix 4. This includes material produced during the ideation workshops, the full storyboards presented to parents during interviews and coding of the interview transcripts.

7.2.1 Introduction

Human-computer interaction (HCI) research into the increasingly critical role that technology use plays within everyday family life has demonstrated the ways in which parents and children have come to enjoy, and depend on the use of mobile devices, particularly smartphones, tablet computers and laptops (Desjardins, Wakkary & Odom 2015; Palen & Hughes 2007). However, researchers have also surfaced many challenges that can arise from pervasive technology use, some of which can negatively impact family dynamics and relationships. One of these challenges pertains to parents associating their family's use of mobile devices with a range of problematic experiences, including conflict in their relationships (Blackwell, Gardiner & Schoenebeck 2016; Derix & Leong 2018; Derix, Leong & Prior 2021; Schiano et al. 2016).

Parents often struggle to reconcile the appeal of mobile devices, with concerns that excessive use might negatively impact their family relationships and child development (Clark 2011; Livingstone & Franklin 2018). As a result, mediating family technology use can become a complex and emotive parenting challenge, associated with experiences of apprehension, ambivalence and guilt (Derix & Leong 2018; Hiniker et al. 2015; Hiniker, Suh, et al. 2016). Previous reports on how mobile device use is managed within families have included descriptions of parents' various efforts to regulate children's device use (Chen et al. 2019; Hiniker, Schoenebeck & Kientz 2016; Hiniker, Suh, et al. 2016), monitor each other's use (Ammari et al. 2015; Derix, Leong & Prior 2021) and minimize their own use when children are present (Hiniker et al. 2015; Moser, Schoenebeck & Reinecke 2016). Recent work has also revealed the tension and conflict that can arise between parents who are raising children together, when they struggle to align individual expectations on how technology should be used within their family (Derix, Leong & Prior 2021; McDaniel et al. 2018). These disagreements can be triggered by the differing ways in which parents themselves use devices, as well as the different approaches they might take to managing their children's device use (Derix, Leong & Prior 2021). In particular, tension and conflict abound when parents perceive mobile devices to be overused when family members are spending time together, often referred to as 'family time' (Derix, Prior & Leong 2021).

Whilst studies have explicated how the use of mobile devices within families can negatively affect parents' experiences and create problems in parents' relationships, scant research exists into how we might design technologies that help address this (Schiano et al. 2016). In this paper, we present our efforts to develop an understanding of if, and how, parents' experiences and relationships might benefit through reimagining the design of mobile technologies used in homes. Four 'reimagined' design proposals were developed through workshops involving 12 professional designers. After fleshing these proposals out as four scenario-based storyboards, we presented them to 14 parents, to stimulate discussion and opinions about how their experiences and relationships might be improved by each proposal.

Our participants' responses to our storyboards reveal their perceptions of how particular approaches to designing interactive technologies might help alleviate some of the problematic ways in which family technology use currently impacts their experiences. These three approaches are: (i) fostering *awareness* and (ii) encouraging *proximity* between collocated family members, and (iii) supporting *communication about technology use* within families. We present the benefits that parents perceived each of these approaches would have, and discuss opportunities for further work to explore how they might best be integrated into existing technologies, or into future technologies designed specifically for families. By considering the effect that family technology use can have on parents' relationships, this work also complements existing research into understanding experiences within parent-child dyads, thus contributing to a more complete understanding of how technology design can better support parents' aspirations and values.

7.2.2 Related Work

Digital technology use plays an increasingly critical role in everyday family life, as it does in society (Kawsar & Brush 2013). HCI researchers have found that both parents, and children, perceive a wide range of benefits from using digital technology, especially mobile devices, such as smartphones and tablet computers (Desjardins, Wakkary & Odom 2015; Isola & Fails 2012; Neustaedter, Yarosh & Brush 2009; Palen & Hughes 2007). Despite this, concerns remain over the potentially negative consequences that pervasive technology use might have on family relationships (Balaam et al. 2013; Ferdous et al. 2015) and child development (Beneteau et al. 2020; Ferdous et al. 2016). In response to these concerns, many within the HCI community have explored the unintended and undesirable effects that technology use might have on family dynamics (e.g., Blackwell, Gardiner & Schoenebeck 2016; Kildare & Middlemiss 2017; Plaisant, Druin & Hutchinson 2002; Schiano et al. 2016).

Understanding how family technology use can shape parents' experiences

A significant research focus of family technology use is to understand parents' approaches to mitigating the negative effects that technology use might have on children (Chen et al. 2019; Davis, Dinhopl & Hiniker 2019; Fails et al. 2012; Hiniker et al. 2015; Kildare & Middlemiss 2017; Plaisant, Druin & Hutchinson 2002). This research often reveals the problematic experiences parents face. For example, despite various tools that offer parental control of technology use, mediating children's device use can be a significant source of stress (Schiano et al. 2016; Yardi & Bruckman 2011). In particular, parents and children clash over how technology should be used during family time (Blackwell, Gardiner & Schoenebeck 2016). Parents' experiences of conflict and problematic experiences when managing technology use

are heightened as mobile devices appeal to increasingly younger children (Beneteau et al. 2020; Hiniker, Suh, et al. 2016). This has led to research seeking to better understand how this has shaped experiences of early childhood parenting (Goh, Bay & Chen 2015; Lauricella, Wartella & Rideout 2015; Nikken & Jansz 2014; Plowman, McPake & Stephen 2008).

Hiniker et al. (Hiniker, Suh, et al. 2016) highlight that, while parents enjoy the convenience of using mobile devices to entertain young children, they often worry about the consequences that device overuse might have on children's safety, health and development. Furthermore, (Hiniker, Suh, et al. 2016) describe the struggle, and conflict, that parents often associate with transitioning kids away from screen-based activities (Mavoa, Carter & Gibbs 2017; Sobel et al. 2017). Investigations into parents' efforts to establish technology 'rules' have emphasised the importance that parents place on family time, and their observations that device use can impede their aspirations for family members to be attentive and responsive to one another when they are together (Hiniker, Schoenebeck & Kientz 2016; Mazmanian & Lanette 2017). This has inspired a specific interest in the use of devices during family mealtimes (Ferdous et al. 2015; Ferdous et al. 2016; Hiniker, Schoenebeck & Kientz 2016; Radesky et al. 2014), which have revealed how parents, as well as children, can struggle to adhere to household technology rules (Blackwell, Gardiner & Schoenebeck 2016; Chen et al. 2019; Moser, Schoenebeck & Reinecke 2016).

Indeed, how parents themselves use devices has become an area of increasing interest within and beyond HCI. Explorations of 'digital motherhood' (e.g., Balaam et al. 2013; Gibson & Hanson 2013), and (albeit to a lesser extent) fatherhood (e.g., Ammari & Schoenebeck 2015; Lukoff, Moser & Schoenebeck 2017) have revealed how pervasive technology use is changing parenting practices. While these studies tend to focus on specific technologies (e.g. mobile phones (Hiniker et al. 2015; Palen & Hughes 2007) and social network sites (Ammari et al. 2015; Kumar & Schoenebeck 2015; Toombs et al. 2018)), they reveal how parents can struggle to reconcile their own desire to use mobile devices, with concerns that it might not always align with their broader aspirations and family values (Gibson & Hanson 2013; Hiniker et al. 2015; McDaniel & Radesky 2018b; Moser, Schoenebeck & Reinecke 2016). In particular, parents feel that they should minimize their device use when children are present, in order to supervise, respond to, and act as good role models for them (Hiniker et al. 2015; Moser, Schoenebeck & Reinecke 2016). This can lead to parents associating their own device use with problematic experiences such as apprehension, conflict, ambivalence and guilt (Derix & Leong 2018; Hiniker et al. 2015; Yurman 2017).

Alas, mediating technology use within family life can be a complex and emotive issue (Mazmanian & Lanette 2017). Parents' approaches to it have been shown to not only vary widely (Ammari, Schoenebeck & Romero 2018; Durrant et al. 2009; Yarosh et al. 2016), but to be heavily influenced by their relationships and social context (Ferdous et al. 2015; Hiniker et

al. 2015; Moser, Schoenebeck & Reinecke 2016). Recent work has also exposed the conflict that can arise between sets of parents who disagree about how technology should be used within their family (Ammari et al. 2015; Derix & Leong 2018, 2020a; Derix, Leong & Prior 2021). This reveals how sets of parents can differ over how to manage their children's technology use, as well as each other's device use (Ammari et al. 2015; Derix, Leong & Prior 2021). For instance, parents can struggle to regulate children's device use, to decide when it is appropriate to use devices to placate children, to agree on how one another should use devices, and to reduce their own device use, especially when children are present (Derix, Leong & Prior 2021). Tension and conflict in parents' relationships have been shown to be especially rife when mobile devices are perceived to be overused, and to cause family members to disengage from one another when they are together (Derix, Leong & Prior 2021; McDaniel et al. 2018).

The above review reminds us that, despite being a critical part of family life, the use of digital technologies (especially mobile devices) within families can negatively shape parents' experiences, and create challenges in their relationships. However, we lack an understanding of how parents' experiences of managing mobile device use during family time might be improved by new approaches to designing interactive technologies. Our attempt to develop this understanding relates to existing efforts into understanding - and designing for - collocated device use.

Design strategies to address the social challenges of device use

Digital technologies have greatly transformed the way in which people interact with each other. At the same time, HCI studies have highlighted some of the unintended social challenges that can arise due to the increasingly pervasive way in which they are used (Lyngs et al. 2019; Oduor et al. 2016; Tran et al. 2019). In particular, mobile devices can disrupt the interactions between collocated people, by persistently offering opportunities for communication with remote others (Olsson et al. 2020). It has been suggested that these digital disruptions can introduce feelings of frustration, disconnection and loneliness, and thus reduce the sense of relationship satisfaction, especially within families and intimate couples (Derix, Leong & Prior 2021; Oduor et al. 2016; Turkle 2017).

In response, several recent studies have explored how technology design might help address the problems that can arise from collocated device use in domestic settings. Principally, the studies are aimed at exploring how technologies might be designed to better support digital wellbeing. Cecchinato et al. (2019) highlight the influx of screen time management features by technology companies who traditionally tended to design technologies to maximize user engagement. The conventional approach is to introduce some form of timer to track, or limit, aspects of device use (Cecchinato et al. 2019; Zaman et al. 2016). HCI researchers have

explored regulating device use employing similar strategies, often inspired by tools designed to support self-management of physical health and wellbeing. These range from providing users with real-time awareness of their device use (e.g., Whittaker et al. 2016), to those that more actively intervene after a set time period to limit certain activities (e.g., Hiniker, Hong, et al. 2016; Kim, Jung, et al. 2019; Kim, Park, et al. 2019). These efforts intersect with a recent HCI movement calling for the intentional ‘non-use’ of digital technologies to be studied more closely (Lyngs et al. 2019). To explore non-use strategies within family settings, Bruun et al. (2020) designed Pup-Lock, an application that enables all the mobile devices in a household to be locked by any individual family member. This design provocation revealed that families might benefit from technologies that both support non-use during family time and encourage families to reflect on how they use devices.

Despite HCI’s growing interest in investigating non-use as a strategy to help manage screen time, Cecchinato et al. (2019) emphasise the need to explore additional strategies to support people’s varying contexts and individual goals. For instance, they recommend research into understanding how promoting more intentional interactions with technology might support users to self-manage their device use and achieve their goals (Lukoff et al. 2018). Hiniker et al. (2017) have examined how this strategy might improve parents’ experiences of transitioning young children away from screen-based activities. Besides helping to manage screen time, this strategy was shown to create valued opportunities for parents and children to reflect on, and to discuss, their device use. While Hiniker et al. (2017) provide helpful indications of how we might attempt to address the challenges currently facing parents, they do not consider how the responsibility of managing family technology use is shared between sets of parents, or how parents use technology themselves.

Meanwhile, Hasan, Mondal, Khatra, et al. (2020) have explored the strategy of raising activity-awareness to tackle smartphone overuse in the presence of others. Specifically, they study an app designed to allow collocated partners to share information about their smartphone activity with one another. This strategy of addressing the private, personal way in which mobile devices are designed to be used, has also been explored by Jarusriboonchai et al. (2016) and Jarusriboonchai, Olsson & Väänänen-Vainio-Mattila (2015) as a way of enhancing social interaction between collocated people, though not within families. In Olsson et al.’s (2020) review, they identify a further strategy of enhancing collocated social interaction by engaging people in collective activity. Within the context of families, this strategy has been explored by Ferdous et al.’s (2016) system to transform mobile devices into a shared display, aimed at encouraging mealtime conversation. This challenges common perceptions of devices as disrupting the social aspects of mealtimes, by suggesting that family experiences can be enriched by devices that enable activity sharing.

These examples provide valuable insights into various strategies that might effectively

help people to better manage their device use, especially within the contexts of families and intimate relationships. However, none explicitly seek to explore how technology design can improve the problematic experiences of parents when trying to manage mobile device use within everyday family life. Nor do they consider how we might help to alleviate the conflict that family technology use can create in parents' relationships. This is despite calls for deeper understandings of how design might address the challenges arising from pervasive device use in specific social contexts (Bruun et al. 2020; Cecchinato et al. 2019; Olsson et al. 2020).

7.2.3 Method: Using Storyboards as Prompts, when Interviewing Parents

Our study sought to establish an understanding of how technology design might help address the problematic experiences that parents associate with managing mobile device use during family time. To do this, we took inspiration from the way in which critical research practices (e.g. speculative design (Wong & Khovanskaya 2018) and design fiction (Blythe 2014) create design proposals for the purpose of probing into the ideas and values that they envision (Gaver 2012). Specifically, we held interviews with 14 parents, to capture their reflections on four scenario-based storyboards (Rosson & Carroll 2009). These storyboards depict design proposals that reimagine new ways in which collocated family members could interact with, and through, mobile devices. These proposals evolved from ideation workshops involving 12 professional user-experience (UX) designers. These proposals were sketched as storyboards, to serve as interview stimuli and prompt parents to imagine, reflect on, and discuss how their experiences and relationships might benefit from the proposed ideas within each narrative. The proposals were not intended to represent complete, detailed concepts, nor to serve as design tools. This paper focuses on presenting parents' interview responses, to reveal what they perceive to be useful and desirable design approaches, and how they believe these approaches would help alleviate the problematic experiences they face when managing mobile device use within the family. But first, we will briefly describe our four storyboards and how they were created.

Creating our scenario-based storyboards

Our four scenario-based storyboards evolved from two 90-minute ideation workshops, held remotely due to COVID-19 restrictions. During each workshop, we challenged six professional UX designers to propose technology-based solutions aimed at addressing the problematic ways in which mobile device use within families can affect parents' experiences, and create conflict in their relationships (Derix, Leong & Prior 2021; Derix, Prior & Leong 2021). Both our workshops followed the same format, informed by well-established idea generation methodologies commonly used within design practice (e.g., frogDesign 2021; IDEO 2021). They were facilitated by the first author, who is very experienced at using these methodologies within their professional capacity as a senior UX design researcher. It was through their professional network that we recruited our UX designers. All 12 have 10-20 years of experience

of working on digital design projects at companies, including Google, IBM and Microsoft Research, and in particular, generating speculative design proposals through insight-driven ideation workshops.

To help the designers prepare for our workshops, we sent them each a presentation summarising our research context and objectives. Our workshops used Zoom as our video conferencing platform, and Mural as our remote collaboration environment. After introductions, we guided the designers through four key activities. First, designers used virtual notes to post short descriptions of initial ideas onto a shared board. They were offered three categories of prompts; (i) challenge areas (e.g. *Conflict between parents who monitor each other's device use*) (ii) opportunity areas (e.g. *Helping parents by designing for self-control*) and (iii) design triggers (e.g. *Gamification*). In each workshop, this activity lasted 20 minutes and over 30 initial ideas were generated. We then spent 10 minutes clustering initial ideas into seven themes (e.g. *Proximity Alerts* and *Shared View*). Designers then worked in groups of three, for 20 minutes, to develop two themes into annotated scenarios, including a sketch, title and description of various aspects (e.g. *How would it work?* and *How would it benefit parents?*). They were also asked to consider the potential challenges and limitations of each proposed scenario. Finally, all six designers presented their scenarios during a feedback session.

A total of eight scenarios resulted from our two workshops, which the authors then reviewed and distilled into four interaction design proposals. This was done by considering similarities, and how well they each met the design brief. We also considered plausibility. Since our objective was to prompt parents to imagine and reflect on how they might benefit from our proposals, we did not want them to be confused or distracted by questioning their technological feasibility. Thus, we decided to couch each proposal as a mobile application that enables new features and device capabilities when installed, a process that we expected parents would be familiar with, and understand well.

The first author then sketched each design proposal as a scenario-based storyboard comprising 9-14 scenes. We commissioned an experienced communication designer who provided guidance on storyboard development as well as the style and fidelity of our sketches. Our storyboards were to be used as interview stimuli; prompting (and probing) parents to imagine, reflect on, and discuss how these design proposals might improve their experiences and relationships. Consequently, we chose an annotated, comic style to suggest that our design proposals are rough and incomplete; intended to broadly communicate *what* they allow users to do, but without detailing *how* (Rosson & Carroll 2009). Each of our four storyboards demonstrates the use of a design proposal within a family (comprising two parents and two young children) by highlighting the main steps and key features involved. We are constrained by space, to only include example sketches in this paper (Fig. 22), together with a brief description of each storyboard. More detail can be found in Appendices 4.3 - 4.6.

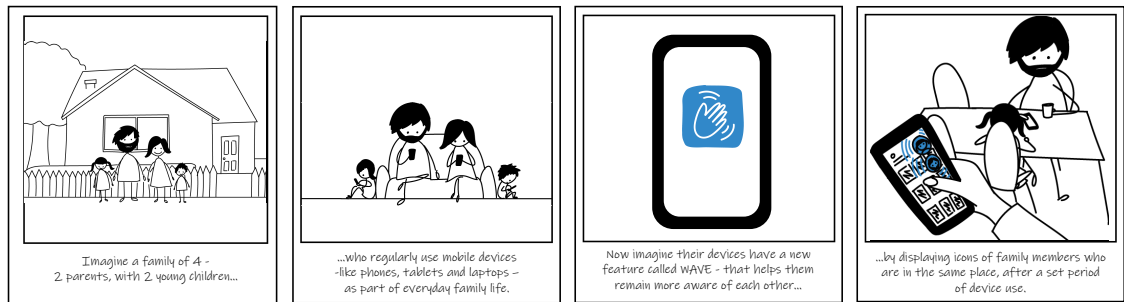


Figure 29. Examples of the 16 scenario sketches used to present Storyboard 1 'Wave'
(for reference only; identical to Figure 9)

Storyboard 1 – Wave

Our first storyboard describes *Wave*, which proposes to help collocated family members remain more aware of one another while using their mobile devices. It is designed to do this by displaying icons of family members who are nearby on the user's screen, after a set period of device use. These icons initially appear as faint avatars, which become more prominent over time, by growing larger, bolder and eventually 'jiggling' to gain the user's attention. A variety of options allow families to determine when, and how, these displayed icons appear, as well as the ways in which users can respond to them. By helping family members to remain more aware of each other, *Wave* also aims to encourage families to discuss and agree on how much attention they wish to pay to devices during family time. This storyboard includes a scenario in which a parent is reminded by *Wave* to curb their mobile phone use when other family members are nearby.

Storyboard 2 – Traffic Lights

Our second storyboard shows the use of *Traffic Lights*, proposed to help collocated family members gauge how 'busy' or 'available' one another are when using mobile devices. It does this by displaying colour-coded icons on the users' screen, that indicate the 'availability status' of family members who are using devices nearby. *Traffic Lights* offers a range of options for how family members set their status. For example, by selecting a status colour when unlocking a device, or by assigning status colours to applications (e.g. email) or times of day (e.g. evenings). Thus, *Traffic Lights* tries to help family members to understand how available they are to each other, while maintaining a level of privacy around precisely what a device is being used for. By providing this level of awareness, *Traffic Lights* also aims to encourage families to set intentions around everyday device use. This storyboard includes a scenario in which a parent uses *Traffic Lights* on their phone to ascertain how 'busy' their family members are on their devices, without disturbing them.

Storyboard 3 – Shared Space

Our third storyboard depicts *Shared Space*, proposed to increase collocated family members' awareness of what mobile devices are being used for. It tries to do this by allowing multiple family members to easily, and simultaneously, make their individual screens visible to each other via a large, shared display (e.g. smart table or TV). *Shared Space* also allows family members to make their screens visible to each other's mobile devices. Families can decide when, and how, the screens can be shared. For instance, to limit sharing during certain times, or between specific devices. *Shared Space* attempts to encourage communication and collaboration within families by offering them more transparent experiences of device use. This storyboard includes a scenario in which a parent and two children can see, and engage with, what each other are using mobile devices for while sitting together at a smart table.

Storyboard 4 – Family Goal-Setter

Our fourth storyboard envisions *Family Goal-Setter*, proposed to help parents integrate technology use into everyday life in a way that aligns with their family's values and aspirations. It aims to do this by encouraging families to set intentions for physical and digital activities that can be tracked over time. It allows both individual and joint activities to be tracked and displays everyone's progress on individual devices, as well as on shared displays. This aims to foster motivation by serving as a reminder and promoting a sense of teamwork. Families can also choose to aim for shared rewards (e.g. movie) and to avoid shared penalties (e.g. Wi-Fi break). This storyboard includes a scenario in which family members discuss and set their goals together, and view their progress on a shared display, mounted on a smart fridge.

Using our storyboards as interview prompts

Our storyboards were used in interviews to prompt parents to consider, and reflect upon, how new ways of interacting with technology might improve their experiences of managing mobile device use within family life. We recruited 14 parents through a network of local primary schools and community groups. Each participant was interviewed separately, for between 40-60 minutes, via Zoom (due to COVID-19 restrictions). All participants lived with at least one child under the age of twelve, and with another adult with whom they shared parenting responsibilities. Parents had between one and four children, ranging in age from one to 16 years. On average parents had 2.3 children, with a median age of seven years. Parents were aged between 37 and 55, with a median age of 42. Five described themselves as fathers, and nine as mothers. While all 14 participants lived in Australia, seven identified as being of non-Australian heritage. Ethics clearance for this study was granted by the University of Technology Sydney.

We familiarised each participant with our research context by sharing a short summary and asking a couple of introductory questions relating to attitudes around family technology use. We explained that we would be showing them four storyboards, each depicting a design proposal, or ‘concept’ being used within a family. We expected that the term ‘concept’ would be more familiar and easier to understand for our participants, than the term ‘proposal’.

However, we emphasised that our storyboards were not descriptions of fully developed designs, but rather suggestions of alternative ways in which mobile devices could be used within families. We also clarified that we were interested in hearing how they imagined parents’ experiences and relationships would be shaped by these design proposals, and that their feedback was not informing concept development. We then animated each of our storyboards manually, by narrating a sequence of scenario sketches presented in PowerPoint. While this format created a similar experience to viewing a video, it enabled us to pause and respond to questions from participants, who we invited to interrupt. It also allowed us to iteratively adapt our narration over the course of the 14 interviews, based on participants’ contributions.

After each presentation, we confirmed whether participants felt that they understood what was being proposed by our storyboard. We then asked them to explain what they perceived to be positive and negative aspects of the proposal they had been shown. These questions were intended to be easy to answer and encourage parents to start sharing their opinions with us. We aimed for them to create opportunities for initial lines of enquiry and to serve as an ‘icebreaker’ before we asked questions designed to prompt deeper, more focused reflection on how each proposal might improve parents’ experiences and relationships. When all four storyboards had been discussed, participants were asked which of the four design proposals they imagined would best improve parents’ experiences of managing mobile device use within the family, and which would be most helpful at alleviating the conflict that family technology use can create between parents. Lastly, we asked them if they had any additional contributions to prompt participants to confirm, or re-consider, their initial responses to the individual proposals. These final questions also provided us with opportunities to identify new lines of enquiry and to interrogate responses more deeply.

Analysing our Interviews

Video and audio recordings were made of each of our 14 interviews. After each interview, we transcribed the recording and took an inductive approach to develop codes (Thomas 2006) from this data, using NVivo software. The first author read through each interview and noted codes, which were then independently reviewed by each co-author. The authors then discussed these codes and created an initial set of themes. Since we aimed to establish an understanding of how we might improve parents’ experiences of managing family technology use, our primary focus

was on participants' positive responses to each of our storyboards. This led to the identification of three design approaches, that parents found particularly appealing. We then created a more comprehensive list of codes by collaboratively conducting another round of coding on each of these three approaches. By organising these codes into a second set of themes, we identified the main reasons why parents perceived they would benefit from these design approaches.

7.2.4 Findings: Design Approaches to Improve Parents' Experiences

Our use of scenario-based storyboards was successful at prompting and stimulating rich, reflective discussions with the parents we interviewed. Our participants' responses demonstrated their ability to understand and relate to the four design proposals, and to envision further possible use experiences within their own families. Their responses point to opportunities for approaches in the design of future technologies that may be helpful in improving parents' experiences of managing mobile device use within families, and in alleviating the resulting conflict between parents. We found that parents were especially enthusiastic about three approaches to technology design: (i) fostering *awareness* between collocated family members, (ii) encouraging *proximity* between collocated family members and (iii) supporting *communication about technology use* within families. Furthermore, we identified seven ways in which parents perceived their experiences, and their relationships, would benefit from technologies informed by these three design approaches.

Approach 1: Fostering awareness between collocated family members

Parents told us that the idea of fostering awareness between collocated family members through mobile devices could help improve parents' experiences, and their relationships, because of three main reasons.

Fostering awareness to support parents' existing efforts to curb device use

The first reason participants welcome the idea of raising collocated family members' awareness of each other, is that they believed it could support parents' existing efforts to curb device use during family time. This benefit was highlighted by the discussions prompted by our first storyboard, Wave. Participants imagined that by using icons to remind family members to be more attentive to one another, Wave would reduce the need for parents to do so. For example, S3P11 suggested,

"I think it's good to have those kind of reminders and this would be a nice way of keeping everybody in the family aware of their screen time. And I think that awareness is the first part of limiting technology use." (S3P11) .

Reflecting on this perceived benefit triggered several parents to discuss their efforts to curb mobile device use during family time. We heard that these efforts were usually motivated by parents' expectations for family members to engage with one another, and observations that device use was impeding this. Several parents complained that the over-engaging nature of device use often meant their efforts were unsuccessful, and their expectations of family time were unfulfilled. For instance, when considering Wave, S3P6 described her ongoing, unsuccessful attempts to curb her children's device use, as '*a drag*' and could imagine how her experience might be improved by this proposal,

"It'd be a great way to help manage the situation, I reckon (my son) would feel really guilty if he saw my little face on the screen trying to tell him to get off (the iPad) . When they're on the devices they're kind of blocking out everything else in real life...it's a sad problem and I'm trying to fix it." (S3P6)

Finally, participants were especially enthusiastic about the role that providing this awareness might have, in curbing activities considered to be less meaningful, and overly engaging (e.g. social networking sites, entertainment and news). Parents told us that they found these types of activities especially challenging to regulate, and that failing to do so could result in them feeling self-critical and guilty. In particular, parents cited their own struggles of remaining attentive to their children while using devices, and hoped that providing collocated family members with more awareness of one another could alleviate these especially challenging aspects of family technology use. For instance, S3P7 reflected on the potential benefits of using Wave, when she recalled an unpleasant, yet familiar experience,

"It's sad when the kids go, 'Mum...you've been on there for too long, get off the phone!' It's happened to me...so yeah, I think it's good to have that kind of reminder, or at least awareness, because you get lost in it – that's the problem." (S3P7).

While most participants felt that displaying visual icons of collocated family members after periods of device use could support parents' efforts to curb family technology use, they also emphasised the importance of allowing families to continually update and negotiate decisions regarding when, and how, such icons are displayed.

Fostering awareness to reduce uncertainties about technology use.

Another reason why our participants appreciated the idea of raising collocated family members' awareness of each other, is they believed that it could reduce some of the uncertainties parents currently associate with their family's use of devices. This benefit was predominantly discussed in relation to our second storyboard, Traffic Lights, which uses colour-coded icons to represent

the attention levels of collocated family members who are using devices. This storyboard prompted suggestions that this approach of raising awareness could bolster parents' existing efforts to establish shared understandings about how much attention family members should expect from one another when together, despite devices being used. Parents expressed their hopes that this increased clarity might reduce some of the misunderstandings and problematic experiences that families currently encounter. For instance, S3P8 imagined the benefits of Traffic Lights,

“When I’m on my device the kids can’t tell whether I’m interruptible, and this idea signals that really clearly to them. I love the idea, because it would take away some of my guilt about when I use my devices...I like the idea that I’m signalling to them that I am open to them...I guess it clarifies communication. And (with my husband) as well, if he’s red, then I will not disturb him...and it forces him to think about when he might want to be available as well.” (S3P8)

Parents described how the lack of certainty around mobile device use can contribute to communication difficulties in their relationships. For instance, S3P8 anticipated that having greater insight into her husband's device use might help her avoid disturbing him unintentionally, and in turn, experiencing his irritated response. As well as helping to prevent unwanted interruptions, parents also embraced the potential for collocated family members to demonstrate that they remained available to one other, despite being on devices. For instance, S3P12 imagined that this added clarity to awareness could help alleviate some of the conflict that she felt regularly arose between her and her husband, as a result of them making misassumptions about one another's device use, which often led to unwanted disruptions or feelings of disapproval and dejection. Meanwhile, S3P13 anticipated that this way of raising awareness between collocated family members would help collocated family members recognise when they are simultaneously 'killing time' on their devices, which he hoped would encourage physical interaction between them, as well as transitions toward device-free activities.

When responding to Traffic Lights, most participants mentioned that they were familiar with similar technological systems that they used to establish communication boundaries between colleagues in workplace environments. Thus, parents could easily imagine how it might improve their experiences of working from home. Despite these positive responses to this proposal, we did notice that not all our participants were enthusiastic about translating the idea of boundary setting from workplace settings into family contexts. For instance, S3P11 felt comfortable using Microsoft Teams (Microsoft 2021) to display her availability to colleagues, yet she believed that family members should always prioritise one another over their devices when in each other's company. Meanwhile, S3P3 expressed his concerns when considering this proposal,

"It's OK in the work environment...but when you're at home with family members, you don't have to go very far to find out what they're doing. And I think you need to be able to look at somebody in the face to be able to talk to them rather than avoiding face-to-face communication...there's a lot of physical contact as well in a family environment... if you remove the physical and emotional aspects of communication, that's detrimental to children's development." (S3P3).

S3P3 also vehemently objected to the idea of children being able to set their status to 'busy', *"I think it is actually quite rude. It's basically (allowing children to say) 'Talk to the hand! Don't talk to me'."* (S3P3).

We also heard slight concerns from parents about feelings of mistrust that might be fostered by offering family members availability awareness through their mobile devices. For instance, S3P12 wondered whether having access to availability information about her husband's device use might lead to her questioning it more than she does already. These concerns remind us of the challenges involved in translating technologies used to mediate aspects of device use within workplace settings, into the more complex and nuanced settings of family homes.

Fostering awareness to promote a sense of connected presence

Finally, our participants also perceived that fostering awareness between collocated family members could introduce a sense of connected presence within families. In particular, parents envisaged that, by simply displaying icons of collocated family members, Wave might help to reduce the feelings of social isolation and disconnection that they currently associate with device use during family time, and thus their need to restrict it. For instance, S3P7 anticipated that technologies designed to help family members remain more visible to one another would help lower her disapproval of device use during family time. Similarly, S3P5, who had initially focused on how Wave could help curb family members using devices in each other's presence, began to consider how it might actually enhance the very experience of collocated device use by, *"providing a sense of connection - that we're still 'here'"* (S3P5). When parents discussed how Wave could promote a sense of connected presence within their families, we noticed that they often referred to the playful nature that they envisaged this proposal to have – describing it as *'fun'* (S3P11), *'cheeky'* (S3P6) and *'cute'* (S3P8). This highlights the importance of considering playfulness when designing technologies to promote a sense of presence within families.

Parents also envisaged that making collocated family members visible to one another through their devices, such as with Wave, would promote a sense of connection by encouraging

more social interaction. They imagined that it would enable subtle forms of communication between family members' mobile devices, such as 'pokes' (S3P6) and 'waves' (S3P8). Furthermore, parents could imagine that this might prompt in-person communication, physical interaction and even transitions away from device use. For example, despite being quite accepting of collocated device use within her family, S3P8 described various situations in which she felt that Wave might satisfy her desire for more communication,

"I like it because it enables what I often want do with the kids when we're all on our devices sitting next to each other - just to nudge them and sort of go 'Hey, what're you up to?' or 'Hey, shall we go out, take a break, have a breather?' ...Often I want their attention because I want them to stop the devices and let's say, set the table." (S3P8).

Some parents, like S3P8, who felt more comfortable about their family members' use of devices in each other's presence, were able to imagine how this could offer families more opportunities to segue between digital and physical experiences. For instance, S3P13, who was opposed to the idea of using Wave to limit technology use, strongly believed that it would enhance his family's experiences of being together, despite using their separate devices,

"I'm imagining that we are all at home, but we're all busy on our own devices...and sometimes you want to share and interact with your family members as you do it. I like that online presence is merging into physical presence - you are at home together, but virtually...living together digitally, in parallel to living together physically." (S3P13)

In contrast, we heard a few parents question the idea of encouraging collocated family members to communicate through devices, fearing that this would displace in-person, verbal communication within families. For example, despite perceiving its potential benefits, S3P5 wondered whether this proposal should be considered as a last resort,

"Maybe you shouldn't need to use a device to do that. You should still have to use verbal communication and say, 'Hey (son) , look up', but yes, it could provide help with that when he's still ignoring you." (S3P5).

We recognise that parents often place value on nurturing in-person communication, especially in their children.

Approach 2: Encouraging proximity between collocated family members

Parents were also enthusiastic about technologies that could encourage proximity between collocated family members. There were two key reasons for this and they were primarily prompted when participants reflected on our third storyboard, Shared Space. Parents especially embraced the idea of screen-sharing to a large, communal display.

Encouraging proximity to prompt communication

When considering screen-sharing to a communal device, as depicted in Shared Space, most participants enthusiastically imagined that it would encourage proximity between family members, thus prompting communication. Participants also felt that this proposal could foster a greater sense of openness and inclusivity within families. Our storyboard depicts a smart-table being shared by a father and his two children, and we observed that participants tended to consider the benefits of using such a device when with their own children. In particular, parents were excited by the idea that it might help them remain aware and involved in their children's activities.

"It'd improve my experience...knowing what (the kids) are watching and understanding what they like. (My son) loves to show me things but I'm always busy. I'd use it to see what they're doing, as a regulatory thing, but also out of interest" (S3P6).

Upon further reflection, S3P6 suggested that using such a communal display could benefit the whole family by,

"sharing, unifying and being in each other's space, but in a non-threatening way" (S3P6).

We found that parents often associate their family's use of mobile devices with a reduction in attentiveness, visibility and communication. Therefore, parents hope that the use of larger, communal devices, would help support their existing efforts to foster interest and involvement between family members. For instance, S3P7 explained why she felt positively about her family members using Shared Space together, when she currently objects to them using their mobile devices during family time,

"Behind the screen feels like there's so much secrecy...that transparency is good because it can open up discussions." (S3P7).

Furthermore, S3P7 suggested that Shared Space might help to improve the relationship she has with her husband. Firstly, she thinks that it would support their existing efforts to collaborate on practical issues such as planning and organisation. Secondly, she feels that it could alleviate misunderstandings between them by providing transparency into what one another are using devices for. These were sentiments that we heard echoed by several other participants.

As we had anticipated, several participants expressed concerns that enabling screen-sharing in this way might risk eroding privacy within families. Some parents who welcomed greater insight into what children were using devices for, felt less sure about the usefulness, and appropriateness, of enabling adults to view each other's screens. For example, S3P1 appreciated being able to monitor their children's device use more easily, yet they imagined that screen-

sharing between adults would feel awkward, describing it as “snooping”. We also encountered widely varying attitudes towards privacy, especially regarding how much parents should afford their young children who are using personal devices. For example, S3P2 expected that parents would respect their children’s willingness to screen-share, while S3P5 assumed that parents had a right to access their children’s screens at all times in order to fulfill their responsibilities and provide parental guidance.

Despite these diverse views around privacy, we noticed parents welcomed the notion of voluntary initiation by the family member wanting to share. For instance, S3P14 perceived that this would create a sense of inclusivity,

“I’m seeing something that’s really cool. I want to share it with you...I’m inviting you into my space’.” (S3P14)

We also found that parents were more concerned about privacy when reflecting on screen-sharing between mobile devices, than on a communal device. For instance, S3P10, distinguished between how he imagined these two experiences,

“With the bigger screen, everyone can be working on their own thing at the same time – it’s a collage - everyone sees what everyone’s doing. Whereas the small screen, say, on your phone, it’d feel more like spying than sharing.” (S3P10)

Encouraging proximity to promote physical interaction

Another reason our participants valued the idea of technologies that encourage proximity, was that they hoped it might promote physical interaction between family members. Parents explained that they tend to feel that opportunities for physical contact between family members are currently reduced by collocated device use within families. For example, as S3P10 described why they welcomed the idea of their family using Shared Space,

“Technology isolates you, pulls you away. This...brings the family back together and into physical contact.” (S3P10)

All of our participants emphasised the impact of physical scale in determining the experience afforded by particular devices. They perceived larger, communal displays to afford more collaborative and inclusive experiences than current mobile devices. For instance, S3P14 imagined that, compared to existing mobile devices, sharing content through a larger screen would create more meaningful experiences that better align with her aspirations for how family time should be spent. Other participants emphasised the importance that the physicality of a shared smart-table might have, in fostering family unity. For instance, S3P13 expressed their excitement at the idea of leveraging a shared physical object,

“If we’re sharing through our own (mobile) devices...it’s not as intimate or as ‘family-like’ as

when we're around a table; the actual physical thing that we're touching at the same time and interacting around...it definitely feels like a centerpiece that represents that we are family, we are one unit, represented by this single thing." (S3P13).

While the parents we spoke to imagined that sharing through a communal device could prompt valued physical interactions within families, we detected some scepticism about the benefits of encouraging family members to screen-share between mobile devices. In fact, two parents, including S#P9, raised concerns about this exacerbating their existing struggles to ensure that collocated device use does not reduce physical interaction, especially between children.

"This would be convenient...but I actually think it's slightly worse than them picking their device up and walking over to the person they want to show...that creates communication...I wouldn't want it to replace that physical interaction." (S3P9)

Supporting communication about technology use within families

Our participants also valued design approaches that support more communication between family members, about how technology is used. This was seen to improve parents' experiences and relationships because of two main reasons.

Supporting communication about family technology use to assist collaborative efforts to manage device use

Our participants believed that the way in which our four proposals either involve, or affect, multiple family members would offer opportunities for them to reflect, discuss and negotiate their attitudes on how technology should be used, particularly when spending time together. In turn, they perceived that our proposals would support more collaborative efforts to manage family technology use. Parents admitted that discussions around technology use currently tend to be infrequent and unconstructive. This can encourage parents to take individual, rather than collaborative approaches to managing their family's technology use. When parents struggle to establish or enforce shared expectations of how technology should be used within their family, misunderstandings, communication breakdowns and conflict can arise in their relationships. Therefore, participants were enthusiastic about the ways in which our proposals seemed to create opportunities for more structured dialogue about aspects of technology use. For instance, S3P11 suggested that Traffic Lights would prompt valuable discussions in which both parents, and children, could align on their expectations about how mobile devices should be used when spending time together.

Our participants envisaged that using Family Goal-Setter to track family members' mobile device use, with the aim of balancing it with other activities, would be especially

effective at generating recurrent family discussions. Parents considered this to be an important benefit, given the changing nature of technology, and evolving family dynamics. Furthermore, participants hoped that using this proposal would help to alleviate the conflict that can arise, especially between parents, when trying to manage family technology use. For instance, S3P4 felt that using Family Goal-Setter would encourage her and her husband, to reflect on their individual aspirations for their family, and to align them through ‘*open communication*’ that she believed would alleviate misunderstandings and improve their relationship.

As participants reflected on using technologies that would help family members mediate their individual attitudes on how devices should be used, they revealed feelings of animosity that can currently arise from ad-hoc, unstructured communication around technology use. For instance, when family members attempt to affect, or even just enquire about, each other’s behaviour. Thus, participants like S3P4 envisaged that using Family Goal-Setter would be more constructive than current approaches to managing family technology use,

“I think that when there's no structure around it, it can feel like nagging. But if you've all agreed that you're going to have the discussions, and that you're going to check in on your own use, and the whole family is involved, then it provides something external, and not me saying, ‘Oh! You're on the phone again?’” (S3P4)

By compelling family members to discuss and establish collective goals, participants perceived that Family Goal-Setter might encourage collaboration between parents who disagree about how to manage their children’s technology. This was especially welcomed by parents claiming that the responsibilities of monitoring, and curbing children’s device use were unevenly distributed between them. We observed that imbalances can result from practicalities ranging from technological limitations (e.g. different operating systems) to differences in parenting roles. While these imbalances are often justifiable, they can nevertheless amplify conflict between sets of parents who have differing opinions on children’s technology use. S3P2 explained that her husband expected her to enforce his stricter rules on children’s technology use, despite her caring for them on her own most of the time. She complained that this led to her children lobbying her to change or ignore the rules, which in turn, created conflict with her husband. Therefore, she hoped that using Family Goal-Setter would alleviate some of this conflict by encouraging greater collaboration and co-operation between them.

Supporting communication about family technology use to empowering families to reach collective goals

When considering our storyboards, participants could envisage how our proposals offered different ways to visualise aspects of family technology use, and expected that this would aid communication between family members, about how technology is used; by either scaffolding

conversations or helping to resolve disputes. In turn, they perceived that this would empower families to reach collective goals, by supporting parents' existing efforts to ensure device use does not disrupt, or distract from, their family's other aspirations, commitments and objectives. These include parents' attempts to establish, and enforce, shared family expectations about how the use of devices is balanced with activities deemed to be more productive and beneficial, or to involve more physical movement and interaction.

Parents acknowledge that these efforts are often challenged by a lack of awareness and certainty over issues such as how long family members spend on devices and what they use them for. Therefore, our participants welcomed the idea of using visual cues, as proposed in our storyboards, to provide family members with greater transparency into each other's device use. Parents imagined that this would help alleviate the confusion and conflict they currently encounter when managing family technology use. For instance, S3P6 expressed her enthusiasm for the visual aspect of Traffic Lights,

"You'd have the plain hard data...visual proof, that's better than verbal agreements. My son has a screen-time policy, but somehow every weekend we're confused about how much time he's used. It's never clear because there's multiple devices, two gaming consoles, a computer, iPad and a phone. This is something that'd be clear and visual, so there's less negotiating." (S3P6).

During our interviews, participants used terms like 'middle man' (S3P7) and 'stepping stone' (S3P5) to describe the neutral, mediatory role that they perceived our design proposals could serve, in avoiding disagreements between family members, and supporting them to fulfil their expectations around how technology should be used at home. In particular, parents felt that being able to offer family members a shared view of their ongoing progress towards agreed goals, as proposed in Family Goal-Setter could help families to avoid conflict. For instance, S3P2 reflected,

"If there was a prior discussion and we all agreed on the targets, and then on that chart, everybody can see the progress...then there'd be nothing to dispute because it's all there, digitally." (S3P2).

In addition, parents told us that offering families shared visibility into aspects of their device use would motivate family members to reflect more deeply, and thus take action on their own technology use. For instance, S3P8 explained that her children made frequent, yet unsuccessful, attempts to raise her husband's awareness of his excessive device use and persuade him to curb it. She expressed her hope that by visualizing aspects of his device use for all to see, Family Goal-Setter might convince him to finally recognise and alter this behaviour.

We heard participants suggest that displaying the behaviour of family members in this way would introduce a sense of accountability and unity, not only between sets of parents, but

all family members. This led to hopes that shared visualizations of behaviour could help to improve parents' experiences, and relationships, by motivating and empowering families to achieve their collective goals together. For instance, S3P7 imagined,

“It's visual so we can see what our goals are...that would help (my husband) and I a lot because it would align us in terms of what we want for the kids. And seeing that we're coming up to a family reward at the end, that's a wonderful way of aligning us, so it's not the kids versus the parents. It's like we're working together as a family towards a common goal.” (S3P7)

7.2.5 Discussion

The primary aim of our study is to develop insights into how parents perceive they could benefit from specific approaches to designing interaction technologies. Yet, it also surfaces knowledge about parents' experiences and practices of managing mobile device use during family time. Our parents' responses confirm previous reports that, despite the critical role that mobile device use plays within families, parents often associate it with problematic experiences, including conflict in their relationships (Bruun et al. 2020; Derix & Leong 2018; Derix, Leong & Prior 2021; McDaniel et al. 2018; Oduor et al. 2016). As for whether technology design can help address these problematic experiences, the responses we gathered highlight the different ways in which parents envisage that their experiences would be improved by three design approaches. These approaches include fostering awareness and promoting proximity between collocated family members, as well as supporting communication about technology use within families.

We now discuss in greater detail, and in some cases, offer considerations of how these approaches to designing digital technologies might help improve parents experiences of managing mobile device use during family time.

Fostering awareness within families

Our findings reveal various ways in which parents' experiences might be improved by technologies that are designed to raise collocated family members' awareness of one another when using mobile devices. Specifically, by using visual cues, underpinned by a sense of proxemic interactions (Greenberg et al. 2011), to foster interpersonal awareness (Neustaedter, Elliot & Greenberg 2006) within families.

Fostering an awareness of presence between collocated family members' mobile devices appeals to parents as a means of supporting them to *communicate and enforce household technology limits*. In particular, displaying visual cues can serve to remind users to curb their device use when other family members are present. In contrast, mobile devices are currently designed for personal use, and digital technologies tend to be designed to promote user

engagement (Hasan, Mondal, Khatra, et al. 2020; Jarusriboonchai, Olsson & Väänänen-Vainio-Mattila 2015). Such technologies encourage people who engage in activities on mobile devices to create a private “*invisible shield*” (Kawsar & Brush 2013). Within families, this way of using mobile devices can give rise to feelings of social isolation (Turkle 2017), and motivate parents’ efforts to monitor and curb mobile device use during family time (Livingstone & Helsper 2008; Zaman et al. 2016). Yet, these efforts can be a source of stress for parents, who may also struggle to curb their own device use (Moser, Schoenebeck & Reinecke 2016).

Our study extends prior explorations into how technologies might be designed to support intentional non-use within families (Bruun et al. 2020), and suggests a need for further explorations into subtler, less punitive, and even playful approaches that might be more appropriate within families, and more appealing to parents. For instance, supporting families to limit mobile device use when together, by allowing them to create customized reminders, reflecting their particular values and aspirations.

Parents also welcome technologies that can foster an awareness of presence between collocated family members’ because of the social interactions and the *sense of connected presence* (Licoppe 2004) that it could promote (See 4.1.3). The sense of social isolation that can be associated with the private, personal way in which mobile devices are currently designed to be used has been shown to create frustrations and concerns within families (Hasan, Mondal, Khatra, et al. 2020). This often drives parents’ attempts to enforce limits on device use during family time, and encourage family members to remain attentive to one another. However, the experience of continually reminding partners and children of the need to be responsive can be a source of frustration for parents, who admit to their own failings in this regard (Blackwell, Gardiner & Schoenebeck 2016; Derix & Leong 2018). Therefore, parents positively perceive technologies designed to promote social interactions and connected presence between collocated device users. This would help reduce their current objections to mobile device use during family time, and correspondingly, their efforts to curb it. The enthusiasm that parents have for technologies that enhance collocated mobile device use might indicate that expectations about what constitutes family time are evolving. This may include parents becoming more accepting, or simply resigned, to mobile device use becoming an increasingly ubiquitous part of family life. As such, it is worthwhile to explore whether awareness-raising strategies used to mediate intimate relationships over distance (Griggio et al. 2019; Hassenzahl et al. 2012; Lottridge, Masson & Mackay 2009) might help to enhance the relationships of collocated family members, separated not by physical distance, but by their persistent engagement in devices. For example, maybe Griggio et al.’s (2019) *Lifelines*, could inspire technologies that foster a sense of connected presence between collocated family members who are on devices, by providing them with peripheral awareness of contextual information about one another’s digital activities?

Fostering activity awareness between collocated family members also appeals to parents

because it would support their existing efforts to *avoid and resolve the frustrations and misunderstandings* that can arise from mobile device use within families. This is because, in addition to being designed primarily for personal use, mobile devices allow users to engage in a vast array of activities, without offering any visible indication of what is being done (Jarusriboonchai, Olsson & Väänänen-Vainio-Mattila 2015). This makes it hard for people who are nearby to understand what users are engaged in and how much attention they might expect to receive from them. Prior work shows that, within family contexts, the type of activity engaged in, plays an important role in determining the appropriateness of device use (Moser, Schoenebeck & Reinecke 2016) and feelings of uncertainty about what collocated family members are doing on their devices can result in frustrations, misunderstandings and family tensions (Oduor et al. 2016). Hasan, Mondal, Khatra, et al. (2020) have demonstrated that allowing collocated partners to share activity-related information while using smartphones can reduce these feelings of uncertainty, and provide awareness about how appropriate it is to interrupt each other. However, Hasan, Mondal, Khatra, et al.'s (2020)'s approach of displaying the type of smartphone app in use raised privacy concerns. Our findings indicate that these concerns might be addressed by more subtle ways of raising activity awareness, such as communicating levels of availability. Overall, parents' interest in technologies that raise awareness between collocated families, lead us to echo prior calls for further explorations into how strategies employed to mediate device use within the workplace (e.g., Ackerman & Starr 1995; Dourish & Bellotti 1992; Sellen et al. 2006) might be translated into technologies intended for use in domestic settings (Moser, Schoenebeck & Reinecke 2016; Oduor et al. 2016; Sellen et al. 2009). Yet, when doing so, our findings remind us of the need to consider the very distinct values and dynamics that exist within families (Neustaedter, Brush & Greenberg 2007).

Promoting proximity within families

Our findings show that parents' experiences can be improved by technologies that are designed to promote proximity between collocated family members by encouraging families to engage in collective activities using communal devices. This is because parents desire technologies capable of creating more *opportunities for communication* (See 4.2.1) and *opportunities for physical interaction* (See 4.2.2) within families. In contrast, the personal, private ways in which mobile devices are designed to be used, can mean that we lose many of the social elements of the activities we engage in (Jarusriboonchai, Olsson & Väänänen-Vainio-Mattila 2015).

Concerns over the loss of social elements mean that parents often resort to placing limits on mobile device use during family time. As well as appreciating the more social experiences of device use that these technologies might create, parents anticipate that their efforts to monitor and curb device use during family time would be much reduced. This builds

on Clark's (2011) desire to expand the notion of parental mediation strategies to include parents and children interacting together with and through digital technologies. It also extends current understandings of how encouraging collective activities can be used as a strategy to promote collocated social interaction within families (Olsson et al. 2020). Specifically, it builds on Ferdous et al.'s (2016) suggestion for technologies that foster 'togetherness' through engaging in shared activities, by emphasising the importance that families place on using shared physical objects together, and the physical interactions that this can encourage, especially with children. Thus, we urge further explorations of how encouraging collective activities through communal devices might improve parents' experiences of managing family technology use.

Supporting communication about technology use within families

Our findings reveal various ways in which parents' experiences might be improved by technologies that are designed to support communication about technology use within families. Specifically, by offering opportunities for family members to reflect and discuss their current and future technology practices. This is because many of the problematic experiences that parents encounter when managing mobile device use during family time, relate to the ongoing challenge of balancing the immediate individual needs and aspirations of family members with the longer terms goals of the family (Livingstone & Franklin 2018). Different expectations about how technology should be used during family time, and even different understandings about what constitutes family time, can create tensions and conflict (Blackwell, Gardiner & Schoenebeck 2016). In particular, conflict can arise between sets of parents who struggle to align their individual perspectives on how their children, and each other, should use technology when spending time together (Derix, Leong & Prior 2021). Our findings reveal that designing technologies that support family members to communicate about how technology should be used when they are together has the potential to help alleviate this conflict, and thus improve parents' experiences of managing mobile device use during family time.

Our findings demonstrate that technologies designed to allow family members to be aware of, or to affect each other's mobile device use, can create opportunities for joint reflection and discussion, thus helping them to communicate and negotiate their individual attitudes. Currently, the communication and negotiation around how technology should be used within families are often unplanned and unproductive, and parents desire more opportunities for collective reflection and constructive dialogue (Bruun et al. 2020; Derix & Leong 2020a; Derix, Leong & Prior 2021). Hiniker et al. (2017) highlight that most commercial offerings aiming to support parents to manage their family's device use are designed to enable them to impose various restrictions on their children's use. Instead, they call for more collaborative approaches that promote intentional interactions. Our study echoes this call, and further emphasises the

need to explore technologies that can better support sets of parents to *collaborate on managing device use* within their family. However, the collaborative aspect of parenting has tended to be overlooked in explorations of family technology use (Ammari et al. 2015; Derix & Leong 2020a; Derix, Leong & Prior 2021). This is despite recent revelations about the imbalances in parents' relationships that can be created, and amplified by technology practices within families (Derix, Leong & Prior 2021). Our study highlights that a lack of consideration about shared parenting practices leaves parents struggling to collaborate through many of the commercially available tools designed to help parents manage family technology use. Thus, we urge researchers to pursue deeper understandings of the collaborative nature of parenting, in order to explore how we can help sets of parents to distribute the responsibility of managing their family's device use more evenly.

Our findings also show that technologies designed to offer all family members visual feedback about aspects of their collective device use can support joint reflection and discussion, about how devices should be used during family time. Furthermore, technologies that display visual information about aspects of device use to all family members can motivate them to establish shared intentions reach their *collective goals*. Providing opportunities for reflection on certain aspects of device use is a common approach taken by many commercially-available tools that have been developed to support individuals be more intentional about their device use and better able to self-regulate it (Whittaker et al. 2016). Yet, despite demonstrations of how sharing information between family members can enhance their experiences (e.g. of organising and scheduling (Brown, Taylor, Izadi, Sellen, Kaye, et al. 2007; Neustaedter, Brush & Greenberg 2007)), only very few studies have explored how to support collaborative efforts of regulating family technology use. For example, by prohibiting device use within families, Bruun et al.'s (2020) work demonstrates that technologies designed to involve, or affect, all family members create valuable opportunities for constructive conversations about their current and future practices. Meanwhile, Dong et al. (2015) provide a rare example of how gamification can be used to encourage discussions and reflections about how technology is used within families. While this example deviates from our own focus on addressing some of the parenting challenges associated with family technology use, we echo Dong et al.'s (2015) call for further explorations into the benefits of technologies that can transform the individual and rather sober experience of managing family device use by making it more social and even playful.

Further explorations

Overall, our study demonstrates that design opportunities do exist, to help address the problematic ways in which mobile device use within families currently shape parents' experiences and relationships. Furthermore, our work has established an initial understanding of

what these opportunities might look like, and highlighted the need for them to be further explored. We would now like to offer some considerations to researchers and designers choosing to do so.

Based on our parents' feedback, it appears that there are some 'quick fixes' that could help alleviate the pain points that parents currently associate with the use of existing mobile devices, and deserve immediate exploration. For instance, how to encourage cross-platform collaboration through applications that aim to support parents manage family device use (e.g. Apple's *Parental Control Settings*), rather than limiting controls to one parent. Similarly, the integration of technologies used in location-sharing applications (e.g. Apple's *Find My*) into the status-sharing features of instant messaging applications (e.g. Facebook's *Active Status*) could be investigated as a means of providing collocated family members with activity awareness and/or a sense of connected presence. Beyond these 'quick-fixes' to technologies that have been appropriated into family homes, our study reveals an exciting opportunity to explore how novel technologies might address some of the challenges faced by parents, by re-imagining and enhancing experiences of collocated mobile device use, so that it becomes something parents feel more comfortable with, or even encourage, during family time.

However, our study reminds us that explorations into any design approach aimed at improving parents' experiences of managing family device use must first recognise the importance of addressing the dynamic and specific nature of families. That families are diverse and parents require technologies that can cater for various aspirations and values. That parents demand technologies that can satisfy the rapidly evolving needs of growing children and newly adopted technologies. That family life can be messy, often lacking consistency and distinct boundaries around aspects such as device ownership. As we have mentioned, this is particularly important to consider when exploring how approaches to mediating collocated device use within the workplace can be effectively adapted, or appropriated, into family contexts.

Finally, our study indicates that parents desire technologies that create more playful, enjoyable and collaborative experiences of managing mobile device use, that better align with their aspirations for family life.

7.2.6 Limitations + Future Work

By surfacing valuable insights into specific ways whereby three specific design approaches could benefit parents, we are also pointing towards areas of further research that can generate deeper design knowledge into such approaches. It would be great if future studies can address several limitations of our study.

First, our results are limited by our participants' ability to fully envisage using our four design proposals and so, when attempting to generate deeper insights and design knowledge into

any specific design approach, we recognise the need to explore the deployment of physical prototypes developed from more complete concepts. When investigating the deployment of such prototypes in family homes, we also emphasise the importance of understanding children's perspectives to them, despite our primary objective of improving parents' experiences. Third, we remind researchers to consider alternative design approaches to try to improve parents' experiences of managing family technology use. After all, the three approaches revealed by our study were directly informed by our selection of four design proposals from at least 60 initial ideas, and so, are surely not exhaustive. Fourth, this paper has highlighted a few concerns that parents raised while reflecting on our proposals, and it is important for such concerns to be further explored when generating more specific design guidance on how to better support parents' efforts of managing mobile device use within families.

We also welcome more diverse, cross-cultural insights into how technology design might improve parents' experiences, given that all our participants were from urban areas of Australia. Lastly, at the time of our study, the full impact of COVID-19 in Australia was not being felt by our participants. Yet, it would be of interest to understand how the effects of the pandemic might have influenced parents' attitudes on the use of mobile devices within families, and specifically, what constitutes 'family time'.

7.2.7 Conclusions

While technologies play a critical role in supporting family life, the use of mobile devices within families often lead to undesirable experiences for parents. Stress arising from misunderstandings and even conflict between parents have been reported. So, this paper reports on our efforts to explore whether technology design might be able to help alleviate some of the challenges and problematic experiences parents face, especially when trying to manage device use during family time. We effectively used scenario-based storyboards to prompt parents to discuss the perceived benefits of four design proposals. This contributed an understanding of how parents' experiences might be improved by three particular approaches to design: (i) *fostering awareness*, (ii) *promoting proximity* between collocated family members and (iii) *supporting communication about technology use* within families. It also helped to identify several directions of further exploration for those interested in understanding, and responding, to parents' perceptions of how to make family technology use a more appealing and desirable prospect. Through this, we hope to take a small step towards technologies that can support parents' aspirations for how their family's time together is spent.

(End of Publication VII)

I now summarise the findings that emerged from Study Three.

7.3 Findings from Study Three

Study Three contributes to a more complete understanding of how technology design might better support parents' aspirations for how devices are used within the family. Parents' responses to the early interaction design concepts created in Study Three demonstrate that opportunities do exist, to help improve parents' experiences. These opportunities include 'quick fixes' and for novel technologies that re-imagine and enhance experiences of collocated mobile device use so it becomes something parents feel more comfortable with, or even encourage, during family time. In particular, parents envisaged that their experiences of managing mobile device use during family time would be improved by three design approaches.

Fostering awareness between collocated family members.

For example, providing family members with proximity-based reminders of one another after set periods of device use, or with various levels of information about the type of activities that each other are engaging in on their individual devices. Parents envisaged this approach would help to improve their experiences by:

- *supporting parents' existing efforts to curb device use*
- *reducing uncertainties about technology use*
- *promoting a sense of connected presence.*

Encouraging proximity between collocated family members.

For example, enabling family members who are near to one another to all make what they are doing visible on a communal screen. Parents envisaged that this approach would help to improve their experiences by:

- *prompting communication within families and*
- *promoting physical interaction between family members.*

Supporting communication about technology use within families.

For example, creating opportunities for more constructive dialogue about how technology is used during family life. These can include opportunities for occasional or more frequent, ongoing discussions prompted by initially setting up or using technological features that involve a degree of reciprocity or collaboration between family members. Parents envisaged this approach would help to improve their experiences by:

- *supporting more collaborative efforts to manage mobile device use*
- *empowering families to establish and reach their collective goals.*

These findings indicate that it would be worthwhile to further research how these, and other approaches, to improving parents' experiences of managing mobile device use during family time. In addition, this study suggests that parents desire technologies that are capable of creating more playful, enjoyable and collaborative experiences of device use, that better align with their aspirations for the time their family members spend together.

Chapter 8 now considers the contributions and implications of this thesis when viewed in its entirety.

CHAPTER 8

Discussion & Conclusions

CHAPTER 8. Discussion + Conclusions

This chapter discusses the findings of this research, by reflecting on the overall learnings from my efforts to better understand how technology use within the family shapes parents' experiences. Whilst each of my publications contains a discussion section, those are focused and limited to considering certain contributions of a specific study. This chapter discusses the theoretical, methodological and design contributions of this thesis when viewed in its entirety. It then considers the implications and limitations of this thesis, as well as directions for future work, before concluding. I begin this chapter with a brief recapitulation of the objectives and findings of the three studies constituting the empirical research done for this thesis.

8.1 Research Summary

Overall, these studies focused on exploring how technology use within families can shape parents' experiences and relationships. This objective responds to a growing HCI interest in understanding the frustrations and challenges that this might present to families (Oduor et al. 2016). These studies also address calls for more holistic understandings of how technology use is experienced within families (Fails et al. 2012). They do this by redressing several limitations of existing work. For instance, prior work tends to focus on parents' efforts to manage children's technology use and how this impacts on parent-child dyads. As a result, parents' experiences of using technology remain underexplored and the collaborative nature of parenting is overlooked. Studies of family technology use also tend to limit their area of focus. For example, they concentrate on the use of specific technologies (e.g. social networking sites), by particular family members (e.g. parents or children) or at certain times (e.g. mealtimes). Furthermore, research with families usually attempts to capture individual responses from a single family member, or collective responses representing the views of whole family. Thus, differing individual perspectives are easily overlooked or lost.

Study One | Establishing an initial understanding of parents' experiences of family technology use

Study One establishes an initial and broad view of the types of experiences that parents associate with technology use within the family. This workshop was designed to prompt parents to reflect on their experiences of how digital technologies are used during everyday family life. In addition, it was intended to inform the design of subsequent probe and interview studies, by building initial relationships with parents and an understanding of their everyday contexts.

This first study confirms that parents' experiences of digital technology use within families are often complex. Despite perceiving many benefits of digital technology use, parents

are concerned about the negative effects that it might have on family and child development. Parents are especially concerned by the way the use of mobile devices disrupts interactions between family members, thus preventing a highly valued sense of togetherness from developing between them.

Study One identifies four problematic experiences that parents' commonly associate with family technology use: *apprehension*, *ambivalence*, *compromise* and *conflict*. This study also suggests that parents can have differing attitudes on how technology should be used within the family. Moreover, it indicates that parents' differing individual perspectives on family technology use can contribute towards conflict in their relationships.

The findings of Study One reveal a gap in our understanding of family technology use. Specifically, the way in which parents communicate, negotiate and align their individual perspectives on how technologies are used within the family, and the impact that this might have on their relationships.

Study Two | Methodological guidance on probe design and use

Study Two offers an example of an effective approach to capture and tease apart parents' individual – and potentially differing – perspectives on family technology use. It also explicates and extends methodological guidance on how to think about designing and using probes, especially to explore individual perspectives within families.

The methodological focus of Study Two first involved reflecting on the process of using Wallace et al.'s *Making Design Probes Work* (Wallace et al. 2013) to guide the design and use of probes. As well as demonstrating the effectiveness of this nascent framework, this process clarifies and develops this guidance on probes. It also highlights additional decisions that need to be considered when probing into individual perspectives within families. For example, whether and how to capture individual or collective responses.

The methodological focus of Study Two also involved reflecting on the effectiveness of the approach developed during Study Two. Doing so illustrated the benefits of seeking a balance between the individualistic and collective approaches to probes that have previously been used to research families. This approach was found to help to (i) discover family dynamics, roles and relationships (ii) reveal parents' individual practices and priorities (iii) raise parents' awareness of each other's perceptions and (iv) prompt parents to reassess their own perceptions. The probes used during Study Two were shown to be especially effective at capturing and teasing apart parents' differing perspectives because of two specific design tactics: (i) creating conversations between sets of parents and (ii) using personification to shift the perspectives of participants.

Study Two | Theoretical understandings of family technology use: conflict in parents' relationships

Study Two also provides deeper theoretical knowledge: how technology use shapes family dynamics by surfacing insights into how technology use can impact parents' relationships. Specifically, it validates suggestions that emerged from Study One, by explicating how technology use can contribute towards conflict in parents' relationships, and ways in which this conflict can play out in everyday family life.

First, this study demonstrates that technology use can help enable or amplify conflict between parents because of four key factors: (i) *differing parenting values*, (ii) *misperceptions*, (iii) *imbalance* and (iv) *inconsistency*. Second, it illustrates how conflict in parents' relationships can arise from the way in which parents use technology or from the way in which parents manage children's technology use. The four main sources of this conflict are identified as: (i) *monitoring each other's digital technology use*, (ii) *using technology as escapism*, (iii) *regulating children's technology use* and (iv) *using technology to placate children*.

Overall, this study suggests that conflict between parents is predominantly associated with the use of mobile devices in situations where family members have the opportunity to interact with one another when spending time together (family time).

Study Three | How the design of interactive technologies might improve parents' experiences

Study Three suggests ways in which technologies might be designed to better support parents' aspirations for the time their family members spend together. Specifically, it provides examples of early interaction design concepts that demonstrate opportunities to help improve parents' experiences of managing mobile devices during family time. Parents envisaged that they would benefit from three particular design approaches: (i) *fostering awareness*, (ii) *encouraging proximity* and (iii) *supporting communication about technology use*.

The findings of Study Three suggest two main areas that deserve further exploration. First, technologies that re-imagine and enhance experiences of collocated mobile device use so that it becomes something parents feel more comfortable with, or even encourage, during family time. Second, technologies that create more playful, enjoyable and collaborative experiences of managing mobile device use that better align with parents' aspirations for family life.

8.2 Thesis Contributions

This section considers the contributions and implications of this work, when viewed in its entirety. This research journey was initially motivated by an interest in understanding how our increasingly prevalent use of digital technologies is shaping the way in which we interact and engage with one another. By taking the family as a context within which to explore this issue, these studies were designed to establish theoretical knowledge with which to inform the HCI community of parents' aspirations, needs and experiences of integrating technology use into everyday family life. Yet, doing so required the development of tools capable of capturing and teasing apart parents' individual perspectives on technology use. Creating a novel set of probes provided an opportunity to develop, extend and demonstrate the effectiveness of existing methodological guidance on the design and use of probes. These probes were then employed to help surface the complex and problematic ways in which family technology use can often shape parents' experiences and their relationships. Finally, this research proposed early interaction design concepts to prompt parents' reflections on how their experiences of family technology use might be improved through the design of future interactive technologies. Thus, when considering this work as a whole, it offers significant theoretical, methodological and design-oriented contributions that are now discussed.

8.2.1 Theoretical Contribution: Establishing more holistic understandings of family technology use

This thesis contributes towards more holistic understandings of technology use within families by revealing how it shapes parents' experiences and relationships. This complements existing research that has traditionally focused either on identifying technologies that support parenting practices (e.g., Ammari & Schoenebeck 2015; Madge & O'connor 2006) or on parental mediation of children's technology use (e.g., Hiniker, Suh, et al. 2016; Vandewater et al. 2005b). In doing so, it responds to calls for more complete view on family technology use (e.g., Fails et al. 2012).

The value of togetherness

The parents I worked with aspire for their family members to feel a sense of togetherness when spending time together. Yet, within the busyness of everyday life, parents perceive that opportunities for family members to interact with each other while sharing physical space (e.g. at home) are often in short supply . Thus, parents tend to associate positive experiences with technology use that is perceived to create opportunities for family time, and to promote togetherness. In contrast, they associate negative experiences with technology use that seems to reduce opportunities for family time, or to threaten this sense of family togetherness.

The detailed accounts of parents within these studies confirm previous reports about the range of undesirable experiences that device use can create within families (Bruun 2020, Oduor 2016). By revealing the complicated nature of parents' felt and lived experiences with technology in everyday family life, these accounts extend current understandings of how family values guide technology practices. Specifically, by demonstrating how the value of *togetherness* affects parents' experiences and practices of managing device use during 'family time'.

Across these studies, most of the problematic experiences discussed by parents, including conflict in their relationships, relate to the use of mobile devices. While parents rely heavily on mobile devices and appreciate the benefits that these can offer their families, they perceive them as greatly impeding togetherness by drawing individual family members away each other. This aligns with previous observations of technology use in families and couple relationships (e.g., Hasan, Mondal, Khatra, et al. 2020; Oduor et al. 2016; Salmela, Colley & Häkkinen 2019). In particular, it echoes Turkle's (2017) notion of device use within families fuels a sense of being 'alone, together'.

Overall, parents feel that the use of mobile devices over-engages individuals, and that the solitary interactions they afford result in feelings of uncertainty and disconnection within families. They also perceive messaging within media and wider society to instil a sense of social judgement about excessive device use within families, by implying that it indicates lower parental interest or ability. This supports previous depictions of what a complex, and morally loaded endeavour parenting can become in our technology-saturated world (Hiniker et al. 2015; Hiniker, Suh, et al. 2016; Mazmanian & Lanette 2017).

Parents' own experiences of struggling to curb device use deepen their concerns about allowing children unregulated screen-time. These concerns about preserving a sense of togetherness within families strongly motivate parents' efforts to monitor and limit children's device use. This work not only confirms that parents find these efforts of mediating children's technology use to be extremely challenging (Livingstone & Helsper 2008; Moser, Schoenebeck & Reinecke 2016; Zaman et al. 2016), but demonstrate that these efforts are a key reason why parents associate technology use with problematic experiences.

Technology Use Shapes Parents' Experiences and Relationships

This work has identified and described the ways in which family technology use shapes, and is shaped by, the dynamics between parents. In addition, it provides a detailed account of how conflict can arise in parents relationships, because of their differing individual values and perspectives relating to technology use. Thus, this thesis extends current understandings of how technology use can impact family dynamics.

People's values drive their behaviour (Harper, Rodden, Rogers, et al. 2008) and even an

individual's decision on whether or not to adopt and use certain technologies (Leong & Robertson 2016). However, the studies carried out for this thesis reveal a more intricate situation of 'values in action' within family life. This is because all individual family members contribute to putting shared family values into action. However, individual values might not always align, and might need to be communicated and negotiated in order to establish shared family values. Attempting to balance the values of individual family members with shared family values can become complicated.

Adding to this complexity is the fact that parents are both users of technology and the guardians of their children's technology use. Parents attempt to restrict their own use of technology, in order to prioritise the needs of their children and model desired behaviour in front of children (Ferdous et al. 2015; Mesch 2009). In particular, researchers have shown that parents limit their device use at times when children are present, such as mealtimes (Moser, Schoenebeck & Reinecke 2016) or at children's playgrounds (Hiniker et al. 2015; Lemish, Elias & Floegel 2020). Additionally, parents experience internal conflict when their own use of technology disregards rules that they have enforced on family members.

While prior work has shown that the presence and use of technology in families can create conflicts in values, prior research has focused on understandings the effects on parents-child dyads (Blackwell, Gardiner & Schoenebeck 2016; Hiniker, Suh, et al. 2016). The studies conducted for this thesis have revealed that conflicts of values, with regards to technology use, can also occur in parents' relationships. Specifically, parents can have very different individual attitudes on how technology should be used within the family, which can become a contentious issue within their relationships. This conflict can arise from parents' differing views on how they should each use technology and/or from their differing approaches to managing children's technology use.

By demonstrating that parents currently struggle to communicate, negotiate and put into action their individual perspectives on how technology should be used within the family, this work highlights the importance of considering the collaborative nature of parenting. Yet, the lack of attention previously given to exploring parents' relationships implies that prior HCI perceptions of parenting might have been over-simplified or misplaced. For example, by assuming that one parent alone is responsible for taking all the decisions that affect how technology is used within the family, or that parents' individual perspectives effortlessly align.

By revealing the complex ways in which technology use within families can shape and in turn, be shaped by, parents' relationships, this thesis complements previous efforts to understand parents' experiences of mediating children's technology use and the conflict this can create in parent-child relationships (Blackwell, Gardiner & Schoenebeck 2016; Hiniker, Suh, et al. 2016). This thesis also contributes to a growing HCI interest in exploring parents' experiences of moderating their own technology use, especially when spending time with

children (Hiniker et al. 2015). Lit. As well as helping to substantiate previous suggestions that parents can have differing attitudes and practices when it comes to technology use (Ammari et al. 2015), it builds on early indications about the potential frustrations that this can create within families (McDaniel et al. 2018; Oduor et al. 2016). By highlighting the need for HCI researchers and designers to understand and support interdependence and collaboration within families, this work contributes towards more holistic understandings of family technology.

8.2.2 Methodological Contribution: Novel guidance and approaches to probe experiences of family technology use

By attempting to understand the impact that family technology use can have on parents' relationships, the research undertaken during this thesis demanded the development of new methodological tools. Specifically, a novel approach to designing and using probes that could help capture and tease apart parents' individual perspectives on how technology should be used within the family. Developing and demonstrating this approach extends current understandings of how probes can be designed and used within HCI, especially to explore complex dynamics and experiences within social groups, such as families.

Firstly, this research provides much awaited additional guidance on how to think strategically about designing and using probes. Secondly, it offers specific guidance on how to adapt the approach of probing into individuals' experiences of engaging with technology, to support explorations of more complex experiences associated with social contexts, such as domestic spaces. It also presents examples of artefacts that effectively engaged sets of parents and helped to reveal their differing perspectives on technology use and the conflict that can arise from this.

Developing guidance on designing and using probes, especially within families Since being introduced by Gaver, Dunne & Pacenti (1999), probes have become a well-established approach to understanding users, their behaviours, and use of technologies (Boucher et al. 2018). However, concerns have been raised about the method being misinterpreted and misunderstood, due to a lack of actionable guidance on how to design and use probes (Boehner et al. 2007). While some publications describe the approach taken to design specific probe tools (e.g., Boucher et al. 2018; Mattelmäki 2006; Tsai, Orth & Hoven 2017), Wallace et al.'s '*Making Design Probes Work*' (Wallace et al. 2013) offers a nascent framework for thinking more strategically about the method.

My efforts to follow this framework involved distilling, using and identifying ways of improving upon it. Doing so has helped to clarify and extend existing guidance on how to think about the core properties of probes, and how to affect them through design decisions. It also offers a consistent visual framework to help guide researchers and designers through the

decisions that are required to design and deploy probes. These efforts result in a set of methodological guidance that is intended to be more accessible and generalizable, especially to those with less experience of designing and using probes.

Wallace et al's (2013) framework solely draws on probes that were designed and used to capture a single perspective. Yet, this research aimed to capture and tease apart parents' individual – and often differing - perspectives on family technology use. Thus, specific advice was sought from reports into the use of probes to explore more complex aspects of family relationships such as intimacy (Dalsgaard et al. 2006; Davis et al. 2007; Horst et al. 2004; Kjeldskov et al. 2004). By highlighting the importance of context-specific factors, such as privacy, these reports helped to identify additional design decisions that were necessary to consider when adapting the method.

A novel approach to probes when exploring complex family experiences
Using probes to explore parents' individual perspectives on family technology use and resulting conflict in their relationships presented significant additional challenges. Following and extending the framework helped to produce a novel set of probes that could address these challenges. These probes were used to effectively engage participants and supporting this research inquiry - the objectives of any successful probe (Boehner, Gaver & Boucher 2012; Gaver et al. 2004). By demonstrating how to adapt probes to capture and tease apart parents' differing individual perspectives, this thesis extends current understandings of how to design and use the method to explore complex experiences of technology use within social contexts – in this case, families.

Using probes in a dialogical approach to support and stimulate discussions between researchers and participants in follow-up interviews is an established practice within HCI (Desjardins, Wakkary & Odom 2015). However, this approach was developed by primarily considering individual experiences of technology. When working with families, relying solely on responses from individual participants overlooks complex family dynamics and, ultimately, the needs of the whole family (Horst et al. 2004). Researchers have sought to correct this by taking a collective approach in which multiple family members complete probes together before discussing responses in group interviews. Yet, this neglects the diverse and potentially conflicting perspectives of individual family members (Desjardins, Wakkary & Odom 2015; Horst et al. 2004).

In this research, these two conventional dialogical approaches were adapted by designing a probe collection capable of capturing a combination of individual and collective responses. Heeding advice on how to create varied probe collections (Wallace et al. 2013), three probes were designed to each capture a different type of response, or combination of responses. This

example of adapting the design and use of probes extends our current understandings of how to use probes when working with families and, more broadly, to surface insights into experiences, and indeed co-experiences (Battarbee 2003), of technology use within social contexts.

This adapted approach healed to address some of the challenges posed by trying to explore the multiple perspectives that surround technology use within families. For instance, people are often unaware of their own approaches and attitudes to technology use, especially with regards to practices of using mobile devices, which have become so habitual (Tran et al. 2019). Another challenge is getting individuals to disclose the cause of tensions that might exist in their family because of technology use. Participants may find it uncomfortable or embarrassing to discuss private and possibly socially undesirable topics such as family conflict (Mazmanian & Lanette 2017). Moreover, participants may not be fully aware of the underlying causes, or the extent, of the tension they experience. This is particularly true in families where tension around technology use has become an accepted part of domestic life.

When designing probes capable of exploring these challenging but important aspects of family technology use, this research found that two distinct design tactics were especially effective. The first tactic was to create various opportunities for conversation. These were not just occasions for participant-researcher dialogue, but for discussions between participants and for them to make explicit their internal dialogue and their collaborative dialogical sensemaking. This tactic was implemented by designing probes that create (i) opportunities for internal dialogue, (ii) opportunities for parents to compare their individual responses and (iii) opportunities for parents to collaborate on a joint response.

The second tactic was to design probes that help to shift (or even invert) the perspective of participants – from that of ‘the self’ to that of an inanimate object e.g. a smartphone. This tactic was implemented by using personification to (i) design probes that prompt a subtle shift in participants’ perspectives and (ii) design probes that prompt a more explicit shift in perspective. Combining these two tactics was found to be valuable when designing probes to explore parents’ differing individual perspectives on family technology use.

To summarise, this work contributes significant methodological guidance on how to design and use probes, especially when exploring the dynamics of social contexts such as families. It also provides examples of probe design artifacts and empirical evidence to document how this guidance was effectively applied to explore parents’ complex experiences of family technology use.

8.2.3 Design Contribution: Enhancing the experiences of families

This research concludes by proposing design approaches that have the potential to improve parents' experiences of managing mobile device use during family time. It also provides user-scenario storyboards that exemplify these approaches, and empirical evidence of *how* each approach might benefit parents. In doing so, it establishes an understanding of how to design technologies that better support the aspirations and needs of parents. More broadly, it also extends current knowledge about how we might design technologies that look beyond enhancing experiences of individual use, to enhancing experiences of being together, even while embracing the benefits of device use.

Designing to foster awareness

Firstly, this work suggests that parents' experiences could be improved by technologies that are designed to raise collocated family members' awareness of one another when using mobile devices. For example, by using visual cues, underpinned by a sense of proxemic interactions (Greenberg et al. 2011) to foster interpersonal awareness (Neustaedter, Elliot & Greenberg 2006) within families. This approach appeals to parents as a means of supporting their existing efforts to ensure that technology use does not erode a sense of togetherness developing between family members when spending time in each other's company.

Fostering activity awareness between collocated family members was also shown to appeal to parents as a way of supporting their existing efforts to reduce and resolve the frustrations and misunderstandings that can arise from mobile device use within families. In addition to being primarily designed for personal use, mobile devices allow users to engage in a vast array of activities, without offering any visible indication to other people of what is being done (Jarusriboonchai, Olsson & Väänänen-Vainio-Mattila 2015). Thus, it is hard for people who are nearby to understand what users are engaged in and how much attention they might expect to receive from them.

Designing to encourage proximity

These studies also indicate that parents' experiences could be improved by technologies that are designed to promote proximity between collocated family members. For instance, by enabling collective activities through communal devices. Parents hope that such devices would help to support social elements, such as communication and physical interaction, within families. In contrast, the personal, private ways in which mobile devices are designed to be used, can mean that we lose many of the social elements of the activities we engage in (Jarusriboonchai, Olsson & Väänänen-Vainio-Mattila 2015). By helping to restore some of these social elements, such technologies would help to alleviate parents' concerns over device use that currently motivate

their efforts to monitor and curb device use during family time. This builds on Clark's (2011) desire to expand the notion of parental mediation strategies to include parents and children interacting together with and through digital technologies.

Designing to support communication about technology use

Finally, this work proposes that parents' experiences would be improved by technologies that are designed to support communication about technology use within families. For example, by offering opportunities for family members to reflect and discuss their current and future technology practices. This is because many of the problematic experiences that parents encounter when managing mobile device use during family time, relate to the ongoing challenge of balancing the immediate individual needs and aspirations of family members with the longer terms goals of the family (Livingstone & Franklin 2018). Furthermore, the communication and negotiation around how technology should be used within families are often unplanned and unproductive, and parents desire more opportunities for collective reflection and constructive dialogue (Bruun et al. 2020).

This work highlights that a lack of consideration about shared parenting practices leaves parents struggling to collaborate through many of the commercially available tools designed to help them manage family technology use. Instead, it suggests that technologies designed to offer all family members communal feedback about aspects of their collective device use can support joint reflection and discussion about how devices should be used during family time.

Furthermore, displaying visual information about aspects of device use to all family members could motivate them to establish shared intentions reach their collective goals. Providing opportunities for reflection on certain aspects of device use is a common approach taken by many commercially-available tools that have been developed to support individuals be more intentional about their device use and better able to self-regulate it (Whittaker et al. 2016).

Despite demonstrations of how sharing information between family members can assist with aspect of domestic life such as organising and scheduling (Brown, Taylor, Izadi, Sellen, Kaye, et al. 2007; Neustaedter, Brush & Greenberg 2007), few studies have explored how to support collaborative efforts of regulating family technology use.

This research demonstrates that opportunities do exist to design interactive technologies in ways that better support the needs and aspirations of parents. The first is designing to encourage more collaborative experiences of managing device use within families, so that interacting with technologies feels more intentional and meaningful, rather than distracting and habitual. The second is designing to support social elements of being together, so that experiences of family technology use feel more unified and transparent, rather than isolated and disconnected.

The contributions of this thesis include understandings of theory, methodology and design – these contributions are summarised below.

8.2.4 Summary of Contributions

Theoretical: More holistic understandings of family technology use

- Extending current understandings of how family values guide technology practices.
 - Demonstrates how the value of togetherness affects parents' experiences and practices of managing device use during family time.
- Extending current understandings of how technology use can impact family dynamics.
 - Identifies and describes how the collaborative nature of parenting shapes, and is shaped by, technology use within the family.
 - Provides a detailed account of how family technology use can contribute towards conflict in parents' relationships.

The theoretical contributions of this research emanated from Study One, which addressed:

RQ1 What types of experiences do parents commonly associate with family technology use?

and from the way in which Study Two addressed:

RQ3 How does family technology use within families contribute towards conflict in parents' relationships?

Methodological: New guidance on, and new approaches, to probes

- Extending the understanding of how probes can be designed and used within HCI, especially to explore complex dynamics and experiences within social groups
 - Clarifies and extends existing guidance on how to think about the core properties of probes, and how to affect them through design decisions.
 - Offers a consistent visual framework to help guide researchers/designers through the decisions that are required to design and deploy probes.
 - Articulates a novel approach to designing and using probes to capture and tease apart parents' individual perspectives on how technology should be used in the home.
 - Provides examples of artefacts that effectively helped support reveal parents' differing perspectives on technology use and the resultant conflict in their relationships.

The methodological contributions of this thesis emanated from the way in which Study Two addressed:

RQ2 How can we use probes to explore parents' individual perspectives on family technology use?

Design: Proposals for enhancing parents experiences

- Establishing an understanding of how various approaches to the design of interactive technologies could enhance experiences of family technology use.
 - Proposes design approaches that could improve parents' experiences of managing mobile device use during family time.
 - Provides examples of user-scenario storyboards that embody these proposed design approaches and empirical evidence of how these might benefit parents.

The design contributions of this work emanated from Study Three, which addressed:

RQ4 How could the design of future technologies help improve parents' experiences of family technology use?

8.3 Thesis boundaries

This section considers the boundaries of this thesis. While this thesis presents an authentic and thorough description of the research and its findings, it does not claim to be an exhaustive and account of how families experience technology use, let alone of how technology use affects family experiences of being together.

8.3.1 Research context and unit of analysis

This research captured parents' perspectives in order to establish and understanding of how family technology use shapes their experiences and, importantly, their relationships. In doing so, it redresses and complements existing work that primarily focuses on parent-child relationships. As a result, children's perspectives were not captured. Furthermore, these studies deliberately engaged with parents with children aged 12 years or younger.

A total of 29 parents participated in this research. This number was sufficient and appropriate, given the research objectives and approach. Yet, the findings are bound by the particular demographic diversity of these participants. All participants were recruited through a network of schools and community groups in metropolitan areas of Australia, predominantly in Sydney, NSW. Despite my efforts to include parents from a range of family structures and ethnic backgrounds, the insights of this thesis are bound by the cultural, educational and income levels represented by its participants.

These studies were deliberately designed to be concise, so as to easily integrate into the busy lives of parents with young children - many of whom were juggling professional and domestic responsibilities. My extensive experience of conducting UX fieldwork within commercial projects enabled me to capture a significant amount of rich data in a relatively short period of time. Yet, since these studies are cross-sectional, the insights relate to how parents

experience a certain stage of life, and do not consider how their experiences might change over time as their children grow and their families evolve.

8.3.2 Working with probes

The methodological contributions of this thesis are limited to the design and use of probes. Specifically, this research demonstrates the effectiveness of a novel approach to designing and using probes to capture and tease apart parents' individual perspectives on family technology use. It might be useful to consider similar approaches and adaptations when using probes to explore experiences of technology use within other social contexts. Yet, this is not something that has been explored within this work. Similarly, some of the methodological insights relating to the design and use of probes might be applicable to methods beyond probes. However, this is not something that this thesis can claim.

This novel approach to probes was developed as a prerequisite to discovering parents' experiences and relationships. While the process of developing this approach and reflecting on its effectiveness helped to generate methodological knowledge, this was not the initial or ultimate objective of this research. Thus, this thesis does not claim to examine all possible approaches or adaptations to the method. Rather, it provides one example of a set of probes, and an in-depth demonstration of its effectiveness within a specific probe and interview study.

8.3.3 Research approach

Throughout this research, I sought opportunities to involve others with data collection and analysis in order to enhance the credibility of its findings and boost confidence in the conclusions drawn from its qualitative data. For instance, as described in Chapter 3, I recruited two collaborators to assist with notetaking and audio recording during the session; an experienced UX researcher and a first year PhD student. We discussed our notes and initial insights during a debriefing session immediately after the workshop that served to support my analysis. Doing this provided an additional level of reliability to the groundwork. Similarly, one of the designers participating in Study Three assisted with facilitation and took part in a debriefing session following each of the design workshops. Doing so provided consistency and additional dependability to the process of distilling the ideas into four final design proposals. Since it was not feasible to include a second analyst/coder throughout this research, much of the data collection and analysis during was conducted alone. However, I did ensure to regularly present and debate the results of each study with my supervisors throughout the analysis process.

Overall, my process of conducting and analysing this research was influenced by my background as a professional UX researcher/designer. This research was also shaped by my role

as a working mother of two young children and my lived reality of sharing parenting responsibilities with my husband and determining how technology is used within our family.

8.3.4 Additional Boundaries

At the time these studies were conducted, an increasing range of non-screen-based devices were appearing on the market. Specifically, voice-user interfaces (VUI) and Internet of things (IoT) smart home devices. While these were starting to be adopted into family homes in Australia, they were not common at the time of my studies. The ethnographically-inspired approach of this research meant that its focus followed emerging findings. Thus, despite initially considering the use of any type of interactive technology within families, this thesis became increasingly focused on parents' experiences of mobile device use.

As discussed in my preamble, this research journey was significantly impacted by the COVID-19 pandemic. In particular, it affected decisions about the design of Study Three. During this final study, some parents did make reference to the ways in which travel restrictions resulting from the pandemic had changed technology practices within the family or their attitudes towards it. However, any implications of how parents' experiences of family technology use might have been affected by the pandemic are outside of the central focus of this thesis, which had already been determined by earlier studies prior to its outbreak.

8.4 Implications: Experiences of being together

This section considers the broader implications of this thesis. Individually and collectively, these studies question how we think about, explore and design for people's experiences of being together, especially within families.

8.4.1 Understanding experiences of being together

This research highlights the value that is placed on fostering a sense of 'togetherness' within families and that this value drives perceptions and practices of technology use. For instance, parents' negative perceptions of mobile device use tend to stem from their fears and observations of it reducing social elements of being together and thus, the sense of togetherness that they seek to foster within the family. On the other hand, parents welcome the idea of future technologies that might be designed to enhance a sense of togetherness by reinstating social elements of being together.

An enthusiasm for technologies that enhance collocated mobile device use indicates that parents' experiences of 'family time' do not simply refer to mealtimes and movie nights, but to a much broader range of dynamic and ambiguous family configurations that need to be further

explored. It also substantiates reports of changing practices in which family members spend an increasing amounts of time together, yet feel more alone as a result of pervasive device use (Mullan & Chatzitheochari 2019). These indications demand that more nuanced explorations are conducted into how technology use might be helping to shift expectations of what constitutes being ‘together’ within today’s families.

The need to explore the value and experiences of togetherness, not only in families but also in wider social contexts such as workplaces and schools is pertinent in a post-pandemic world in which distinctions between work and home are forecast to remain increasingly blurred. It would be worthwhile to examine how togetherness drives perceptions and practices of technology use in these various contexts and to seek opportunities for enhancing it through the design of interactive technologies.

8.4.2 Understanding how technology use can create conflict

In order to enhance experiences of technology use within social contexts, researchers and designers first need to develop deeper understandings of the problematic social impacts of existing device use. This research has revealed the complex experiences that parents associate with family technology use, especially the conflict that it can create in parents’ relationships. Further investigations into how technology use impacts parents’ relationships is critical, given that marital and relationship satisfaction is a cornerstone of both individual and family wellbeing (Ahlstrom et al. 2012).

By characterizing the ways in which technology use can create conflict in parents’ relationships, this work complements previous reports of discord in parent-child dyads and contributes towards a more holistic understanding of how technology use impacts family dynamics. In order to provide an even more holistic view of how technology use affects family dynamics, there is clearly a need to explicate the relatedness and interdependency between these two forms of family conflict. It would also be worthwhile to consider how (especially collocated) technology use might be contributing towards tension and conflict in other types of relationships, particularly those which are based on certain power dynamics. For instance those between employers and employees, students and educators etc.

8.4.3 Approaches to researching experiences of being together

The conventional goal of UX research methods is to understand experiences of individual users engaged in a specific technology so that they can be further prioritised through design. This research demonstrates the need and opportunity to extend these existing methods and to develop new ones that are better able to support research into complex experiences of technology use within social groups. While this research was concerned with parents’ experiences of

technology use within the family, the notion of adapting methods to explore the individual – perhaps contentious - perspectives of multiple people is applicable to other groups and within wider social settings.

Likewise, this description of how probes can be adapted to effectively capture and tease apart multiple individual perspectives should be considered as an initial example, or prototype, that can be further developed and tested through deployment in different contexts. Furthermore, it should provide inspiration to researchers seeking to develop new approaches to other UX methods, beyond probes, to investigate experiences of being together while using technology.

8.4.4 Designing to enhance experiences of being together

By unpacking the concerns that parents express about the use of technology, particularly the collocated use of mobile devices, this research identifies a demand for interactive technologies that are designed to better consider and even enhance people’s experiences of being together. The characterization of how various design approaches might improve parents’ experiences suggest a range of options that can be considered by designers seeking to explore how to enhance the experiences both within families and in other social contexts. This could be done by further developing the ideas depicted by the scenario storyboards or by exploring new ideas and approaches.

Supporting social elements of being together

This work establishes that parents desire technologies that are designed to promote the social elements of being together. This desire primarily stems from parents’ perceptions of today’s technologies, especially mobile devices, as reducing opportunities for in-person social interaction. These perceptions arise because mobile devices are designed to encourage communication with remote others and to promote private, individual user engagement in activities while failing to provide social cues to collocated others. Thus, opportunities exist to redress this through technologies that are designed to promote awareness and encourage interactions between people who are using their devices in each other’s presence. In other words, to create more experiences that feel more unified rather than individual and isolated. These opportunities were identified in relation to parents’ experiences of technology use in family contexts and here, there is much scope to explore them further. However, there is also a need to establish an understanding of how this approach to designing interactive technologies that support social elements of being together might translate beyond families and domestic spaces and into a wider range of social contexts.

Supporting more collaborative efforts to manage technology use

This research identifies a demand for technologies that support more collaborative efforts of managing technology use. Within the context of families, it demonstrates that parents often feel isolated in their (often unsuccessful) efforts to ensure that device use does not undermine the broader, long-term aspirations that they have for their family. Parents' individual and often conflicting approaches to managing their own device use, as well as their children's, can lead to tension and conflict in their relationships. This conflict further compounds their dissatisfaction with and negative perceptions of technology use. Thus, design opportunities exist to encourage dialogue between parents and even children, about how they intend to use technology within everyday life. Design opportunities also exist to provide family members with greater awareness regarding aspects of device use. While these opportunities were identified whilst researching device use in family contexts, it would be valuable to explore the benefits of these approaches within wider contexts. More specifically, it would be worthwhile to explore how the notion of supporting collaboration through technology designs might be applied within a growing ecosystem of tools aimed at helping people to self-manage their device use.

8.4.5 Mounting Relevance

In the years since starting this study, technology use has continued to become more pervasive in families as it has in wider society (Livingstone & Blum-Ross 2020). In turn, concerns around the unintended consequences that pervasive technology use might have on individuals and on families have only grown (Wiederhold 2020). These have been exacerbated by reports in the mainstream media of technology use threatening social institutions such as politics, finance and healthcare (Allcott & Gentzkow 2017; Di Domenico et al. 2021; Weiss-Blatt 2021). As a consequence, public perceptions of technology use have shifted significantly, with many becoming more sceptical towards it (Brown 2020). Amidst this shift, the need for technologists to take more responsibility for the wider implications of their designs has become increasingly accepted, both within and beyond the field of technology (Bowles 2018; Fiore 2020; Ibiricu & Van der Made 2020; Lindberg, Karlström & Männikkö Barbutiu 2021).

In response to this newly acknowledged responsibility, recent efforts have been made to understand and address the problems of designing technologies that are destined for use in social contexts, in a way that over-prioritises individual user engagement (Lukoff et al. 2021). From a research perspective, this includes a growing interest into people's attempts to alter or limit their use of devices (e.g., Baumer et al. 2014; Radtke et al. 2022; Syvertsen 2020; Trajkova & Martin-Hammond 2020) and endeavours to re-establish some of the social elements that can be lost when interacting with our devices (e.g., Dagan & Isbister 2021; Hasan, Mondal, Khatra, et al. 2020; Khatra 2022; Olsson et al. 2020; Stepanova et al. 2022). From a commercial

perspective, new products and services cater to a growing demand for technologies that help people better control how their attention, time and energy are spent while interacting with technologies (e.g., Cecchinato et al. 2019; Lyngs et al. 2019). It is also evident, from the features that companies such as Google (2022b), Apple (2022a) and Microsoft (2022) have recently introduced and highlight, that they have been making a more concerted effort to consider families and to better support parents' experiences of managing their children's technology use.

These efforts are encouraging because it confirms that researchers and designers recognise both the high-level issue that I initially discovered in my professional experience as well as a similar research gap to that which I subsequently identified in the literature reviewed for this thesis. Secondly, it demonstrates that the pace at which technology continues to evolve and the pervasiveness with which it is used demands deeper understandings of how to research and design for people's experiences of being together and living with technology, rather than of simply using it.

8.5 Future Work

This section provides an overview of the various opportunities for further work that were identified during this research. These include opportunities to capture additional perspectives, to consider further contexts and to explore additional methodological and design approaches.

8.5.1 Capturing additional perspectives

While this work has made significant contributions towards more holistic understandings of family technology use, there are several specific avenues for further research to consider a more extensive range of perspectives.

Firstly, further research is required to substantiate the findings of these studies by capturing the perspectives of more parents, especially parents who represent greater diversity. This research includes engaging with parents in other locations (i.e. beyond Australian cities), from varying socio-economic, education and cultural backgrounds and who have older children (i.e. teenagers). It also involves understanding the experiences of parents who are not cohabiting, or who are caring for children alone.

Secondly, in order to build an even more holistic view of family technology use, it is important that future work also incorporates children's perspectives. This includes exploring how children currently experience the various ways in which they, and their parents, use digital technologies within everyday family life. In particular, it would be of interest to explore how children perceive and are impacted by the conflict that technology use can contribute in parents' relationships. It is also crucial that future work investigates the additional considerations of engaging with children when using and adapting existing research methods, for instance probes,

to explore the individual perspectives on technology use that exist within the whole family. It is also especially important that children's perspectives are captured when attempting to understand how the design of new interactive technologies might be used to enhance experiences of family technology use.

The stories of the parents who participated in this research also indicate that it would be valuable to explore how factors such as gender, role and occupation might influence parents' attitudes towards and experiences of family technology use. Also, to understand how parents' experiences of navigating family technology use change over time. This is because participants in this research described the challenge of integrating technologies within the dynamic context of family life. Specifically, of constantly re-evaluating and readjusting technology practices as children develop and the ecosystem of technologies within the family grows.

8.5.2 Considering further contexts

While this research focused on understanding the experiences of technology use within the context of the family, there are opportunities for further research to consider a broader range of contexts. These opportunities include understanding how technology use affects experiences of being together in other settings and situations. It would be especially valuable to explore how the methodological guidance and novel approach that was taken to research individual perspectives could be applied to other social groups and settings such as working or learning environments. Further research should also consider how experiences of collocated technology use in various settings can be enhanced through design.

The findings of this research indicate that whether or not a particular use of technology leads to tension and conflict between parents depends on a variety of contextual considerations such as what device is being used, by whom, where, with who else present, how often, and for what purpose. While this aligns with findings of previous work on parent-child relationships (Hiniker, Suh, et al. 2016; Yurman 2017) we require more detailed investigations into how certain contexts of technology use can contribute towards conflict between parents.

It is critical that future work also investigates domestic settings in which emerging technologies such as Internet of things (IoT) and voice-user interface (VUI) devices have been adopted. While this research set out to explore parents' experiences of any and all the technologies used within family life, the participants who engaged with this research were found to represent family homes dominated by screen-based technologies such as smartphones.

Finally, it would be worthwhile to build on this work by exploring how parents' expectations and experiences of technology use within the family have been affected by post-pandemic working patterns. While the pandemic was ongoing during Study Three, its impact was not specifically examined.

8.5.3 Additional Methodological and Design Approaches

This research has developed new methodological guidance and demonstrated a novel approach to designing and using probes to effectively explore parents' experiences of family technology use. Specifically, a set of novel probe artefacts that successfully captured parents' individual perspectives on technology use. However, these probes are not intended, nor should they be considered, as an exhaustive solution. Opportunities exist to further develop and seek alternatives to this novel approach and to these particular probes. It would be especially valuable to explore the effectiveness of other methods (besides probes) to support inquiries into conflicting attitudes and perceptions within families or other social groups, or to inspire the design of new tools that can help us explore the different perspectives of multiple individuals and how we might support more unified experiences of aligning them.

Similarly, there are opportunities to develop and to look beyond the specific design proposals that were used in this research to prompt reflections into how parents' experiences of managing family technology use might be improved. For instance, the scenario storyboards used in Study Three are artefacts characterizing examples of design ideas that might help enhance peoples experiences of technology use in social settings. Future work is needed to develop them into more complete concepts and to deploy physical prototypes. It would also be worthwhile to explore a wider range of approaches and proposals.

8.6 Concluding Remarks

The journey of this thesis began by me questioning the effect that HCI's traditional focus on prioritising individual user engagement might have on the way in which people experience and engage with one another when using interactive technologies in social contexts. In other words, how our increasingly ubiquitous human-computer interactions affect the interactions between people, human relationships and ultimately, our experiences of being together. As the fundamental unit of society, families were chosen as the context within which to explore this thesis and parents as the unit of analysis.

Traditionally, studies of how technology use affects interactions between family members and shapes family relationships have focused on parent-child relationships. In particular, exploring how they are impacted by parents' efforts to limit children's technology use due to their concerns around the risks posed by excessive amounts of childhood screen-time (Hiniker, Suh, et al. 2016; Mazmanian & Lanette 2017). Yet, HCI research has recently become more interested in understanding the ambivalence experienced by parents when trying to limit their own device use to ensure that they pay attention to their children (Hiniker et al. 2015; Kildare & Middlemiss 2017).

This research has confirmed that parents' attempts to reduce family technology use can be attributed to the personal, private and over-engaging way in which interactive technologies are designed (Cecchinato et al. 2019; Peters, Ahmadpour & Calvo 2020). This often clashes with parents' aspirations for family members to engage and interact when spending time with one another. So, these studies confirm previous reports of parents' experiences of managing family technology use being complex and challenging. However, this prior work neglects to consider parenting as the collaborative undertaking that it typically is, and, therefore, the need to understand how technology use shapes, and is shaped by, parents' relationships.

This thesis addresses this gap by probing into the different individual perspectives on technology use that exist within sets of parents, and how these are communicated, negotiated and put into practice within family life. By complementing prior work concentrating on parent-child relationships, this research contributes towards more complete theoretical understandings of family technology use, and specifically its effect on parents' experiences and relationships. In doing so, it reveals that family technology use often creates conflict between parents, and provides examples of how such conflict typically plays out.

Designing and using probes to capture, compare and tease apart parents' individual perspectives on technology use and surface insights into the tension and conflict that it could cause in parents' relationships demanded a novel approach. Developing (and reflecting on) this approach contributed methodological knowledge about how to employ probes to explore the complex families and, more broadly, the experiences of multiple people when technology is used within intimate, social settings.

Within the context of families, and parents in particular, this thesis highlights the need to revise over-simplified ideas about how decisions on family technology use are taken. By failing to consider parents' relationships, prior HCI research has incorrectly assumed that one parent is always responsible for determining their family's technology practices, or that parents inherently agree. In challenging these assumptions, this work demonstrates the importance of exploring how to help parents align their individual perspectives on managing technology use and navigate this complex endeavour, together.

This research suggests a more radical way in which the design of interactive technologies could help improve parents' experiences of managing family technology use, which currently involve monitoring and limiting device use during family time. This involves dispelling unhelpful binary tropes of parents, either irresponsibly failing to curb their family's excessive screen-time, or ignorantly failing to provide them access to innovative technologies. Rather, it requires us to understand that, while parents are increasingly accepting and appreciative of the technologies used within family life, they perceive that current technologies, especially mobile devices, are designed in ways that dominate the time and attention of individuals. Instead, parents desire technologies that can foster interaction, engagement and a sense of 'togetherness'

between family members. Such technologies would better support parents' aspirations for the time their families spend together. In doing so, they would help to alleviate parents' existing struggles to control and curb device use in everyday family life.

Finally, this work indicates that opportunities exist for HCI researchers and designers to improve people's experiences of interactive technology use in social settings. These opportunities involve exploring how to create more unified experiences that not only consider how to engage the individual user, but also consider the perspectives of those around them and the interactions they have with them. By revealing these opportunities, and demonstrating the steps taken to identify them, this thesis hopes to encourage and inform future efforts to more fully explore how people's behaviour and experience is affected by not only using, but living with technology, together.

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Appendix

APPENDIX

Appendix 1 The Publications

Appendix 1.1 Publication I

Days of Our Lives

Family Experiences of Digital Technology Use

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ABSTRACT

This paper describes findings from a workshop, with 11 parents of children under 12 years of age, that explored family experiences of digital technology use. We found that technology experiences within everyday family life are complicated and interlinked. We highlight four experiences that featured most prominently with our participants: *apprehension*, *ambivalence*, *compromise* and *conflict*. In addition, we discuss how family values govern these experiences and how families use digital technology. This work contributes to current understandings of how family values guide technology practices. These early findings suggest that deeper understandings of family values; how they are shared, negotiated and put into action, will help inform the design of future technologies that not only support families' practices and activities, but also their experiences and aspirations.

CCS CONCEPTS

• Human-centered computing → Human computer interaction (HCI)

KEYWORDS

Digital technology, family, experiences, values.

ACM Reference format:

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1 INTRODUCTION

HCI research into the pervasive use of technology in family life has shown how digital technology has affected the minutiae of family life. Digital technologies, such as smartphones and tablets, have become a mainstay of today's families. The proliferation of mobile devices has blurred the work and home lives of parents

[30, 38], and they are increasingly relied upon to manage prosaic aspects of domestic life [15]. Even the use of touchscreen devices by toddlers and babies has been normalized [20, 35]. Meanwhile, debates and uncertainty endure over how the presence and use of these devices are affecting aspects of family life [6, 46].

Amidst the profusion of digital technologies into families and uncertainties regarding its effects, many researchers have urged for a deeper understanding of ever-evolving family experiences of technology use [10, 16, 18, 43]. This will be more critical, with the emergence of Internet of Things (IoT) and Voice User Interface (VUI) devices that are set to join the current device ecosystems of family homes. These emergent technologies amplify uncertainties over issues such as privacy, security and ownership, further complicating family experiences [32, 34, 42].

It is against such a backdrop that we sought to explore how today's families are experiencing their digital technology use. As we will explain in Related Work, efforts to date have tended to limit their focus to particular family members or specific family practices or activities. Our workshop sought to capture a broader view of how digital technology is incorporated and experienced in all aspects of everyday family life. The aim was to establish some early findings of family experiences of digital technology use, and to surface productive directions for future research.

2 RELATED WORK

As digital technologies have increasingly become part of the home and families [15, 27], HCI researchers have explored how digital technology can support family practices, relationships and experiences. One common approach in HCI involves the design and introduction of (novel) digital technologies to try and improve particular aspects of family life. These interventions include video connections to enhance experiences of families communicating over distance [22], a location-aware clock to improve experiences of home coordination [7], and even technologies to enrich experiences within intimate relationships [14]. While many seek out opportunities to exploit digital technologies to support practices and experiences in families, there are others who warn that digital technology use within today's families is problematic [43, 46].

There are suggestions that pervasive use of technology in childhood can adversely affect child development [6, 23], and that parents' prolific use of technology reduces their ability to attend to the needs of their children [46]. Unsurprisingly, pediatricians and psychologists have weighed into these claims. For example, the American Academy of Pediatrics issued screen-time guidelines,

associating use in early childhood with greater risk and recommending age-dependent limits [1]. Meanwhile, psychologists report on how technology-based interruptions, or “technoference”, adversely affect family relationships, and associate parents’ device use with problematic behavior in young children [31]. Amplified by mainstream media [8, 24], such reports fuel widespread uncertainty amongst laypeople around the effects of technology use in families [6]. Some in HCI are trying to understand this apparent ‘darker side’ of technology use in the family [5, 18, 19, 29, 37].

To address concerns over excessive use in childhood, efforts have been made to explore the implementation of parental controls and family technology rules. Research into the effect of rules on relationships and experiences has tended to focus on specific activities, such as video gaming [41] and Internet use [28]. Since the widespread adoption of touchscreens, an initial focus on adolescents has expanded to include technology use in early childhood [13, 19, 47]. Research into controlling childhood technology use tends to consider a parent’s role as the guardian of their child’s technology use. A prominent exception is Hiniker et al’s [17] work on technology rules that also considers the role of parents as technology users. This found that both parents and children struggle to comply with rules, leaving all family members desiring more attention from one another when in each other’s company. The authors call for further work to explore contextually appropriate use of technology within families.

The role of parents as users of technology has received increasing attention in recent years. Palen’s [38] study found mobile devices enabled ‘remote mothering’ and shifted family members’ sense of ‘home’ as a place. The affordances of mobile devices have since expanded far beyond telephony. With Facebook’s first teenage users now maturing into parents, mothers have become the fastest growing demographic of social media users [36]. In turn, researchers demonstrate a growing interest in parents’ use of technology, particularly of social networking sites (SNS) [3, 12, 25, 44, 45]. These studies reveal that while considering their own technology use, parents’ experiences remain governed by their responsibilities as parents and the need to consider their child. For instance, parents report negative emotional experiences, including guilt, when they use their smartphone whilst caring for their children at public playgrounds [18]. Parents also describe struggles to consider issues such as child privacy, when deciding what information to share about their child Online [2].

In summary, our review of related work in HCI found that efforts tend to limit their focus to the experiences of parents [3, 4, 18, 25, 44, 45] or children [5, 6, 35, 39]. As Isola and Fails note in their literature survey of technology use in family [21], very little work explores experiences of the family as a whole; recommending that future work should adopt a more holistic view of family. Within the limited research that does consider the experiences of both parents and children, they focus on particular situations, such as mealtimes [9, 11, 37], particular devices, such as mobile phones [37] and home assistants [40], and particular practices, such as rules to restrict family technology use [17, 29]. However, the range of digital technologies used in families today is broad and increasingly growing; often used by all members of the family. Given the uncertainties that surround the effects of technology use on family experiences, we need to develop more nuanced understandings of the experiences of families as a whole, especially

within the complex and messy nature of everyday family life. As a first step towards this goal, we conducted a workshop with parents of young children, to understand these experiences. The workshop was granted ethics approval from University of Technology Sydney.

3 WORKSHOP

The activities of the two-hour workshop were informed by our review of related literature. This included ways to explore how digital technology is experienced by all family members, which devices were typically used, when, where and why. Importantly, we explored participants’ feelings towards these experiences, as well their perception of how their family members felt.

3.1 Participants

The workshop consisted of 11 parents from nine Sydney households with ethnically diverse backgrounds. These parents, of children ranging between 9 months and 9 years old, had varied technological expertise and a broad spectrum of technology outlooks – from self-proclaimed ‘futurists’ to those declaring they were cautious and apprehensive (Table 1).

| | M/F | Age | Relationship | Employment Type (Full/Part-Time/Home Duties) | Children No. (age) |
|-----|-----|-----|--------------|--|--------------------|
| P1 | M | 38 | Married | Architecture (FT) | 2 (3,<1) |
| P2 | F | 36 | Married | Architecture (PT) | 1 (2) |
| P3 | F | 42 | Widowed | Planner (FT) | 3 (8,7.5) |
| P4 | F | 40 | Single | Pharmacist (PT) | 2 (6,3) |
| P5 | F | 30 | Married (P8) | Home Duties (HD) | 3 (5.3,<1) |
| P6 | F | 37 | Married | Marketing (PT) | 2 (3,1) |
| P7 | M | 52 | Married | Marketing (PT) | 2 (9,6) |
| P8 | M | 33 | Married (P5) | Project Manager (FT) | 3 (5.3,<1) |
| P9 | F | 47 | Married | IT (FT) | 2 (6,2) |
| P10 | F | 35 | Single | Child-Care (PT) | 1 (9) |
| P11 | M | 40 | Married | Home Duties (HD) | 2 (8,6) |

Table 1: Summarized participant details

3.2 Workshop Activities & Data

The workshop began with an *Icebreaker* introduction exercise to capture an overview of technology attitudes and practices. Three activities followed. Each required a worksheet to be completed individually before discussing experiences as a group. The first activity asked about *Positive Technology Experiences* in family life. The second activity, *Love/Hate*, explored issues of ambivalence. Participants were asked to consider family experiences of digital technology use that were felt to have both positive and negative aspects. The final activity, *That’s Not OK*, asked about family experiences with technology that were felt to be negative or inappropriate. We provided participants with inspirational picture cards. During the first two activities, these depicted a range of prevalent digital technologies (e.g. smartphones, home assistants etc.). During the third activity, various family contexts of technology use were shown (e.g. families making a video call together, parents trying to remove a device from a child etc.).

Audio and video recordings of the workshop were transcribed. Thematic analysis [33] was used to analyze the transcripts and the completed activity sheets. This produced different pertinent themes, which we will describe next.

4 FINDINGS: “IT’S COMPLICATED”

Despite the group’s diverse backgrounds, common themes emerged. Participants described a wide range of experiences: positive, negative and those in-between. We highlight four prominently discussed experiences that reveal the complicated nature of family life. Whilst they are discussed separately, the experiences are interlinked, shaping and influencing each other.

4.1 Apprehension

Participants described how their attitudes towards digital technology had changed since becoming parents, becoming more apprehensive. This was due to two main factors. Firstly, concerns over potential adverse effects on children’s social, emotional or physical development, as a result of excessive or inappropriate technology use in childhood. Secondly, considerations of children’s privacy, safety and identity ownership. These factors contribute to feelings of uncertainty that parents have regarding family technology use. For example, P1, a father of two young kids whose work involves digital technology explained, “it (is) weird...I’m very interested (in technology) professionally, and personally, but...I don’t really know yet what I think when it come to my kids”. Therefore, parents are more hesitant, especially when deciding whether to adopt new technologies. For instance, P1’s concerns over his children’s privacy had so far prevented him from purchasing a VUI home assistant.

Due to these feelings of apprehension, all participants believed family technology rules were required. However, none had a clear process of setting, managing, or enforcing technology rules. As a result, participants felt unable to fulfill their expectations of themselves as parents. For example, “So I’m quite cautious, particularly since Max has come along...we’ve tried to set up tech values...but it doesn’t work” (P2). Participants often looked ahead, considering how they would incorporate future technologies with added apprehension, “we are probably going into a bit of a minefield as they grow up” (P6).

4.2 Ambivalence

Although we planned to discuss ambivalent experiences during Activity 2, participants already began sharing their experiences of ambivalence during their introductions. For example, P9, who works in IT, described her attitudes to technology, “I’m a bit apprehensive about it, though I do love it...I’m at home mostly with the kids, and I do appreciate their appreciation of technology, so I can do the dishes, or whatever”. She added, “I’m enthusiastic about digital technology as a concept...but I’m not so enthusiastic about it at home”.

Other examples of ambivalence were found as participants unwittingly contradicted views they had shared earlier in the session. For instance, P6, began the session by describing her use of SNS as a positive experience “Mindless scrolling...there’s something quite therapeutic about that, just thinking about everything and nothing”. But towards the end of the session, she claimed, “the time wasting of...social media...I think it makes you a bit stupid, and a bit unbalanced”.

Ambivalence was found to pervade and affect all of the other experiences shared by our participants.

4.3 Compromise

Participants described how their families’ use of digital technology compromised aspects of their children’s upbringing. For instance, P3, who had described her use of mobile news, online shopping and online banking, as positive experiences, added, “the flip-side of that, is that while its great and convenient for me, I worry that my kids are missing out...they are not coming to the bank with me, they are not learning the money...they are not seeing that I am reading the newspaper, and not playing a game...whereas I grew up seeing my parents reading newspapers and learning that they were valuable and important”. Interestingly, P7, a self-declared ‘technologist and futurist’ stated, “I prefer to take (the kids) shopping with me for the real experience...its actually some time that we get to spend together”.

Questions were also raised over the individual and curated nature of online experiences. P3 reflected, “how individually tailored it all is, particularly with my kids. They get used to, ‘Well I want to watch MY things’, and I have 3 kids all wanting to watch separate things...it’s (about) them learning to...share and...do things collectively as a group”. She also questioned how her children’s access to online knowledge might be altering her role, “I get a bit sick of it (technology) being right all the time. You used to be the fountain of all knowledge, now they are like ‘No Mum, you’re wrong’. I used to be able to con them on lots of things, now they can look it up, they don’t have that relationship with you that you are always right”.

4.4 Conflict

Disagreements over device use were cited as a main source of negative experiences with technology. Whilst disputes between parents and children were mentioned, the differing approaches between parents were more vehemently discussed. P5 presented herself as “lenient...my husband is very strict”. P9 added, “My wife is very strict, so there is a conflicting approach, which is tough on the kids”. Conflict between parents and children often escalated within the family when parents held differing parenting attitudes towards children’s technology use. Parents also disapproved of each other’s behavior, such as P9’s condemnation of her wife’s habit of shopping online while at the dinner table, “I can’t stand it”, she declared.

Internal conflict was also discussed, mainly by mothers, who admitted being unable to adhere to their own rules. For example, when discussing negative experiences, P3 explained “my big (rule) that’s not OK in front of the kids, is screens in bed, but then I end up doing the same thing in bed once they’re asleep, and very often they are asleep with me in my bed while I am secretly watching!” P5 also reflected on her ability to stick to her own rules “putting my phone before my children’s needs...I’m guilty of all of this, I can’t even read this, I feel bad...I’m sitting there on my phone. I should be able to put it aside, for the kids”. P6 referred to her past behavior, “Breastfeeding my child and checking my phone...that was the time you should be talking to your child. So (I felt) conflicted as I was always doing that”. P6 also said that she found managing family technology use to be harder than any other parenting issue. P9 concurred, “it’s so prevalent, you deal with it as it comes up but it’s everywhere ...it’s about everything you do”.

5 DISCUSSION

Like others [27], our participants' stories reveal the complicated nature of their felt and lived experiences with technology within the messiness of everyday family life. In particular, our participants' experiences were strongly shaped by their family values. The values that emerged from these stories included *togetherness*, *privacy*, *freedom* and *parental responsibility*. The value that was discussed most by our participants was togetherness. Given the constraints of this short paper, we will focus on togetherness, to discuss how family values shape experiences.

Our participants generally describe family life as busy. Parents repeatedly express a desire to spend 'family time' with partners and children, in which to share a sense of togetherness. As such, technology use that promotes togetherness is described as a positive experience. In contrast, technology use that diminishes togetherness is described as a negative experience. For example, P3 enjoys the convenience of online shopping and banking, as she feels it enables her to spend more time with her family. On the other hand, P9 dislikes her wife's habit of shopping online during family mealtimes, as she feels it reduces togetherness.

People's values drive their behavior [15] and even an individual's decision on whether or not to adopt and use certain technologies [26]. However, our findings reveal a more complicated situation of 'values in action' in family life. This is because all individual family members contribute to putting shared family values into action. However, individual values might not always align. In order to establish shared family values, individual values need to be communicated and negotiated. Prior research has explored experiences of conflict between parents and children associated with technology use [5, 19]. Stories from our workshop also reveal recurrent conflicts of values between parents, with regards to technology use. Conflicts arise when parents' approach to children's technology use differs, or when they disapprove of each other's technology use. More attention is paid to a partner's use of technology in situations when children are present. Additionally, parents experience internal conflict when their own use of technology disregards rules that they have enforced on family members. We are not aware of any prior work exploring the range of conflict experienced within families as a result of technology use.

The presence and use of technology in families can create conflicts in values. Our participants' reports of ambivalent and compromised experiences highlight the extent to which a particular use of technology can promote certain family values, whilst simultaneously undermining others. It is possible for compromises to only become evident over time, such as when parents perceive a lag in their child's development. It might also be that individual family members benefit, at the expense of others. An example of this can be seen, in P5's admission of '*putting my phone before my children's needs*'. This leads to attempts to balance individual values with shared family values. This can become complicated, particularly since parents are both users of technology and guardians of their children's technology use. Parents attempt to restrict their own use of technology, in order to prioritize the needs of their children. Researchers have shown that parents limit their device use at times when children are present, such as mealtimes [37] or at children's playgrounds [18]. For some of our participants, they have gone further and their prioritization of family values has led

to them deliberately opting out of using a particular technology that they enjoy as an individual. For example, instead of online banking or shopping, parents physically take their kids to the bank or supermarket in order to teach them about certain aspects of money or food. In fulfilling their parental responsibility, these parents forgo their desire for convenience.

Family values govern how experiences of technology use are evaluated, yet the ways in which family values are put into action can vary between families. Though guided by the same family value, different families adopt different family practices. So, while several participants used online shopping to free up time to support togetherness, others felt that a trip to the shops with their kids was, in fact, an opportunity for togetherness.

Research into ageing individuals' values has described how people's values are dynamic, open to negotiation and change over time to best fit in with their new and changed life circumstances [26]. This resonates with the stories we heard, revealing that people's attitudes towards technology change when they become parents. While researchers note parents' concern over different aspects of technology use [2, 5] and are increasingly exploring the use of technologies, such as SNS, by new parents [12, 44], we have not found research that explicitly describe how values and attitudes change as individuals transition into parenthood. Nor have we found any explorations of how family experiences of technology change over time. However, we found that any rules and boundaries associated with technology use need to be continually revisited, renegotiated and even revised as children become older. This need is furthered by the availability, adoption and incorporation of ever-new devices into family life.

In addition, we discovered emergent associations between primary caregivers and their experiences of family technology use. In our workshop, most primary caregivers were mothers. They confessed to having a more lenient parenting approach to technology, compared to their partners who were described as strict. All the stories we heard of internal conflict, guilt and regret resulting from family technology use were from mothers. This possibly hints at influences of gender with regards to values pertaining to technology use. After all, the approach of mothers and fathers to particular aspects of technology use has been found to differ [2]. These differences require parents to discuss and negotiate certain aspects of technology use. We certainly encourage more sensitive and considered work to better understand if and how gender roles affect family values in action, and resulting experiences of family technology use.

In closing, we must qualify that our study was constrained to a short workshop with 11 participants. Nevertheless, it provides a glimpse into the complicated experiences of today's family experiences of digital technology, including the uncertainties regarding adverse effects on children. This paper also offers an emergent understanding of how these experiences are shaped by people's values. Our findings strongly suggest that the design of future technologies, intended for use by families, would benefit from deeper, richer, and more nuanced understanding of how family values are established, negotiated, change over time, and are put into action with regards to technology use. Through this, we might design technologies that are more supportive of family values, and desired experiences.

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Towards a Probe Design Framework

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ABSTRACT

Since their introduction, probes have been widely used in HCI. Despite this, there have not been much reflections and discussions about the design thinking behind their creation and use. There is also a lack of actionable guidance on designing and using probes. This lack may have contributed to some concerns that the method has been misinterpreted and misunderstood. We reviewed HCI literature surrounding probes and found one of the few papers that offers a nascent framework for probe design and use. We used it to guide the design of a collection of probes and reflected on the framework's usefulness. We extend this framework by offering a more useful way of visualizing and working with probe design properties. We also provide further clarity and advice on how others may think and approach the design and use of probes more effectively, especially those turning to probes for the first time.

CCS CONCEPTS

• Human-centered computing → HCI design and evaluation methods

KEYWORDS

probes; design; framework; guidance

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1 Introduction

This is a methods paper that contributes to current understandings of how probes can be designed more thoughtfully and strategically, to support user research in HCI. More specifically, it describes how

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we utilized Wallace et al.'s [21] framework that guides probe design and use to help inform our decision-making when developing a set of probes of our own. We reflect on our probes design process and how our research participants used the probes to ascertain the usefulness and effectiveness of this framework. This leads to suggestions and insights as to how this framework could be extended and tested, so as to be more helpful to HCI researchers. This contribution is particularly valuable in supporting (budding) researchers and designers contemplating probes as a method; offering a more structured and strategic way to think about the decisions taken when designing and using probes.

After all, these decisions can impact how deeply participants engage with our probes, the quality of their responses, and their overall sensemaking of these designed objects of inquiry.

The need to develop a set of probes came from our research, which explores the complex experiences associated with family technology use. In particular, we were interested in capturing the different individual perspectives held by parents within the same family [10]. We planned to supplement a series of in-home interviews with probes as a means of encouraging participants to reflect on aspects of routine technology use that are often overlooked within the messiness of everyday family life. When reviewing the literature on probes, we found many publications describing probes, but that only Wallace et al.'s [21] paper went some way to providing comprehensive 'guidance', in the form of a framework. So, we were interested in exploring the usefulness of this framework to guide us in designing the probes for our research project.

Our review of related work will unpack some of the debate and concerns around probes, particularly around the lack of clarity about the method itself. We also discuss the availability of design guidance offered within the literature on probes, in particular the one presented by Wallace et al. [21]. We then describe how we operationalized this framework to guide the design and use of a set of probes. First, distilling the framework: outlining the key design properties of probes and the decisions that affect them. Second, putting the distilled framework to use as a guide to design and use of three probes of our own. The 'findings' section will be our reflections on the effectiveness of the framework to guide the design of a probe collection. We also discuss the framework's utility by considering how participants responded to using these probes. Finally, by reflecting on what we learned by using the

framework in this way, we suggest refinements, extensions, and ways that the framework could be adapted and tested in future.

2 Related Work

Since their conception by Gaver et al. [11] probes have become a well-established approach to understanding users, their behaviors, and use of technologies [6]. However, amidst this enthusiastic uptake of the method within HCI and design, concerns have been raised about the misinterpretation and misappropriation of probes. In particular, Boehner et al. [5] suggest that this may be due to a lack of clarity on the method itself, with accounts of probe use tending to gloss over details of how they were designed. Some researchers have attempted to add clarity to the method by discussing what probes are [5] and what they do [2, 14]. Attempts have been made to catalogue different kinds of probes [13, 18], for instance by topic of interest (e.g. domestic probes, urban probes etc.), desired result (e.g. empathy probes, value probes etc.) or new approaches to using probes (e.g. mobile probes, technology probes etc.) [5]. Another effort to provide clarity has been to try and determine what these different probes have in common (e.g. probes inspire, probes create fragments, probes provoke... etc.) [14]. Despite these efforts, clear guidance on how to actually design probes remains elusive.

2.1 Existing Probe Design Guidance

Most publications involving the use of probes discuss what probes are and what probes do, furthering Gaver et al.'s [12] original definition of cultural probes as "collections of evocative tasks meant to elicit inspirational responses from people". Detailed guidance on *how to design* probes is limited. Instead, advice centers on how to approach the probe design process. For instance, in their outline of the probe design process, Hemmings et al. [15] discuss various skills required by those wishing to adopt the method (e.g. idea generation, graphic design, model etc.) and list the phases involved (e.g. recruitment, assembling probes, deploying probes, retrieving probes etc.). However, while they highlight the need for design skills and for team discussions to generate probe ideas, they neglect to include a probe design phase from their schedule which moves straight from "Selecting Volunteers" to "Assembling Domestic Probes". The tendency to gloss over the design thinking behind probes is common in probe literature.

We found guidance on how to *think about* probes. For example, Graham et al. [13] define common probe features (e.g. capture artefacts, making the invisible visible, participant as expert etc.) and their effects (e.g. humanize, create fragments etc.). Guidance is also offered on how to generate the questions being asked through the use of probes. For instance, Mattelmaki's [18] introduction to the method suggests considering participation, before designing probes (e.g. "Who is your user?" "How long will people be involved?" etc.). In addition, The Interaction Design Studio [19] offer approaches to prompt the ideation of probe concepts. (e.g. "use analogies", "ask obliquely-related questions" etc.) and provide examples of probe tools. We acknowledge that these attempts add

clarity to the method. However, we still lacked more explicit/detailed guidance about the design decisions required to develop a probe collection.

To be fair, there are a few authors who describe the thinking behind their probe designs in more detail. For example, Tsai et al. [20] describe their rationale for designing Memory Probes; balancing three sets of probe properties ("familiarity-strangeness", "definiteness-ambiguity" and "objective-subjective"). Boucher et al. [6] also discuss probe properties (e.g. "simple and easy", "open-ended", "playful" and "absurd" etc.) when introducing a novel probe tool, TaskCam. However, while these reports provide insights and details into decisions taken to designing probes, these efforts are not aimed at providing general advice or guide for effective probe design decisions. These occasional glimpses into differing ways of thinking and also talking about the design properties of probes further highlight a need for clearer, more consistent guidance. One exception is a paper by Wallace et al. [21], which provides a systematic reflection on probe design decisions. One of its explicit aims is an "attempt to address the identified lacuna" – which is "the lack of accounts that describe in detail the design of probes and their use with participants". Some have argued that this lacuna is one of the reasons why the method has been often misinterpreted and proved elusive to many.

2.2 Wallace et al.'s Framework

In *Making Design Probes Work*, Wallace et al. [21] offer what they call "a framework for probe design and use" based on detailed descriptions of the design of probes and their use with participants. This salient guide, which we will refer to in this paper as 'the framework' focuses explicitly on the design decisions required to develop probes. It is a summary of learnings from their projects spanning over a decade involving the design and use of probes.

The framework in this paper consists of two types of guidance. The first is a lexicon of probe design properties; which can be used in probe design to provide "scaffolds for response". This section also offers guidance as to how design decisions can affect particular design properties and, in turn, participant engagement and response. The second type of guidance offered in this paper is less prescriptive. It relates to supporting "relationships and reciprocity" and includes ways to best consider and involve participants when designing probe studies. To the best of our knowledge, nobody has explicitly described putting this framework to use. So, our initial aim was to ascertain the effectiveness of this framework as a guide to design a set of probes deployed in an empirical study. As mentioned earlier, this was part of our research into parents' experiences of family technology use.

3 Method

We quickly realized that operationalizing Wallace et al.'s framework to design our probes was not a straightforward exercise. They have provided some resources and general advice but we had to first distill the various elements to make it useful.

3.1 Distilling the Framework

As we mentioned earlier, one set of guidance from the framework describes four probe design properties. First, *openness/boundedness* relates to how clear or vague a participant finds the question being asked by a probe as well as what is required to complete it. Second, *materiality* relates to the physicality of the probe tool (or artifact) that might help embody the question being asked by a probe, or encourage a particular type of response from participants. Finally, *pace and challenge* relates to the time and effort required to complete a probe.

Openness/ Boundedness: The framework explains this property by describing the design of the probe *Self Tree*. Participants were asked to write about people in their lives on a series of oval, locket-like paper discs. This example shows how the openness or boundedness of a particular probe can be determined by both the physical dimensions of a probe tool and conceptual decisions to define a probe task. For instance, the openness of the question asked by *Self Tree* is balanced by the choice to use small paper discs that restrict the amount that can be written.

Materiality: The framework describes how material choices, and decisions around the shape, style and finished appearance contribute to the *materiality* of a probe. The examples used to describe this design property reference relevant objects in order to invoke an intended response from participants. The use of physical metaphor is demonstrated through the example of *Home* probe, intended to capture participants' sense of home and designed as a cardboard structure in the form of a house. More subtle references are shown through the example of *Pillow* probe and *Self Tree*. The former aims to invoke a sense of intimacy by asking participants to write on a pillow, while the latter aims to suggest preciousness by taking the form of jewelry.

Pace: The framework describes how probes can be designed to encourage faster responses from participants. In particular, they describe breaking a probe task up into smaller chunks that participants perceive as being more completable. The example of *Top Trumps* probe is described, in which the request for participants to describe objects that are significant to them is broken down into smaller activities by using six playing cards.

Challenge: The framework highlights the need to offer probes that offer space for deeper reflection on certain topics or to tease out issues that are more difficult to express. It describes how probes designed to do this often presents participants with higher levels of challenge. As an example, it uses the design of the probe *Communication Fairytale*, a short storybook that creates an imaginary scenario and enables participants to express complex ideas, such as how they feel loved, as one of the characters. These more imaginary scenarios remove the restraints of what is possible and instead afford freedom from inhibitions and realities. This promotes participants reflecting from fresh perspectives.

| Probe Design Property | Design Decision |
|------------------------------|---|
| <i>Openness/ Boundedness</i> | <i>Scale</i> : e.g. provide small vs. large physical boundaries for response |
| | <i>Context</i> : e.g. provide real vs. imagined scenario |
| <i>Materiality</i> | <i>Materials</i> : e.g. use novel vs. familiar materials |
| | <i>Shape and Style</i> : e.g. reference familiar objects or ideas, use physical metaphor |
| | <i>Aesthetic</i> : e.g. create rough vs. polished finished appearance |
| <i>Pace</i> | <i>Speed</i> : e.g. offer the opportunity for fast vs. slow response |
| | <i>Duration</i> : e.g. offer long vs. short time within which to respond |
| | <i>Frequency</i> : e.g. offer the opportunity for single vs. multiple responses over time |
| <i>Challenge</i> | <i>Level of Commitment</i> : e.g. encourage light vs. greater effort |
| | <i>Level of Creativity</i> : e.g. encourage factual responses vs. use of imagination |

Table 1. Distilling the framework: probe design properties

By discussing their own probes, Wallace et al. exemplify how different design properties can be put to use. So, we had to first analyse and interpret the various design guidance in relation to the specific probes described. We then distilled this set of guidance into a more structured and more generally applicable set of design direction, by mapping each of the probe design properties to corresponding design decisions (see Table 1). As we did this, we noticed that probe design properties can relate to probe tools (i.e. artefacts) and/or probe tasks (i.e. activities). *Materiality* tends to relate to the artifact, while *pace* and *challenge* tend to relate to the task and *openness/boundedness* often relates to both.

3.2 Using the Framework

After analyzing and distilling the guidance from the framework, we then put it to use. In general, this meant adopting the approach suggested. And when we were ready to design our probes, we used the information from Table 1 to guide our design decisions. Next, we describe the process chronologically.

3.2.1 Investment and Trust: building relationships. Following Wallace et al. [21], we began with considerations for *investment* and *trust*. This means, prior to designing the probes, researchers should first build an understanding of the participants and their context to inform the design of probes. In our project, we held a workshop with parents to gain initial insights into their experiences of family technology use [10]. We then used these insights to design a collection of probes that would be given to eight sets of parents to use within a two-week study. We planned to introduce our probes to each set of parents during an in-home 'opening' interview on Day 1. Completed probes would be collected 10-12 days later and reviewed to inform 'closing'

interviews planned for Day 14. Due to the space constraints of this paper we are unable to elaborate on the ideation process of the study and focus instead on how we used the framework to guide the design of a collection of three individual probes.

3.1.2 Design Properties: supporting thinking for probe designs.

We used the information in Table 1 to guide the design of each of our three probes. We used the four probe design properties; *openness/boundedness*, *materiality*, *pace*, and *challenge* to systematically explore different possible probe designs. We also went back to the examples provided in the framework to find inspiration and ideas for tangible alternatives. We now describe each of our three probes and explain how their design was guided by the framework's probe properties.

Probe 1: Family Experience Jar.

We wanted a probe that would serve as an icebreaker by encouraging participants to offer quick, regular responses and to reflect on their experiences throughout the study. We designed it as an extension of a diary, inspired by Andell et al.'s [18] stress-relaxation container. Each set of parents are given a large clear glass jar and asked to fill it with handwritten notes that log their experiences of family technology use (Fig. 1 – top). Three colours of 'post-it' style notes are provided: pink for positive experiences, blue for negative experiences and yellow for neutral or mixed experiences. We hoped that this icebreaker probe would offer participants a simple entry point into our probe collection, as recommended within the framework.

Openness/Boundedness: Since we intended *Family Experience Jar* to serve as an icebreaker, we kept both the concept of the question being asked and the physicality of completing the task bounded. The task requires little imagination or creativity to complete. The instructions are simple, and a reminder is written on the side of the jar. Providing small 'post-it' style notes limits the space on which to write about each experience. In contrast, the large number of notes we provided, and large size of the jar convey to participants that while we ask for at least one contribution per day, many contributions are welcome, if not expected.

Materiality: We intended for *Family Experience Jar* to encourage both parents within a family to offer their thoughts and feelings on experiences of family technology use. We understood that these experiences could be both overlooked and contentious. We hoped that the final appearance of the jar would remind participants of family swear jars and piggy banks. We chose clear glass jars usually bought as a decorative homeware item or vase in the hope that participants would position them in visible locations in their homes. This visibility might serve to remind participants to add contributions more regularly. The jar had a cardboard lid with a small slot cut into it. Notes must be folded in order to be fit through this opening. The lid was attached to the jar with glue so once inserted, notes could not be removed. This prevented the details of the notes being read by family members. We hoped that the privacy

this affords would also encourage curiosity and further participation.

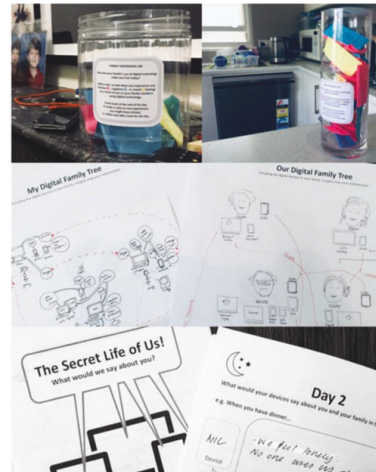


Figure 1. Using the framework to design probes. Probe 1. Family Experience Jar (top) Probe 2. Digital Family Tree (middle) Probe 3. Device Journal (bottom)

By choosing jars made of clear glass, participants could see contributions amassing over time. The visible colour of the notes inside the jar would provide an 'at-a-glance' idea of the types of experiences that had been logged. We hoped this might generate curiosity as to what other family members have contributed, encouraging reflection and further participation. We also anticipated that the visible empty space would promote more participation.

Pace: We hoped that by compartmentalizing this 'diary' task into fast-paced, high-frequency note-taking would keep participants mindful of family technology use throughout the study. We asked participants to submit at least one note per day and invited them to make additional contributions as-and-when such experiences would occur. However, it is entirely possible for them to introduce their own flexibility with this task and add notes to the jar retrospectively. We also hoped that participants would find the physical act of selecting, writing and contributing notes to the steadily filling jar more rewarding and compelling than simply completing diary entries.

Since *Family Experience Jar* is intended as an icebreaker probe, we designed the task to be light-weight, requesting factual information about the realities of everyday life. It does not require much time, creativity or deep reflection. We did ask participants not to discuss contributions with other family members as we hoped that this

element of secrecy might introduce a sense of competition and make the activity feel more playful than completing a two-week diary.

Probe 2: Digital Family Tree. We wanted this probe to help transition participants from the icebreaker task to a task that requires deeper reflection. We designed a mapping exercise in which participants create a family tree that also included the digital technologies used in everyday family life (Fig. 1 - middle). We asked each parent to complete an individual family tree during the first week of the study. During the second week we asked that each set of parents compare their individual family trees and collaborate to create a joint family tree. We hoped this probe would encourage participants to think about the role that technology plays within their family and provide overviews of the different ways in which each parent perceived technology to be incorporated within family life.

Openness/Boundedness: We provided participants with blank paper templates on which to complete this task; individual templates for the first part of the task and a shared template for the second. The minimalistic design of templates was intended to offer participants the freedom to interpret this open-ended task. We chose to use A3 sized paper hoping that it would invite self-expression and creativity yet provide clear boundaries to convey a sense of easy completability. When we piloted the use of this probe, we realized that more cautious participants might benefit from extra scaffolding to help explain the task and encourage creative-thinking. To do this, we prepared an example of a completed *Digital Family Tree* to show participants when explaining the probe activity. We were more interested in how participants interpreted this probe than in accurately recording their technology use, so took this example away once participants confirmed they understood our instructions. This also removed any temptation to follow our example too closely.

Materiality: When preparing our example of a completed *Digital Family Tree*, we tried to follow the 'typical' style of family trees and hoped participants would be especially familiar with this given the current popularity of services such as Ancestry.com. We attempted to keep our example unrefined in appearance to remove any concerns that participants might have over the level of artistic talent expected from them.

Pace: We offered participants flexibility over when to complete this probe. We slowed the pace of this probe by asking participants to leave time between completing the individual task and collaborating on their joint *Family Tree*. We hoped that this lower pace would encourage reflection.

Challenge: We designed this probe to demand a certain level of creative thinking and imagination from participants, which we hoped would provide them fresh ways of thinking. We were inspired by Wensveen's [22] use of anthropomorphism to design probes prompting imaginative responses from participants and Battarbee et al.'s [1] design of probes that ask participants to represent domestic appliances with animals.

We hoped that using the familiar notion of family trees as a physical metaphor to pose our question would support the challenge presented by this probe. An additional challenge presented by this probe was in asking participants to compare their individual responses and to collaborate to complete a shared family tree. This demanded extra commitment and introduced the need for communication, negotiation and collaboration. We asked participants to make a note of any difficulties they encountered to help surface insights into how parents manage their differing perspectives.

Probe 3: Device Journal: 'The Secret Life of Us'

Aspects of family technology use are often habitual and overlooked. Some are uncomfortable or even socially undesirable. We hoped that the use of this probe would provoke unexpected responses from participants by prompting them to reflect from a different point of view. To do this we designed a comic book called *'The Secret Life of Us'*, in which the characters are the digital technologies used within everyday family life (Fig. 1 - bottom). This probe inverts the traditional diary by asking participants not to write about their own experiences, but to imagine how their devices experience family life and to journal them in the comic over the course of two days. We were inspired to design this probe by reading about the probe *Communication Fairytale* in the framework.

Openness/ Boundedness: We introduced an imagined context and used anthropomorphism to make the familiar strange. This is because we hoped to prompt participants to reflect on aspects of technology that usually go unnoticed, or aspects that they are less inclined to share with researchers, such as less socially desirable contexts. As with *Communication Fairytale*, we hoped that creating an imagined scenario would enable participants to remove themselves from the constraints of reality and to express complex ideas as a character in a story. We balanced the openness of the ideas introduced by this probe by designing it as a (literally) bound A5 comic. By using a series of empty speech bubbles to divide each page we hoped the task would seem easily understandable and more importantly, completable.

Materiality: We hoped that the compact, playful comic design would make this probe seem approachable, despite it introducing unfamiliar ideas. We hoped the use of a cartoon style would encourage participants to respond by using their imagination and creative thinking. In particular, we used device icons and speech bubbles to remind participants that we wanted them to give their technological devices an imagined voice. The design of this comic book was guided by the way Wallace et al. describe their probe *Communication Fairytale* as providing participants with a novel way of thinking and expressing themselves.

Pace: The aim of this probe is to provoke participants to shift their perspective and promote deeper reflections on the topic. We slowed

the pace of *Device Journal* by asking participants to focus on this activity, adding at least four entries per day, and completing it over a period of two days. We hoped that the second day of journaling would encourage participants to recognize a wider range of experiences and any repetition. Participants are given the freedom to complete this journal over any two days during the study.

Challenge: This probe demands a high level of imagination and creative thinking and we hoped it would elicit deeper reflection by furthering the imagined context introduced by Probe 2. A relatively high level of commitment is required from participants during the two days on which they complete this. First, we ask them to introduce their character (the imagined character of a particular technology) and to describe themselves and their families as they imagine their character would. Then we ask them to make regular journal entries that describe the imagined experiences of their character throughout the day.

When we piloted this probe, we realized that, as with probe 2, our participants might benefit from additional scaffolding given the levels of imagination that this task demands. We chose to support our participants in this way by providing a link to an audio clip of 'Everything Is Alive'[7], a podcast series of fictional interviews with personified everyday objects, played by actors.

3.2.2 Reciprocity and Communication: probes as a collection. Finally, the framework encouraged us to design our probes as a collection. The rationale is that probe collections should offer participants a range of channels for different kinds, types and ways to respond and reflect, to foster *reciprocity* and *communication* in the researcher-participant relationship. Our approach to designing probes was to design our three individual probes in parallel, and stepping back regularly to gauge how the individual probes complement and support each other. We were also aware that altering the design of one probe might require changes to the design of another. This also means using the different design properties (Table 1) to help vary the probes within the collection.

We found it helpful to use linear scales to represent the probe design properties (i.e., *openness/boundedness*, *pace* and *challenge*) as shown in Figure 2. Comparing the properties of our probes in this way helped us visualize the different role that each probe would serve within the collection. We could see that the relative boundedness, fast-pace and low-level challenge of probe 1 would contribute to its role as an icebreaker. Meanwhile, the openness, slower pace and higher challenge of probe 2 would help it transition participants towards probe 3. We hoped the slowness, great openness and high challenge presented by this probe would enable it to encourage deep reflection from participants. We discuss the utility of these linear scales in guiding the design and use of our probes in greater detail in our findings.

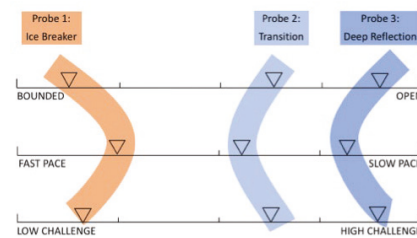


Figure 2. Using linear scales to visualize how three design properties vary across a probe collection

4 Findings: Usefulness of the Framework

Probes are artefacts for inquiry, designed to be used in a bi-directional way to facilitate conversations between researchers and their participants. Thus, our findings will first reflect on the framework's utility to guide our design of our probes, and how our participants responded to these probes.

4.1 Reflections on Probe Design

We found Wallace et al.'s framework useful because it provided a structured way to think about probe design and design decisions. It foregrounds the need to consider our relationships and interactions with our participants, prompts us to consider the design properties not as binary states but as properties along a continuum, as well as guided the planning, thinking and design of a varied probe collection. However, there were also parts of the framework that we found ambiguous.

4.1.1 A Structured Way to Define Probe Design Properties.

The framework introduces a lexicon of four design properties - *openness/boundedness*, *materiality*, *pace* and *challenge* with tangible examples that helped us to better understand how to use the properties. This lexicon provided us with a clear and structured way to consider, plan and think when designing our probes. The lexicon also gave the research team a consistent terminology to talk about the probes as well as reducing potential misunderstandings.

4.1.2 A Structured Way to Take Design Decisions.

The framework also provides a structured way to consider how different probe design properties are affected by different kinds of design decisions e.g. scale, style, aesthetic etc. This enabled us to reflect and modify the design properties of our probes in a more measured way. For example, we originally thought of probe 1 as a two-week paper experience diary. However, we anticipated that our participants would perceive this to be a heavy commitment, given how busy they had described family life to be during the preliminary workshop. We tried to reduce this apparent commitment through the design of *Family Experience Jar*. We hoped that participants would perceive the task of making short notes and collecting them in a jar to be less demanding.

4.1.3 Prompts Consideration of Design Properties as Continuous. We found it helpful to consider design properties as continuous, rather than as binary states. When describing the property *openness/boundedness*, the framework suggests taking design decisions that “offer a participant both openness to share whatever she feels appropriate and clear boundaries to respond within”. We adapted this advice by visualizing this balancing act by means of a linear scale ranging from *bound* to *open*. As we explored with design decisions, we found it helpful to slide the relative position of a particular probe along this continuous scale. For instance, we could slide it from more open to more bound by reducing the size of a probe or slide it from more bound to more open by introducing an imagined scenario. We found it helpful to visualize the three properties in this way; *openness/boundedness*, *pace* (ranging from fast to slow) and *challenge* (ranging from low to high). On the other hand, we found that it is not meaningful to visualize the property *materiality* in this way since choices such as material, shape and style are distinct rather than continuous.

4.1.4 Helps Guide the Design of a Varied Probe Collection. Besides providing helpful guidance on the design of individual probes, the framework is especially effective at steering the design of varied probe collections. In particular, when we used the scales to compare *openness/boundedness*, *pace* and *challenge* (see Fig. 1). We realized that these properties can be used to distinguish each probe within a collection; Probe 1 (*Family Experience Jar*) serves as an ice-breaker, Probe 2 (*Digital Family Tree*) as a transition to reflection and Probe 3 (*Device Journal*) as a source of deep reflection. This realization helped us to ensure a collection of distinct probes that support and complement each other. While the framework was useful, there were also aspects that were ambiguous. First, the connection between probe design properties *pace* and *challenge*, second, uncertainty over the effects of certain design decisions and finally, general difficulty in translating the second section of the framework.

4.1.5 Areas of Ambiguity. Wallace et al. discuss the design properties *pace* and *challenge* together which we found rather ambiguous, both when translating the framework, and when considering the design of our own probes. These two properties may often relate to each another, however, they can be affected by different design decisions. After all, it is possible that both fast and slow-paced probes could be designed to be challenging. Therefore, we chose to separate these two probe design properties in our distilled version of the framework.

Another area of ambiguity was when we tried to map the design property of *materiality*. Several choices that are said to affect *materiality* were also found to affect *openness/boundedness*, *pace* and *challenge*. For instance, while the use of physical metaphor is described as affecting *materiality*, it is also shown to affect *challenge* and *openness/boundedness*. We found that this introduced uncertainty and hesitation when distilling the framework.

The framework’s lexicon of probe properties was useful, especially once we distilled it into a usable format (Table 1).

Examples of actual probes that exemplified particular design properties were very helpful to understanding how these properties could be used. It helped to clearly explain what and how we could do when designing probes. However, the framework’s general advice on how to approach probes was less accessible and helpful. Understandably, this could not be as prescriptive as the probe properties. Nevertheless, we were able to interpret and heed certain advice to inform our design process. For example, we invested in time to understand our participants before beginning probe design by holding a preliminary workshop.

4.2 Reflections on Probe Use

The framework provided useful guidance on how to design and use our probes. Our participants were able to use the probes successfully and engage with it in the way we had planned. For example, they were able to offer varying levels of responses – from quick responses to our icebreaker probe and to more reflective responses with the other probes.

4.2.1 Supporting Engaging, Quick, and Easy Responses.

The framework provides guidance on how to offer participants fast, light-weight probes that can serve as ice-breakers. It recommends using these probes to act as a point of entry prior to more challenging probes. We designed Probe 1 *Family Experience Jar* to serve as an icebreaker and encourage regular, swift, direct, physical responses. Our material and aesthetic choices had helped to ensure that this intended role was accomplished. When we first presented the three probes during opening interviews we noticed that almost all our participants immediately gravitated towards the jar. Later, when we visited our participants’ homes to collect the completed probes, we observed that, as intended, jars had been placed in prominent positions such as on kitchen worktops, dining tables etc. Then when we reviewed completed probes we found our participants’ responses to *Family Experience Jar* were the most consistent and comprehensive across all families.

When we asked participants to reflect on their overall experience of using the probes during closing interviews, most of them refer to this probe, and in particular reference the visibility of the colored notes. It appears that the transparent glass jars provided participants a view of the colored post-it notes; a visual representation of their experiences. This seems to allow them to more easily reflect and articulate their experiences easily.

4.2.2 Supporting Creative and Reflective Responses.

The framework offers guidance on how to explore more difficult phenomenon by providing participants the opportunity to reflect deeper through the probes we design. For example, it suggests using tasks with a slower pace or introducing imagined contexts. When compared to Probe 1, these probes required more creativity and imagination to complete.

When we reviewed the completed probes, we found that our participants understood the task of Probe 2 (*Digital Family Tree*). This probe asks participants to map relationships between family

members and their digital technologies. The task was designed to give participants the freedom to interpret the task in their own way. We saw this in the variety of response we received. For example, some showed which family members used which devices, some depicted the technologies used to connect family members and others chose to represent family members who they felt used a lot of technology by drawing a device instead of a person. The metaphor of family trees was easily understood and this probe productively facilitated fresh ways of thinking by our participants. During our discussions, they often became animated as they explained and elaborated on their creations.

Probe 3 (*Device Journal*) demanded the highest levels of imagination and creative-thinking. It was also designed to promote deeper reflection. It asks participants to write an imaginary journal of how their digital technologies might experience their home. When we reviewed responses, we realized that several participants had struggled with its open, slow and challenging nature. Some participants had not completed all the speech bubbles in the comic book. Some made very brief entries. Others wrote about their own experiences rather than the imagined experiences of their digital tech.

During our interviews, we discovered that most of these participants had not listened to the short audio clip that we had directed them to, to support this task. This highlighted the need to find suitable ways to scaffold probe tasks that are more challenging. Despite this, this probe inspired the most interesting and meaningful conversations during our interviews. Even participants who had struggled to complete the task could be prompted to reflect more deeply on their relationships with technology as we reviewed this probe together. These productive conversations reminded us of the importance of offering participants the freedom to not respond and to see this as a creative act in itself, as highlighted in the framework.

4.2.3 Supporting Varying Levels of Reflection and Realizations.

The use of a varied collection of probes allowed participants to offer a range of responses about the phenomenon of interest. We designed our probes to vary widely in both thematic context and the types of activity. Regular tasks that require short bursts of reporting, tasks that require reflection about self and others, and finally, tasks that require greater imagination and creativity.

When we spoke to our participants about the probes, they described how the experience of completing this range of different probes had revealed aspects about their family's technology use that they found interesting, surprising and sometimes undesirable. They explained how the activities had provided an opportunity for them to 'take stock' of their situation and that this had allowed them to make discoveries about family life, their family members and themselves.

"It enabled me to reflect on all those negative things (laughs). How much conflict there is with my son and my daughter. I wasn't aware how much that was taking up my energy I guess... I am surprised at (my wife's) self-opinion on her devices cos she's actually on the phone a lot and she doesn't think that she is. So, I was surprised by that and I guess doing these (probe) activities gave me a legitimate lens to have a look at that... I guess I had never really tied these automatic habits, like picking up my phone, to an emotional motivation." (P9)

Some participants went further and concluded that the process of completing the probes had prompted them to consider actually making changes to their lives and their family.

"It made me really think about how to manage our time with the devices. I have actually thought about a once a month device-free day for the whole family...to be all together on a Saturday or Sunday." (P2)

Most of our participants thanked us for the probes. They commented that the probes had provided them with an opportunity to think about not only their individual experiences but to be led to consider their family experiences more holistically and from different perspectives. This perhaps responded to the framework's recommendation for designing probes that can offer participants some degree of personal benefit during and after use.

5 Discussion

As our findings highlight, Wallace et al.'s framework indeed fills a void within HCI by offering us useful and actionable guidance on probe design. It does this by offering generalizable probe design properties and providing clarity on how to affect these properties through design decisions. We found that it provides an extremely useful starting point when looking for advice on probes, and probe design in particular. Our efforts to follow the framework has produced engaging probes that have been useful to support the research inquiries of our project - the objectives of any successful probe [4, 12]. While a few publications have described the approach taken to design particular probe tools (e.g. [6, 20]), this framework offers detailed discussions on how design decisions affect probe properties and exemplify useful tactics. The lexicon introduced in the framework introduced a way to describe and discuss probes designs with some consistency into an otherwise ambiguous and diverse vocabulary used by different researchers/designers designing and using probes.

However, our use of this framework also revealed areas for improvement. In this section, we will discuss how this framework might be better translated, extended and improved upon. We believe that efforts towards establishing a probe design framework will be helpful especially to HCI and Interaction Design students and researchers new to designing and using probes as a tool for inquiry [21].

We first came across some ambiguity within the framework when we analyzed the probe examples provided by Wallace et al., in our effort to distill a more actionable guide on how to design probes. The framework refers to *pace and challenge* as a single probe design property and yet the examples used, described these two as separate, though related properties. For instance, a light weight icebreaker activity is shown as taking less time to complete than a more challenging task. However, when we mapped the design decisions that affect probe design properties, we found that *pace* and *challenge* are affected by different design decisions. *Pace* is affected by decisions such as speed, duration and frequency, while *challenge* is affected by decisions such as commitment and creativity levels. We therefore recommend considering these two properties as separate, as we have done so in Table 1.

When we put the framework to use, we also found it useful to think of the probe properties as something along a continuum. This was particularly useful when visualizing the three probe design properties; *openness/boundedness*, *pace* and *challenge* together. Boucher et al. [6] mention this continuous nature of probe properties when describing how to design engaging and productive probes: “They provide for a range of engagement...range from relatively neutral to playful.” Meanwhile, Tsai et al. [20] use pairs of values to guide the design of their probes; familiarity-strangeness, definiteness-ambiguity and objective-subjective. These examples reiterate the usefulness of using continuums when conceptualizing the design properties of probes.

The importance of offering participants a diverse range of probes is widely acknowledged [12, 18, 19] and we found that considering the set of probes along various continuums (Fig. 3) not only helps guide the design of engaging individual probes, but the strategic design of a more-balanced, varied and engaging probe collection that can more effectively steer a participant through varying levels of reflection. We made sure to include an icebreaker probe, a probe to promote deeper reflection and a probe to transition participants between these two (Fig. 2).

We found that the more discrete property of *materiality* is useful to consider because of its potential to offer gift-like qualities in probes we give to participants to complete. This can foster participant engagement [21]. Take for instance, how participants gravitated towards the *Family Experience Jar* when we unpacked our three probes. Their attention was drawn towards the stylish clear glass jar we showed them and away from the other two (paper) probes. We also realized that *materiality* also has the capacity to affect the properties *openness/boundedness*, *pace* and *challenge*. An example is *Family Experience Jar*. While the *materiality* of the jar initially engaged participants, the choice to use colourful post-it notes to break up the otherwise lengthy diary task increased *pace* and lowered *challenge*. This in turn maintained engagement throughout the study.

In their original conception by Gaver et al. [11], probes were designed with a ‘spirit’ of absurdity, ambiguity, mystery and

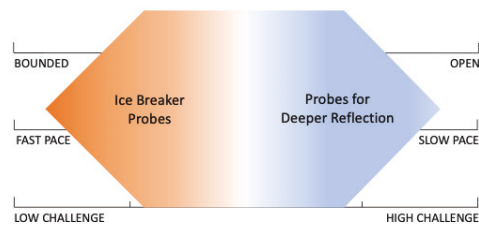


Figure 3. Using linear scales to visualize how varying three design properties can support the design of different probe types

playfulness in an attempt to provoke unpredictable responses from participants [4, 12]. Elements of this ‘spirit’, such as playfulness, have been carried through by researchers/designers exploring how to adapt the method to engage participants (e.g. [1, 3]). Therefore, we were surprised that the framework did not feature explicit guidance about this ‘spirit’. However, given that the context of Wallace et al.’s work is limited to explorations of self-identity and personal significance, it is appropriate that their probe examples tend to be designed to embody sensitivity, and draw less on absurdity, mystery or playfulness etc.

While it was not explicitly mentioned in the framework, we found it necessary to look for ways to inject a sense of fun, humor and absurdity into each of our probes. For example, the lids of our *Family Experience Jar* were designed with a very thin opening so participants would have to fold their notes before they would fit. We also glued the lids so notes could not be removed. We anticipated the sense of secrecy, curiosity and even competition that might be introduced. As we piloted *Digital Family Tree* we were aware of the personal curiosity that might arise from learning how a loved one had depicted aspects of family life. When we discussed responses to *Device Journal* with our participants, we found that the sense of absurdity and playfulness inherent in the design of our comic book had inspired the creativity, imagination and humour we had hoped for. We find Boucher et al.’s [6] term ‘affective tone’ appropriate to describe a probe design property that relates to the ‘spirit’ of a probe. We find that it would be useful to extend the framework by including this additional property and to explore the decisions that might affect it, beyond how neutral or playful the probe is.

Participant engagement is affected not only by how we design the probes, but also how to use them [4]. Here, we think that more guidance about how to initiate probes would be helpful such as, how to instruct participants to use our probes and how to offer support and communication while they are using them, and so on (e.g. [18, 19]). So, a more useful framework should provide clearer guidance on the decisions involved with instructions. These might include choices on the level and format of any directions provided to explain a probe, whether to provide an example of a completed

probe and whether to offer additional scaffolds such as sources of inspiration. Similarly, guidance on communication might include advice on whether and how to offer or require certain levels of communication with participants during the study.

In addition to the guidance from Wallace et al.'s paper, we now summarize some key points derived from our learnings. These points are some of our main contributions discussed in this paper. We hope that these ideas, when read with Wallace et al.'s framework can help extend and offer greater clarity and guidance when designing and using probes.

1. Before embarking on probe design, invest in understanding participants by holding a preliminary workshop or similar activities to get to know the participants and their situations.
2. When you are ready to design your probes, use Table 1 – our distillation and translation of the design properties, together with possible design decisions. This will support systematic considerations of the various design properties.
3. Do not think about the design properties as binary states but rather characteristics on a continuum. This will give you greater flexibility and creativity when considering your probe designs (Figure 2).
4. Consider *materiality* as a discrete property and consider how to use it to affect the design properties of *openness/boundedness*, *pace* and *challenge*.
5. Consider the additional property *affective tone* to help guide the design of probes that are neutral, playful, absurd etc.
6. When designing a probe collection, use the continuum of design properties to ensure that participants are offered an icebreaker probe and probes that offer varying levels of reflection.

Finally, we must acknowledge that the framework is informed by examples of probe use in which a single perspective is captured from an individual or family group. Hence, we are aware that designing our probes to capture differing perspectives held by parents within the same family introduced additional design decisions. We looked for advice within growing reports of probe use to explore families and aspects of family relationships, such as intimacy [8, 9, 17]. Horst et al. [16] provide valuable insights into the challenges of designing probes with families, such as the need to cater for the diversity of individual family members (e.g. gender, age, interest, ability, motivation etc.), as well as the need to consider privacy. Guidance such as this helped inform our additional decisions about how to design and use probes to explore differing perspectives held by parents within the same family.

We first had to decide whether to initiate probes and to review probe responses with participants on their own or together (e.g. initiating probes with participants together, reviewing probe responses with each participant on their own). In designing our probes, we had questions about whether to provide participants with individual or shared probe tools (e.g. individual *Device Journals*, a shared *Family Experience Jar*). We also had to decide

whether participants' responses to our probes would be shared or private (e.g. sharing responses to *Digital Family Trees*, private responses to *Family Experience Jar*). Finally, we varied the amount of communication, comparison and collaboration permitted or required by each probe.

The framework states that probes mediate the researcher-participant relationship. In our research project, where some probe tasks were shared between individual parent, we found that probes also mediated the relationship between these individual participants. To adapt probes to cater for the multiple perspectives that are inherent within families is not insignificant. However, as far as we are aware nobody has explicitly discussed the necessary design decisions involved in creating probes and probe activities when extending the method in this way. Emerging ubiquitous computing technologies demand that we will need to design probes that can be used productively to capture multiple perspectives within groups. Future work could provide more guidance regarding this.

6 Towards a Probe Design Framework

This paper presents our learnings from using Wallace et al.'s framework to guide the design and use of probes in a research inquiry. One aim is to ascertain its usefulness as a guide. Another, to see if we can contribute to clarify and extend their contribution, as well as suggesting possible future efforts that can advance us towards a more robust framework. While Wallace et al. acknowledge that their offering is "an example of what a framework for probe design and use might look like" [21] rather than a definitive guide, we would argue that efforts that can build upon their insightful work towards formulating a framework for probe design will be very useful for HCI and Interaction Design.

To be fair, we do agree with researchers who caution against being too didactic and prescriptive about how we design and use probes for fear of losing some of the creativity and designerly inspirations that can be seen in truly effective probes [4, 5, 19]. However, we do see the benefit of more guided reflections without being overly prescriptive. This could reduce some of the misunderstandings and misinterpretation of how probes are designed and used. At the same time, it will provide (new) researchers and designers wishing to use probes, a more robust and actionable starting point.

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Probes to Explore the Individual Perspectives on Technology Use that exist within Sets of Parents

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ABSTRACT

Research reveals that family experiences of technology use in everyday life can be complex and messy, often associated with tension and conflict. This complexity can be intensified when sets of parents have differing individual perspectives on their family's technology use. Exploring these different perspectives, requires an approach that not only considers parents as individuals, but also as part of a set. To challenge matters further, parents may not be fully aware of their own attitudes and assumptions relating to technology, let alone of each other's. Parents may also be embarrassed to share details about family conflicts. This methods paper presents a probe study that successfully helped us to explore the individual perspectives on family technology use that exist within sets of parents. It provides an example of an approach to using probes that can reveal the hidden experiences of multiple individuals within a social context. In this way, it contributes an understanding of how we might interrogate the complexities of co-experience.

Author Keywords

Family; parents; technology use; experiences; perspectives; probes.

CCS Concepts

• Human-centred computing → HCI design and evaluation methods

INTRODUCTION

The pervasive use of digital technologies is increasingly affecting the minutiae of family life [18]. Uncertainties regarding the effects of technology use on child development and family relationships have led to calls for the HCI community to better understand family experiences of digital technology [19, 44, 46]. One trajectory is to explore the complexities associated with technology use within families e.g. [4, 22, 28]. Research suggests that differences between the experiences, expectations and attitudes of individual family members can contribute to this complexity. Family conflict and tension can arise when parents differ in their approach towards their family's technology use [1, 9, 34]. It is therefore critical that we develop our understanding of these different individual perspectives within sets of parents, and how they are communicated, or negotiated within family life.

However, researching individual perspectives on family experiences presents significant challenges [38]. Firstly, we need to understand the complex social contexts of family relationships in which these experiences take place. In particular, understanding how the needs of individual family members are integrated within the needs of the whole family. Secondly, we need to encourage parents to reflect not only on their own experiences, but also on each other's. Parents may not be fully aware of their own experiences, let alone each other's. This may hold incorrect assumptions about each other's perspectives on family technology use. They might also find it hard to reflect on apparently routine experiences of habitual technology use that occur within the busyness of family life. Furthermore, they could find it embarrassing or uncomfortable to discuss certain experiences, such as those associated with family conflict, or dissatisfaction with aspects of being a parent [11] arising from technology use.

In this methods paper, we present a novel approach to using probes to explore the individual perspectives that exist within sets of parents. While probes have been shown to effectively support research with families, prior work has tended to take either an individualistic, or a collective approach to using them. In other words, some efforts use probes to focus only on individual perspectives, while others design probes to explore the collective (family's) experiences. Instead, we designed our probes to capture a combination of individual and collective responses from each set of parents, in an attempt to reveal a more nuanced understanding of their experiences. We explain that comparing each set of parents' responses, exposed the different ways in which they perceive experiences of family technology use.

Our findings show how our probes successfully helped to address some of the challenges posed by this research. Firstly, enabling us to discover family dynamics, roles and relationships. Secondly, allowing us to reveal the individual practices and priorities of each parent. Thirdly, helping to raise parents' awareness of each other's perceptions. Finally, prompting parents to reassess their own perceptions. This approach to using probes helped elicit unexpected realizations and reflections on uncomfortable experiences.

Overall, this paper contributes an example of an effective approach to support explorations of domestic life that look beyond individual experiences of technology use, and

consider some of the complexities including co-experiences. Specifically, our probes enabled us to more deeply explore individual perspectives of parents, regarding their family's experiences of day-to-day technology use. We hope that the knowledge presented in this paper can add to researchers' understanding of how to develop more productive research tools to support inquiries of domestic HCI.

RELATED WORK

Understanding the Experiences of Parents

Technology use continues to be increasingly woven into the fabric of family life as it does in society [30]. Meanwhile, uncertainty surrounds the potentially adverse effects technology use might have, especially on children [27, 37] and family relationships [6, 34]. This has led to efforts within HCI to develop deeper understandings of how families experience technology use within the messiness of everyday life e.g. [13, 46]. However, exploring these experiences presents significant challenges [11].

Some of the challenges associated with uncovering experiences of family technology use, were first described by early researchers of television [7, 38]. They discussed the difficulties of exploring experiences that take place within the social contexts of personal relationships and private domestic settings. Understanding the social contexts of families are particularly complex, as it requires us to consider people as individuals at the same time as considering them as being part of a family. This is because, while families comprise of diverse individuals with different interests and needs [23], being a member of the family unit inherently involves reciprocity and a sense of shared aspirations.

When it comes to domestic technology use, individuals' different experiences, expectations, and attitudes may need to be balanced with those of other family members [4, 55]. This builds on Battarbee's [3] concept of the co-experience, in which she reminds us that 'people are both individuals and social beings'. This is particularly pertinent when considering parents, who not only need to balance their individual interests and desires, but also negotiate the responsibilities, demands and aspirations associated with parenting [31]. This requires parents to consider shared views, modulate opinions, compromise and so on. In order to do this, parents develop expectations, hopes, assumptions and demands on one another [20].

Understanding the individual perspectives on technology use within families is important. As recent research shows, a failure to balance and negotiate between different, even opposing outlooks of individual family members can lead to family tension and conflict [4, 9, 55]. Tensions between sets of parents in particular can be associated with technology use and the different individual attitudes that each parent has towards it [14, 40]. A set of parents might have to negotiate contrasting individual approaches to implementing family technology rules, including how they each use technology [1, 9, 40] as well as parenting of their children's technology use

[22, 49]. In addition, children may also share their views on how parents manage and use technology [20]. So, with technology use occupying an increasing amount of individuals' time within everyday family life, many people come to associate it with complex, challenging experiences [9, 24, 47].

Efforts to explore the dynamics of family technology use, offer valuable glimpses into parents' experiences. Traditionally, these predominantly considered the role of parents in mediating and controlling their children's technology use e.g. [4, 34, 50]. However, as technology use has become more ubiquitous, research has also started to consider parents' own use of technology, such as mobile phones [21, 42]. Studies of 'digital motherhood' [16] explore the ways in which technology use is changing parenting practices [2, 32]. While these tend to focus on the use of specific technologies, such as social network sites [39], they begin to reveal the finely balanced role that technology often plays in the lives of parents. For example, the same technologies that parents turn to when seeking or sharing information about their children, offer connection to non-parenting activities and interests [16]. This can help people avoid the isolation often associated with parenting, but can also distract them from looking after their children [21].

These efforts begin to construct an understanding of parents' increasingly complex realities of technology use in family life. However researchers tend to take an individualistic approach to explore the experiences of parents when in fact, their attitudes and approaches to family technology use vary greatly, and are shown to be highly influenced by their relationships and social context. For example, the opinions of family members and friends can affect the types of technology rules set by parents [14, 20, 40] as well as what they decide is appropriate to share about their children online [1]. The expectations of wider society affects parents' attitudes towards technology use in public, as demonstrated by studies of mobile phone use in family restaurants [45] and of texting at children's playgrounds [21].

While researchers have highlighted how the views of others may affect family's technology use, what is particularly lacking is an understanding of if, and how, sets of parents communicate, negotiate and collaborate on their approach towards their family's technology use [9]. This need for deeper understanding of the experiences of parents correlates with specific calls for a more holistic view of parents' evolving experiences of technology use [13, 25] and, more broadly, for HCI research to consider the social elements of experience more thoroughly [3].

Probing Experiences of Family Technology Use

New tools are required to support research into co-experiences of family technology use, given the significant challenges it presents. In particular, [34] discuss the risk of parents wanting to provide socially desirable responses rather than disclosing family experiences that they might feel uncomfortable or embarrassed about. Furthermore, they

highlight the critical need to consider the different expectations of individual family members, as well as potential power differentials between them. In addition to these fundamental challenges, others note that intimate contexts require an awareness of privacy concerns [13]. Finally, it has previously proved challenging to integrate research into the busy day-to-day lives of families e.g. due to work commitments of parents [54]. It is perhaps challenges such as these that have encouraged a number of HCI researchers to turn to probes in order to support their inquiries of family technology use [11].

Probes are playful and open-ended tools [15] used to access aspects of participants' lives by allowing participants to express themselves through collected information [33]. This is often used to support and stimulate discussions between researchers and participants during contextual interviews. This dialogical approach has been demonstrated effectively within families, promoting the articulation of experiences and behaviors that are usually taken for granted and go unnoticed by participants [23]. The ambiguity of responses can also offer participants privacy, which has led to the use of probes in sensitive settings or with populations that require sensitivity [5]. Their capacity to surface experiential and emotional aspects of interaction design has also been well demonstrated [29]. In this way, a dialogical approach to probes is well placed to help researchers to address some of the challenges presented by exploring co-experiences of technology use within families.

In researching family technology use, one approach has been to design probes to be completed by, and discussed with, an individual family member e.g. [17, 41]. However, [25] advise against taking an individualistic approach when researching families, as it risks promoting Turkle's [48] notion of 'being alone together'. Instead, they suggest taking an approach that considers the needs of the family as a whole. Similar suggestions have been made for more holistic approaches to developing more complete accounts of family experiences with technology [13, 23, 25]. Another approach to researching families has considered the whole family unit. This collective approach involves designing probes as collective family tasks, to be completed by the whole family, in preparation for a collective family interview e.g. [8, 52, 53]. However, seeking a collective response from families assumes that families are homogeneous and overlooks the differences between the individual perspectives of family members [23].

When exploring communication in families, we find that [23] describes an attempt to balance these two approaches by designing one probe to capture the collective perspective of the whole family and another to capture the individual perspective of one family member. Allowing multiple family members to complete the individual probe is recommended, in order to produce a more complex and complete view. We found another example in which probes seem to have been used in a way that combines individual tasks and collective

tasks e.g. [51]. However, this approach is not explicitly described, nor is it taken in order to understand how families are currently experiencing their everyday technology use. Rather it is taken in order to support the design of technologies that mediate intimacy between couples.

As more technologies are brought into homes and the pervasive use of technologies within families is increasingly scrutinised, it becomes critical to adapt our methods to develop a more complex and complete view on these experiences. That is one of the motivators behind our design of a probe study to explore the individual perspectives of family members, in this case, sets of parents.

THE NEED TO EXPLORE PARENTS' PERSPECTIVES

As we have discussed elsewhere [9], as a precursor to this work we previously held a workshop with parents, to explore their experiences of technology use within family life. This revealed how parents' differing approaches to technology use can result in negative experiences and family conflict. Exploring this further addresses wider calls for better understandings of the interplay between technology use and the complex family dynamics between parents [20, 21, 36]. To the best of our knowledge, there are no explicit examples of methods that explore individual perspectives on family technology use that might exist within sets of parents.

In order to start understanding the social contexts in which parents experience family technology use, we need to take an approach that not only considers them as individuals, but also to be part of a set of parents. Our method must also be capable of encouraging parents to reflect on experiences that might seem unremarkable within the habitual technology use of everyday family life. Therefore, we anticipate the significant challenge of encouraging sets of parents to reflect on their own experiences of technology use, and also on each other's.

METHOD - CREATING OPPORTUNITIES TO COMPARE

We will now describe how we designed our probe study to create opportunities to compare sets of parents' individual perspectives on their family's technology use. Specifically, we will discuss the design of our probes and decisions behind their deployment.

Probe Design - Individual and Collective Responses

In the absence of explicit examples of how to use probes to explore individual perspectives of multiple family members, we referred to broad guidance on effective probe design (see [10]). However, this guidance tends to be informed by examples in which researchers either take an individualistic or a collective approach to probes. Therefore, probes are either designed to capture individual responses from single participants, or collective responses from multiple participants. When considering how to adapt the use of probes to explore the individual perspectives within sets of

parents, we attempted to take a balanced approach. This meant designing our probes to capture a variety of individual and collective responses from each set of parents. This built upon suggestions that probe collections work well when they offer participants varying opportunities to respond [33, 53]. We now describe how this approach informed the design of our three probes (i) Family Experience Jar, (ii) Digital Family Tree, (iii) Device Journal (Fig. 1).

Probe 1: Family Experience Jar

This probe is designed to encourage sets of parents to log their individual experiences of technology use within family life, throughout the study. Each set of parents receives a Jar (Fig. 1, top), along with three small paper notepads which are coloured to denote the type of experiences being logged. Pink for logging positive experiences, blue for negative experiences and yellow for experiences perceived to have both positive and negative aspects. We asked each parent to submit at least one note per day for the duration of the study, inviting them to make additional contributions as-and-when such experiences occurred.

The Jar is designed in such a way so as to prevent the details of the notes inside being read: notes are inserted through a small slit cut into the lid of the Jar, meaning that they must be folded in order to fit. The lid is also glued onto the Jar meaning that notes cannot be removed once they are inserted. Whilst the details of the notes cannot be read, by choosing Jars made of clear glass, participants are able to see contributions amassing over time. The visible colour of the notes inside the Jar provides ‘at-a-glance’ idea of the types of experiences that had been logged. We hoped this might generate curiosity between parents as to what the other has contributed; encouraging reflection and further participation. Finally, we asked each parent to initial and date their notes to assist us in identifying and comparing their logged experiences.

This probe is inspired by Andell et al.’s [33] stress-relaxation bottle and captures individual responses within a collective container. This is intended as a physical analogy of how we considered participants as being part of a set of parents, and also as individuals. While completing this probe, participants would be able to compare the amount and ‘mood’ of each other’s individual responses. When reviewing this completed probe we anticipated being able to compare the individual responses of each set of parents.

Probe 2: Family Tree

This probe is designed to encourage each parent to express how they see themselves in relation to their family members, as well as in relation to the technologies used within everyday family life. Provided with a piece of A3 paper, participants are asked to create a Family Tree diagram (Fig. 1, middle) to illustrate the relationships both between their family members and also the technologies used in everyday family life. We hoped this would help surface insights into how each parent perceives these relationships and into aspects of co-experience. Including technologies in these

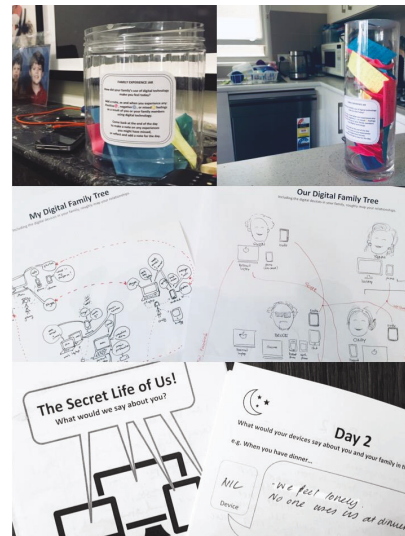


Figure 1. Probe 1 - Family Experience Jar (top), Probe 2 - Family Tree (middle), Probe 3 - Device Journal (bottom)

relationships was intended to play into people’s tendency to anthropomorphize [12] and assist them to think differently about their family’s (often routine, mundane or habitual) technology use.

During the first week of the study, each parent is asked to complete a Family Tree. During the second week, sets of parents are asked to compare their individual responses with one another. Then they are asked to collaborate with each other to complete a shared Family Tree. We asked participants to make a note of any shared outlooks, differences in opinion or even points of contention that might emerge during this process.

This is the probe that most explicitly considers participants as being part of a set of parents, and also individuals. It is designed to capture individual responses from each parent, and then a collective response from each set of parents. To complete this probe, participants would need to compare their individual responses and collaborating on a collective response. These steps are intended to highlight the way in which individual perspectives of parents are communicated and negotiated upon within family life. When reviewing this completed probe we anticipated being able to compare each set of parents’ individual responses with each other, and with their collective response.

Probe 3: Device Journal

This probe is designed to encourage parents to reconsider their perspective on family life. Inspired, in-part, by artifact ecology [26], we devised a comic-style Journal (Fig.1) that

introduced a fictional context [53] by asking each parent to imagine how their devices experience family life. We hoped this playful probe would enable parents to take a different viewpoint with a refreshed perspective of their family unit and their families' experiences. We hoped that by comparing each set of parents' individually completed journals, deeper insights of habitual technology use would surface that might have otherwise been taken-for-granted, unremarkable, uncomfortable or even socially undesirable.

This probe captures individual responses from each parent within their own Journal. Participants could pick any two days on which to complete this probe and sets of parents were not asked to align, or discuss this task with each other. When reviewing this completed probe we anticipated being able to compare the individual responses of each set of parents.

Probe Deployment - Individual and collective interviews

When planning how to deploy our probes, we sought to create a balance between offering opportunities for individual and collective responses, as we had when designing our probe collection. We intentionally held a combination of individual and collective interviews, to consider the individual perspectives within each set of parents.

We decided to hold collective Opening Interviews with each set of parents. We would introduce our probe collection and provide instructions on how and when to complete each probe, which probes required individual or collective responses, and which responses could be discussed or compared. Collective Opening Interviews are particularly appropriate when introducing single, shared probe artefacts such as our Family Experience Jar. In addition, it would

allow our participants to identify and introduce themselves as part of a set of parents, and part of a family. This was important given the overall research topic of understanding experiences of family technology use.

We decided to hold individual Closing Interviews with each parent on their own, rather than with sets of parents. This decision was informed by the findings of our preliminary workshop. We hoped it would encourage participants to be more candid and ensure that we were able to explore the different perspectives of each parent. In case a parent might be less candid through fear of us disclosing their opinions during the other parent's Closing Interview, we assured them that their discussions would remain private.

Participants

This research was conducted in accordance with ethics approval from [University name]. We recruited 17 participants (P1-P17), representing eight families (F1-F8) in which there was at least one child under the age of twelve years (see Table 1). We were cognizant of the broad and diverse range of family compositions [13] and, as is standard in HCI, defined family either as a unit of people living in a home together, or who are related to each other [25]. We acknowledge that many arrangements of parenting exist. For example, F8 consists of a single mother, aunty and grandmother who live together and share responsibility for raising three children.

Study Outline

The study was conducted over 14 days (see Fig. 2). On Day 1 we conducted semi-structured Opening Interviews with each of the eight set of parents. This took place at their family home and lasted between 60-90 minutes. Each parent introduced themselves and their family, before briefly discussing aspects of technology use within broader family life, including routines, attitudes and expectations. We then introduced our probe collection and explained that they had 10-12 days to complete the probes, before we would collect them.

After collecting completed probes, we reviewed our participants' responses in order to identify interesting questions to be discussed during the semi-structured Closing Interviews held with each of our 17 participants on Day 14. Each Closing Interview lasted between 50-70 minutes and took place, once again, at family homes. This was a researcher-participant co-exploration of the completed probe activities, to make sense and to reflect, retrospectively, on their use of the probes. Also, this interview gave us the opportunity to seek clarifications of certain responses we found interesting when reviewing the completed probes.

| Family | Participant | Role | Employment |
|--------|-------------|---------|------------------|
| F1 | P1 | Mother | Full-Time |
| | P2 | Father | Part-Time |
| F2 | P3 | Mother | Full-Time Parent |
| | P4 | Father | Full-Time |
| F3 | P5 | Mother | Part-Time |
| | P6 | Father | Full-Time |
| F4 | P7 | Mother | Part-Time |
| | P8 | Father | Full-Time |
| F5 | P9 | Mother | Part-Time |
| | P10 | Father | Full-Time |
| F6 | P11 | Mother | Full-Time Parent |
| | P12 | Mother | Full-Time |
| F7 | P13 | Mother | Part-Time |
| | P14 | Father | Full-Time |
| F8 | P15 | Mother | Part-Time |
| | P16 | Grandma | Retired |
| | P17 | Aunty | Disability |

Table 1. Participants

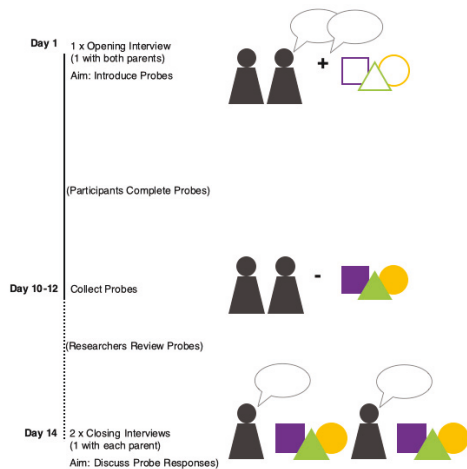


Figure 2. Study Outline

Data Collection and Analysis

After collecting the completed probes, we reviewed them in order to inform Closing Interviews. Firstly, we reviewed the responses of our 17 participants individually. Secondly, we reviewed them as eight sets of parents, comparing one parent's responses with the other's. As such, we began to build a picture of, and identify questions relating not only to 17 individual parents, but to eight distinct sets of parents, and to some extent, eight distinct families.

We audio-recorded all interviews and took handwritten notes to support analysis. We used open coding to analyse these data and generated codes to reflect a variety of attitudes and approaches to their family's technology use. These codes combined to create themes that will be reported in future work. For the purpose of this methods paper, we focus on how our approach to using probes helped us to explore the individual perspectives on technology use that exist within sets of parents.

FINDINGS

In order to highlight the effectiveness of our probe study in enabling us to develop deeper understandings of parents' individual perspectives on their family's technology use, we draw on how participants responded to our probes, as well as on how they reflected upon these responses during Closing Interviews. As anticipated, when we received and reviewed completed probes, we were able to compare the individual responses of each set of parents. We found that our probes were able to capture the internal dialogues of each parent, by encouraging them to reflect from different, sometimes novel, perspectives. For example, by asking them to imagine how particular technologies perceive family life, our Device

Journal probe prompted them to consider and even reassess their views, revealing usually hidden experiences of family technology use. We were then able to compare these internal dialogues and discuss them during Closing Interviews.

In the case of our Family Tree probe, we were also able to compare each set of parents' individual responses with their collective response. As well as enabling us to compare the individual perspectives that exist within sets of parents, this also allowed us to identify ways in which these different perspectives might be communicated, and negotiated within family life. Participants had been asked to take notice of any interesting conversations, surprising realizations or tensions while completing this probe. This enabled us to ask them about their experience of this process, as we highlighted interesting similarities and differences between their responses during Closing Interviews.

When we interviewed participants, we heard many stories about the differing ways that a set of parents might perceive technology use, and its role within their family. We also surfaced conflicting attitudes about the ways in which technology use might affect their family's relationships. This included elaborate, unexpected realizations that participants sometimes found to be emotional, and even surprising. During these discussions it became clear that our collection of probes had been used successfully to overcome some of the challenges posed by attempting to compare sets of parents' individual perspectives on family technology use. Firstly, discovering family dynamics, roles and relationships. Secondly, revealing parents' individual practices and priorities. Thirdly, raising parents' awareness of each other's perceptions. Finally, prompting parents to reassess their own perceptions.

Discovering Family Dynamics, Roles and Relationships

Comparing the individual responses of each set of parents to our probe collection enabled us to garner a sense of the dynamics between each set of parents, and their families, insofar as how technology is integrated into their daily practices and routines. Responses to our Family Experience Jars in particular, revealed clues about the role of each parent within their family. We discovered, for example, that one parent tended to log more work-related experiences while the other focused on social, domestic or child-related experiences.

This influence of familial roles was also evident, though perhaps less explicitly, when comparing the degree to which each parent had engaged with the probes. In almost all households, one parent responded more comprehensively than the other. This tended to be the parent who spent more time at home with the children compared to the other parent, who was usually out at work during weekdays. This was visible, for example, in the significant difference between the number of notes each parent contributed to their Family Experience Jar, or by the disparity between the care and detail with which each parent had drawn their Family Tree.

While we had asked each set of parents to work together to create a collective Family Tree, we found that several collective responses looked very similar to one parent's individual response. We also noticed that some collective responses were missing. During closing interviews, several parents explained that on comparing their individual Family Trees with each other, one parent had conceded that the other parent's diagram was actually more accurate than their own. This individual response had then been either redrawn as a collective response, or used in lieu. In all of these cases, the individual response that was reappropriated as a collective response was created by the parent who held most domestic and child-caring responsibilities. While these explanations might give rise to suspicions of a lack of time or engagement, they may also hint at the true nature of contested opinions, dominant viewpoints and complex negotiations that exist within families, such as one parent's views being more dominant.

By comparing the individual responses of each set of parents we were also able to identify and interrogate instances in which a set of parents describe the same act of technology use. In some instances, we discovered clues about our participants' relationships, or how they perceive their relationships. For example, correlating notes in P7 and P8's Jar, both written on pink paper, describe a shared, intimate experience that both perceive to be positive, "watched Netflix with P7 in bed together" (P8, Jar) and "watched a nice movie on Netflix, me and P8, 2 nights in a row! ☺" (P7, Jar). By contrast, another set of notes expose their conflicting perceptions, with P8's pink note positively describing "binge watching Netflix (alone time)" (P8, Jar) and P7's blue note logging her negative perception of the same experience "P8 spent the whole evening after work watching Netflix" (P7, Jar).

Clues about family dynamics and relationships could also be found when comparing differing individual attitudes of parents towards experiences of technology use involving their children. For example, P11's pink notes describe her positive experiences, "we all watched some kids TV in bed having a cuddle" (P11, Jar) and "while I showered, the boys played games on my phone" (P11, Jar) while P12's blue notes portray these experiences as negative "using TV for calming kids down" (P12, Jar) and "using phone to calm kids" (P12, Jar).

By comparing each set of parents' individual responses, our probes allowed us to more thoroughly explore how each parent perceives their experiences of technology use in family life. This helped to surface deep, candid and interesting reflections by our participants that we could in turn, also compare. For example, during each of their closing interviews, we asked P7 and P8 to expand on entries they have made in their individual Journals and uncovered contested beliefs: "I can confidently assume that if I became P7's phone for a week I wouldn't be uncovering anything." (P8, Int.) compared to "My phone would know that P8 is

spoilt, he's a lucky guy to have a family like us...he would know that from the amount of searches I do trying to work him out." (P7, Int.). Disclosures such as these provide insights into family relationships and also highlight the extent to which technology use plays a role within them.

Revealing Parents' Individual Practices and Priorities

Comparing the individual responses to our probes also helped to reveal the different individual practices and priorities within each set of parents, regarding technology use. For instance, we found Device Journals entries portraying each parent's smartphones as having very different experiences to one another. For example, comparing "I am the centre of P1's life!...I never leave his side or get switched off." (P1, Journal) with, "I am so quiet. P2 almost always mutes me...the grubby little hands (of the kids) that use me sometimes can be rough and have dropped me sometimes." (P2, Journal) reveals the different attitudes and practices of each parent.

Almost all parents describe the television as the device that would know most about their family. Their Journal entries concerning television use also reveal similarities and differences between the individual practices and priorities that exist within sets of parents. For instance, in P5 and P6's Journal entries, we find clues that monitoring their children's technology use is primarily the concern of P5. She imagines their TV to say, "The kids get to watch me while Mum (P5) makes dinner, or in the afternoon on weekends, but not in the mornings...Sometimes Mum streams Cosmic Kids or GoNoodle so that she doesn't feel guilty about kids' screen-time." (P5, Journal). In contrast, P6 focuses on the functionality of technology and writes, "I'm the TV, I'm supposed to be part of the smart home setup but all I do is cartoons before dinner." (P6, Journal).

By comparing individual responses to our Family Tree probe, we were able to reveal broader perceptions of technology use within family life. For instance, often, one parent took a people-centric view by drawing connections between faces of family members, while the other took a more technology-centric view by drawing connections between devices.

Raising Parents' Awareness of Each Other's Perceptions

The Family Tree probe involved the sharing and discussion of individual responses within each set of parents, before each set could collaborate on a collective response. During Closing Interviews, we found that this process had helped to raise parents' awareness of each other's perceptions on technology use. For instance, in P5's interview, she explained: "When I put together my Family Tree, the relationships are always in terms of the people relationships. The devices facilitate those relationships...whereas P6's is more about the connections between the devices themselves. It was hard to marry them together because of that. They were similar but they had such different focuses." (P6, Int.).

By becoming aware of how the other parent had illustrated their Family Tree, some of our participants had been prompted to re-examine family technology practices that they had previously taken for granted. Several parents talked about how this task had spurred conversations with each other that had led to various new-found realizations about family technology use. For example, P8 explained how collaborating on a collective Family Tree had prompted him to reassess: *"I thought that it was a family desktop, but (creating) Our Family Tree made me realize that it's really just me who uses it. I recognize now that these devices are more personal than shared. I realized that everyone in the family has their own (technological) companion"* (P8, Int.).

Others discussed how these conversations had exposed conflicting perspectives of technology use. For example, *"P10 will tell you a different story...I am surprised at P10's self-opinion of her own use. She doesn't think she uses (her smartphone) that much, but I really do. The (probe) gave me a legitimate lens to have a look at that."* (P9). Several participants expressed similar appreciation of the opportunities that this probe created, to discuss perceptions of technology use with the other parent in their family.

Prompting Parents to Reassess Their Own Perceptions

Asking our participants to collaborate on a collective response to our Family Tree probe demanded a deeper level of comparison by parents of each other's individual efforts. Though challenging, this negotiation of individual perspectives encouraged greater understanding and reflection, not only of one another's perceptions, but also of their own. We found that this facilitated more interesting discussions and surfaced interesting realizations during our Closing Interviews.

It also prompted some parents to reassess assumptions they had made about their families' technology use. For example, P12 described how he was surprised to learn about the central role TV played in his family, realizing that his family spent more time watching TV in his absence than he had previously imagined, *"I saw that the TV is central to the family, though I don't have any connection to it personally"* (P12, Int.). We noticed several participants were similarly surprised to learn that their assumptions about their families' technology use were not always right. For example, P2 who allows her children to access her phone had always assumed that her husband did the same. However, in her Closing Interview, she described her surprise at noticing that her husband's Family Tree showed no connection between his phone and the children. This had prompted her to ask her husband about this and learn for the first time that he did not, in fact, allow their children to use his phone since he considered it to be a work tool. In this way, asking parents to compare their individual responses had created opportunities for conversation between parents and raised awareness of different perspectives on technology use that tend to be overlooked in day-to-day family life.

DISCUSSION

Our work suggests that using probes in a way that both considers participants as individuals, and well as being part of a family unit, can help to uncover challenging but important aspects of the family dynamics surrounding technology use. This is evident from our participants responses presented in the findings, which illustrate the extent to which our probe study enabled us to compare, explore and unpack the individual perspectives on technology use that exist within sets of parents. As such, this paper provides HCI researchers and interaction designers with a valuable example of how to use probes to productively research the complex experiences of multiple people within family groups.

Our findings describe how our novel way of using probes helped us to address several challenges posed by this research. Firstly, discovering family dynamics, roles and relationships. Secondly, revealing parents' individual practices and priorities. Thirdly, raising parents' awareness of each other's perceptions. Finally, prompting parents to reassess their own perceptions. This enabled us to surface a more complex and complete view of technology use within the lives of our participants and their families. As well as allowing us to compare the individual perspectives on family technology use that exist within sets of parents, our probes helped us to examine how these perspectives are communicated and negotiated within family life.

Our review of related literature acknowledges an established practice within HCI of using probes in a dialogical approach to support and stimulate discussions between researchers and participants in follow-up interviews [11]. This approach was developed by primarily considering individual experiences of technology, and when working with families, relying solely on responses from individual participants overlooks complex family dynamics and, ultimately, the needs of the whole family [23]. While researchers have sought to correct this by taking a collective approach in which multiple family members complete probes together before discussing responses in group interviews, this neglects the diverse and potentially conflicting perspectives of individual family members [11, 23]. In our efforts we sought a balance between an individualistic and a collective dialogical approach to probes.

This balanced approach considered participants not only as part of a set of parents, but also as individual people. Therefore, as we have described, our use of probes slightly adapted the conventional dialogical approach by designing a probe collection capable of capturing a combination of individual and collective responses. Heeding advice on how to create varied probe collections [53], we designed each of our three probes to capture this combination of responses in different ways, and to varying extents. We had hoped that this would create a range of opportunities to compare the responses of each sets of parents.

Combining individual and collective probe responses

While probes that ask people to log their individual experiences are commonly designed as personal diaries [33] our Family Experience Jar probe provided each set of parents with a shared receptacle in which to deposit their individual notes. This physical analogy of the individual perspectives that exist within each set of parents helped to communicate the research topic to participants, thus helping to create an easy entry point for participants to start engaging with our probe collection. By making the notes visible within the Jar, we allowed sets of parents to get a sense of how much one another was engaging with the probe, and the types of experiences that they were logging. Our findings show that this aroused curiosity in our participants and helped to raise participants' awareness of each other's perspectives. We believe that designing probes that capture individual responses within a shared physical object can help to engage multiple people when working with families.

When attempting to compare individual responses from multiple people that are captured in a shared receptacle, it is of course necessary for researchers to be able to identify each participant's individual contributions. We asked participants to initial each of their notes, which allowed us to easily compare the extent to which each parent had engaged with the activity and the types of experiences that each parent had recorded. This helped in revealing the individual practices and priorities of each parent. By also asking participants to include the date on each of their notes we were able to more precisely compare each set of parents' individual responses, and identify correlating notes describing each parent's version of the same incident. As described in the findings, this allowed us to interrogate differing individual perceptions of a particular co-experience and to discover aspects of family dynamics, relationships and roles. Although occasional examples do exist of probes that capture individual responses from multiple people [33], accounts of their use do not explicitly discuss the use of probes to explore the individual perspectives of multiple family members, or to compare their perceptions of the same experience.

In contrast to our Family Experience Jar probe, each parent recorded their individual responses in their own individual Device Journal. This Journal deviates from conventional diary probes [33] asking participants to record the imagined experiences of devices regularly used by members of their family. Using probes to introduce fictional contexts in this way has been discussed as a means of enabling participants to remove themselves from the constraints of reality, and to express complex ideas [53]. Whilst we have found no explicit accounts of using such probes to explore the individual perspectives within families, our findings indicate that fictional contexts might indeed help encourage family members to consider each other's perspectives. By allowing parents to take a more detached position, this probe also revealed clues about sensitive subjects, such as family conflict. These responses helped us to broach these subjects with participants during Closing Interviews, and elicit revelations about family dynamics, roles and relationships.

In addition, asking each parent to complete their Journal on their own, and without discussion, exposed the different ways in which individuals interpreted this rather unconventional probe. As illustrated in our findings, this helped to reveal more about the individual practices and priorities of each parent.

In addition to capturing individual responses, our Family Tree probe also asked each set of parents to compare and negotiate their individual responses with each other, in order to create a collective response to the same task. This was intended to understand how parents might communicate and negotiate their individual perspectives within family life. As far as we are aware, this is the first time that a combination of individual and collective responses to the same probe have been used to explore the individual perspectives of family members. By comparing individual and collective Family Trees, we were able to discover aspects of family dynamics and relationships that would have been otherwise challenging to expose, had we relied solely on either individual or collective responses. As described in the findings, this process of asking sets of parents to first complete a task individually, and then to repeat it as a collective exercise, spurred interesting dialogues between them. The opportunities for collaborative dialogical sensemaking [29, 35] created by this task helped to raise parents awareness of each other's perceptions, and their own, which sometimes led to unexpected realizations that even surprised some of our participants. Though somewhat inadvertently, these then went on to play a pivotal role in surfacing subsequent discussions during Closing Interviews.

A probe approach to explore complex family experiences

Reflections of our findings have led to a number of methodological insights. These insights pertain to the various ways in which to effectively use probes to tease out complex, tacit and even conflicting experiences that take place within families. Our approach to probes sought to find a balance between the individualistic and collective focus previously given to working with families. Our findings show that by taking this approach, our probes helped us to address some of the challenges posed by exploring family experiences of technology. Now we discuss these findings more broadly to provide those researchers, interested in exploring the individual perspectives on technology use that exist within families, with more general insights into how to approach the use of probes.

Capturing individual responses from multiple family members is required before we can compare them. Thus, allowing multiple family members to respond individually to probes is essential when attempting to explore their different individual perspectives on technology use and to enable more a complex and complete view of their experiences within everyday family life [23]. However, we acknowledge that this presents researchers with additional considerations.

Firstly, this requires us to recruit multiple family members and to engage them in our probe activities. As discussed, family life is busy [34] and individual family members have different interests, needs and priorities [23]. Therefore, while researchers can intend to engage with all family members equally, it should be accepted that their individual levels of interest, effort, abilities and overall engagement may vary. This is heightened when including children's responses [23]. While this might limit the precision and confidence with which individual probe responses can be compared, the varying ways in which individual participants interpret probes can sometimes provide clues and stimulate interesting discussions about the individual perspectives of family members. Secondly, allowing multiple family members to respond individually to probes introduces two stages of data-analysis; considering each participant's responses individually, and then within the responses of their family members. This adds complexity and time to this process.

While it is also essential to capture collective responses from multiple family members, relying solely upon their collective responses limits our ability to develop complete views on family experiences. This is because collective responses overlook the individual perspectives of individual family members and may instead amplify the views of more powerful, assertive or vocal individuals within the family [34]. Also, when attempting to capture collective responses, it is important that some probes are better suited to capture collective responses than others. These are usually creative, fun, collaborative tasks that allow participants to express themselves within a relatively short and flexible timeframe. Given the shared, public nature of these tasks, collective responses will likely require more interpretation by researchers and offer limited depth. Therefore, to make these responses more useful, researchers might look for ways in which to offer participants a sense of privacy within these collective tasks. Probes designed to incorporate a sense of individual and collective duality might go some way to achieving this, as shown by our Family Experience Jar and Family Tree probes.

Including a probe that asks multiple family members to compare their individual responses to a task, and then to collaborate on a collective response significantly enhanced our approach. This is primarily because this process sparked discussions between family members, helping to raise their awareness of each other's perspectives, and of their own. These discussions also prepared participants for follow-up interviews in which we could more easily encourage and support participants to reflect on highly personal, sensitive and sometimes uncomfortable experiences of family technology use. Our approach also incorporated a combination of collective and individual interviews. Collective interviews are more suited to introduce probes. They ensure that individuals see themselves as part of a family unit and prompt them to reflect on experiences within family life. In contrast, individual interviews allow candid reflection on personal experiences of family life that might

be considered embarrassing or socially undesirable [11]. While this aspect of our approach is beneficial, it introduces further time requirements, both in conducting probe studies and analysing data.

As discussed, existing guidance on the use of probes e.g. [33, 53] tends to either consider an individual or collective approach [23]. Seeking a balance between these two approaches surfaced additional considerations, some of which we have discussed. These considerations of how we can approach the use of probes to better understand family experiences of technology provide a significant contribution to researchers wishing to research co-experiences of technology use in families and other social groups.

CONCLUSION

Family experiences of technology use have been shown to be complex and messy. In particular, family conflict and tensions can arise when sets of parents have differing attitudes and approaches to technology use. This paper presents an example of how to effectively use probes to explore and compare the individual perspectives that exist within sets of parents. It describes the novel approach we took to using probes, by considering parents not just as being part of a set of parents, but also as individuals. It explains how we achieved this by designing our probe collection to capture a combination of individual and collective responses from each set of parents, and to stimulate discussions between them.

This novel approach to using probes helped to address some of the significant challenges posed by researching complex family experiences of technology. Firstly, developing our understanding of the social contexts in which these experiences take place. Secondly, raising our participants' awareness of each other's perspectives, as well as their own. Our approach allowed us to effectively use probes to tease out complex, tacit and even conflicting experiences that take place within families. This demonstration of how we can advance methods in HCI to help develop our understandings of the social experiences of technology use that increasingly permeate everyday life.

LIMITATIONS AND RECOMMENDATIONS

Our work has demonstrated the utility of using probes to collect a combination of individual and collective responses from multiple family members. We plan to extend this approach to include all family members e.g. children, and to explore a wider range of family configurations e.g. separated parents. This approach to using of probes could also consider how family boundaries and technology adoption evolve over time [43], for example, as children grow up.

Given the lack of explicit guidance on how to design probes to explore social experiences of technology, we see value in adapting this approach to develop more complete understandings of the perspectives of multiple people. We believe this a critical step in advancing methods to support the design of increasingly social interactive systems.

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Tactics for Designing Probes to Explore Parents' Differing Perspectives on Family Technology Use

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ABSTRACT

Experiences of technology use in everyday family life can be complex. In particular, tensions can arise when parents have differing perspectives on their family's technology use. This paper describes design tactics we used to create a probe collection that successfully supported explorations of these differing perspectives, and to uncover the tensions involved whilst remaining sensitive to any existing conflict. The tactics created opportunities for conversation between parents and to shift their individual perspectives. These tactics helped to raise the awareness sets of parents' had of each other's perspectives on their family's technology use. Unexpected insights emerged that even surprised our participants, when they were asked to invert their point of view to imagine how their technologies might experience domestic life. Furthermore, deeper insights emerged when participants' responses to individual probes were viewed together, as a collection.

CCS CONCEPTS

• Human-centred computing • HCI design and evaluation methods

KEYWORDS

Probes, design tactics, family, parents, technology, experiences.

1 Introduction

This methods paper contributes to our understanding of how probes can be used to better understand some of the complex experiences associated with technology use within families [6, 27, 36]. Specifically, the differing individual perspectives within sets of parents, regarding their family's experiences of day-to-day technology use [1, 15, 40]. In particular, it describes how we designed a collection of probes using two design tactics to (i) create opportunities for conversation between sets of parents, and (ii) to shift the perspectives of our participants. These tactics were used to help explore the different experiences, attitudes and expectations of parents, uncovering the tensions involved, while remaining sensitive to any existing conflict. Our probes also enabled reflection of socially undesirable, uncomfortable and even hypocritical situations. Overall, this paper contributes to an approach of how probes can be designed and used to productively support explorations of individual and co-experiences of technology use within domestic life. We hope that the design tactics and overall approach presented in this paper can help encourage researchers' efforts to develop more productive research tools to support inquiries of domestic HCI and, more broadly, of co-experiences within social groups.

Also, we highlight the value of using these distinct design tactics in combination, within our probes collection, demonstrating how the cumulative learnings revealed richer, unexpected reflections when compared to the sum of the learnings derived from the use of each individual probe. We hope that the knowledge presented in this paper can add to researchers' efforts to develop more productive research tools to support inquiries of domestic HCI.

2 Researching Experiences of Family Technology Use in HCI

The family is the fundamental unit of society [50]. Technology use has become very much woven into the fabric of family life as it has in society [38]. Meanwhile, uncertainty surrounds the potentially adverse effect it might have on children [9, 34, 42] and family relationships [8, 23, 40]. This has led to various efforts within HCI to develop our understanding of how families experience technology use [19, 48, 49]. However, researching family technology use presents some challenges. For instance, the challenge of how to define 'family'. This requires researchers to be cognizant of a broad and diverse range of family compositions [19]. In exploring the design of technologies for families, HCI has tended to define family either as a unit of people living in a home together, or who are related to each other [31]. The privacy concerns involved when attempting to research intimate domestic spaces, especially when

involving children [19] present additional challenges. Practical challenges are also presented, by the need to integrate research into the busy day-to-day lives of multiple family members e.g. due to work commitments of parents [55]. The challenges presented by researching everyday domestic experiences has inspired a diverse set of methodologies, often requiring the refinement or reinvention of investigative approaches [16]. These varied methods used in HCI research of families has included the use of surveys [25, 43], interviews [1, 6], observations [26, 40] participatory design [44, 47], prototype testing [10], speculative design [17] and probes [29, 53].

In their explorations of technology rules in families, Mazmanian and Lanette [40] remind us of the need for research tools that don't overlook the messiness of family life, the power differentials between individual family members (e.g., parents and children), the varying expectations between family members, and changing family contexts. Furthermore, [40] note the risk of participants (particularly parents) providing socially desirable responses. We believe that the use of probes may play a part in helping to alleviate some of these concerns.

2.1 Probes to Explore Experiences of Family Technology Use

Since Gaver et al. [21] introduced cultural probes to HCI, these playful and open-ended tools have been used effectively to explore elements of domestic life [30, 45, 53]. As well as stimulating early dialogue with participants, probes support reflection by users. The ambiguity associated with completing probes offers participants a sense of privacy that has allowed them to be utilized in sensitive settings, or with populations that require sensitivity [7]. Probes can, therefore, enable intimate and personal issues to be addressed [12, 35]. Their ability to reveal experiential and emotional aspects of design has been well established [37].

Many HCI researchers have demonstrated the effective use of a dialogical approach with probes. This involves exploring aspects of participants' lives by offering them opportunities to express themselves through completed probes [39], in conjunction with contextual interviews. This approach of 'probing for empathy' rather than 'probing for inspiration' has been demonstrated effectively within families, as a means of encouraging participants to acknowledge experiences that might usually go unnoticed within everyday life [29]. This dialogical approach has also been particularly fruitful in exploring more ephemeral aspects of family experiences, such as intimacy [12, 13, 35].

One way in which researchers have used probes in research with families has been to design them as a joint family project, to be completed together in preparation for a family interview [29, 53]. Another approach has been to capture the perspectives of two individuals to explore a particular aspect of their relationship, e.g., studies on intimacy between couples [52] and between children and grandparents [13].

Isola and Fails' [32] review of HCI research involving families describes a tendency to design for individual family members, rather than families as a whole. It suggests that this risks promoting Turkle's [49] notion of 'being alone together'. That is why, some researchers are calling for more holistic approaches and ways to develop more holistic accounts of family experiences with technology [19, 31]. As families' use of technologies become more pervasive, and as more technologies are brought into homes, it becomes critical that our understandings of family experiences with technologies are holistic and nuanced. This is a primary motivation behind the design of our probes.

2.2 Parents' Complex Experiences of Family Technology Use

Families comprise of individuals, but being a member of the family unit often involves reciprocity and a sense of common aspirations. This comes with expectations, duties, and responsibilities that usually depend on an individual's role within the family, and likely to change over time, for example, collaborating on pragmatic tasks like coordinating family activities or participating in leisure activities [13, 24]. They can also include establishing etiquette (e.g., routines, rituals) [6, 35] and more nuanced, ephemeral acts (e.g., attention, affection, intimacy, and love) [52]. As technology use becomes more interwoven into the fabric of family life, technology can be seen to connect the living room with other worlds [38]. When it comes to technology use, individuals' different experiences, expectations, and attitudes may need to be balanced with those of other family members [6, 56].

Recently, research shows that a failure to balance and to negotiate between these diverse, sometimes conflicting outlooks of individual family members can lead to family tension and conflict [6, 15, 56]. In particular, tensions between parents is associated to family technology use, and to differing individual attitudes towards it [20, 43]. Parents might have to negotiate contrasting approaches to implementing family technology rules, including towards how each other use technology [1, 15, 43] as well as towards the parenting of their children's technology use [27, 51]. No wonder many parents come to associate everyday family technology use with complex, challenging experiences [15].

Efforts exploring the dynamics of family technology use have offered valuable glimpses into the complex experiences of parents with regards to family technology use. These efforts tend to focus on the experiences that mothers (e.g. [22]), or fathers (e.g. [2]) have with specific devices, such as smartphones (e.g. [46]), activities, such as the use of social network sites, (e.g. [1]), or of particular times, such as mealtimes (e.g. [43]). However, many researchers recognize the need to build a more holistic view of families' evolving experiences of technology use [19, 31]. This

includes developing our understanding of the interplay between technology use and the complex dynamics within sets of parents. To do that, we require tools that can assist in exploring the different experiences of individual parents, regarding their family’s technology use. Ideally, these tools would allow us to disentangle the individual perspectives within sets of parents, in a way that captures any associated conflict or tension while remaining sensitive to them. We anticipate that this involves being able to prompt parents to reflect on a wide range of positive, negative, neutral and ambiguous experiences with technology, as well as those that go almost unnoticed. Next, we will describe a set of three probes designed to address this challenge.

3 Method: Probe Design and Deployment

In their work with families, Isola and Fails [31] recommend that researchers should also consider the family as a group besides focusing on individual members. As such, we believe that Battarbee and Koskinen’s [3] notion of co-experience, to attempt to understand both the individual and also the social user experience to be a useful theoretical concept to keep in mind when exploring family experiences. Desjardin et al.’s [16] review of HCI approaches to researching domestic experiences provides another source of inspiration for the design of our probes, suggesting researchers consider how different personal experiences of the same home might differ. They also propose considering the perspective of objects within the home, posing questions like, *‘how does a fridge experience domestic life?’* [16]. Guided by these recommendations, we considered ways to design a collection of probes that could support sets of parents to reflect upon the complexity that might exist within ordinary experiences of family technology use with a focus on surfacing and disentangling their individual perspectives. We found three different perspectives to explore (Fig. 1).

Perspective 1 – The Self

We want to encourage sets of parents to reflect upon their family’s technology use. This includes each parent’s individual perceptions both of their own use of technology *and* their family members technology use. This will often involve habitual or routine uses of technology given its prevalence within everyday life.

Perspective 2 – Relating the Self to Others

We also want to encourage sets of parents to reflect upon the relationships they have with their family members *and* the technologies commonly used within everyday family life. We hoped that guiding parents towards this perspective would enable us to explore individual perceptions within the same family.

Perspective 3 – Imagining Technology’s Perspective

Finally, we wanted sets of parents to imagine how their technological devices might experience domestic life. This meant encouraging participants to reconsider their default point-of-view, ‘the Self’ to take on a different point-of-view. This was intended to promote reflections of the family unit; to surface more detached, candid consideration that may include any socially undesirable, or uncomfortable aspects.

3.1 Designing Our Probes

We designed three probes, (i) Family Experience Jar, (ii) Digital Family Tree, and (iii) Device Journal (‘The Secret Life of Us’). Next, we describe how the design of each of our probes was intended to position the participant to reflect from these different perspectives.

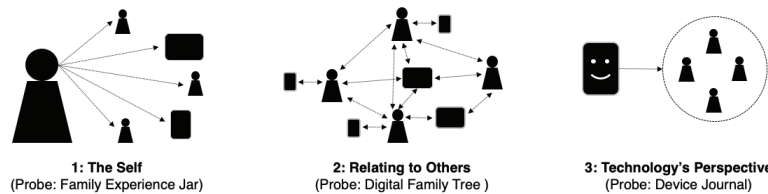


Figure 1. Exploring three perspectives to guide the design of probes

3.1.1 Probe 1: Family Experience Jar.

The Family Experience Jar probe (Fig. 2, left) is intended to encourage parents to log their individual experiences of everyday family technology use, from the perspective of ‘The Self’ (Fig. 1). We gave each set of parents a Jar and a pad of post-it notes to denote the type of experiences they have. Pink for recording positive experiences, blue for negative and yellow for experiences perceived to have both positive and negative aspects. We asked each parent to

submit at least one note per day for the duration of the study, inviting them to make additional contributions as-and-when such experiences occurred. Parents were not to discuss contributions with other each other. Finally, we asked each parent to initial and date their notes.

Aesthetics: By designing the Jars in an aesthetically pleasing way, we hoped to encourage parents to position them in visible locations in their homes, which might help remind them to make regular contributions.

Transparency: By choosing Jars made of clear glass, participants could see contributions amassing over time. The visible colour of the notes inside the Jar would also provide 'at-a-glance' idea of the types of experiences that had been logged. We hoped this might generate curiosity as to what the other parent had contributed; encouraging reflection and further participation.

Single Slot Opening: We cut a small slot into the lid of each Jar, meaning notes could only fit through if folded. Gluing the lid onto the Jar meant that notes could not be removed once they had been inserted. This prevented the details of each parent's notes being read by the other.

Size: We chose Jars large enough to contain several notes per day from each parent. We anticipated that visible empty space would promote more participation.

3.1.2 Probe 2: Digital Family Tree.

We designed the Digital Family Tree probe to explore parents' perceptions of relationships between technologies and their family. Each parent was asked to create an individual Family Tree diagram to illustrate the relationships between their family members *and* to include the technologies used in everyday family life (Fig. 3). During the first week of the study, each parent is asked to complete an individual Family Tree. During the second week, sets of parents are asked to compare their individual responses to the probe with each other. They are then asked to collaborate on a collective Family Tree (Fig. 2, middle). Including technologies into these diagrams was intended to play into people's tendency to anthropomorphize [18] and assist them to think about their family's relationships with technology differently. At the same time, we were interested in the differences between these perceptions and any resulting tensions. We explained that we would be especially interested in discussing how participants perceived the differences between individual Family Trees, and how they negotiated and collaborated to complete their shared Family Tree.

3.1.3 Probe 3: Device Journal.

The Device Journal probe (Fig. 2, right) was designed to encourage parents to completely reconsider their usual point-of-view and instead to take on the viewpoint of the technologies used in everyday family life. Inspired, in part, by artifact ecology [33], we devised a comic-style Journal called '*The Secret Life of Us*', in which characters are technological devices, rather than humans.

We asked each parent to imagine how their devices experienced family life and individually journal them for two days. We hoped this playful probe would enable each parent to take a different viewpoint, with a refreshed perspective of their family and experiences. We hoped the tool could help surface insights of habitual technology use that might have been taken-for-granted, unremarkable, uncomfortable or even socially undesirable. Given the abstract nature of this task, we tried to support and inspire the participants by playing a short clip of 'Everything Is Alive'[11], a podcast series of fictional interviews with personified everyday objects, played by actors.

3.2 Research Design and Probe Deployment



Figure 2. Probe Collection: Family Experience Jar (left), Digital Family Tree (middle), Device Journal (right)

This research was conducted in accordance with ethics approval from the University of Technology Sydney. Our study involved 17 parents of young children, from eight families. For each participant, the research spanned across 14 days.

On Day 1, we conducted an opening interview at each of the eight family homes. This lasted between 60-90 minutes. Each parent briefly introduced themselves and their family, and discussed technology use within broader family life, including routines, values, aspirations, and expectations. We then introduced parents to our probes and

provided detailed instructions on how and when to complete them. We specified which probe activities were to be completed individually and which were to be completed collectively (Fig. 3).

They were told that they had 10-12 days to complete the probes. Between day 10-12, we collected completed probes and reviewed participants' responses, identifying interesting questions to be discussed during the closing interviews. On day 14 we held closing interviews with each of the 17 parents, individually. The choice to discuss the completed probes with each parent on their own, rather than with sets of parents, was a conscious one. We hoped it would encourage parents to be more candid and ensure that we captured their different perspectives. Each closing interview lasted between 50-70 minutes. This was a researcher-participant co-exploration of the completed probes, to make sense and to reflect, retrospectively, on their use of the probes. Also, this interview gave us the opportunity to seek clarifications of certain responses we found interesting when reviewing the completed probes.

3.2.1 Participants.

We recruited 17 parents to participate (P1-P17), from eight families with at least one child under the age of twelve. All parents had between one and three children, ranging between 1 month and 15 years. Participants held a range of occupations and a broad spectrum of outlooks and experience of technology. Participants were ethnically diverse. We should also note that one set of parents included three participants, a mother, aunty and grandmother, living together and raising three young children.

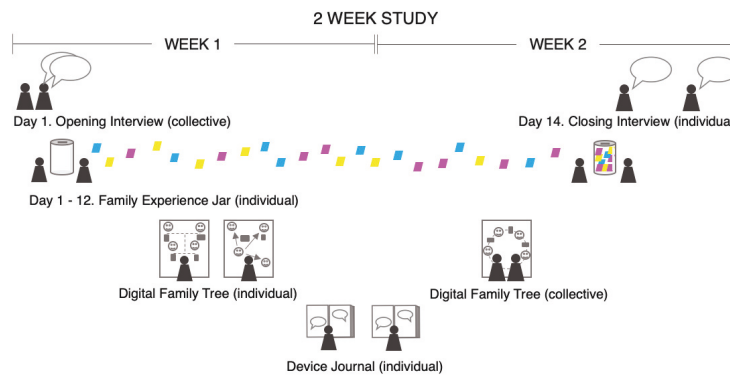


Figure 3. Probe deployment plan

4 Findings: Effective Tactics for Designing Our Probes

During the closing interviews, we found that our probe collection was successful in prompting varying levels of reflections about family experiences with technology. During our discussions, we heard many stories about the differing ways each parent perceived experiences of technology use within their family's everyday life. This included unexpected realizations that participants sometimes found to be emotional, and even surprising.

Within the messiness of family life, habitual, routine interactions with technology, and the experiences that result can seem automatic and inconsequential. Our probes were able to shift the perspectives of participants: for example, by inverting the conventional individual-centric point of view to imagine how particular technologies perceive family life. By reflecting from different perspectives, our participants began to interrogate aspects of their family's experiences and even reassess their views. The probes helped to reveal usually hidden experiences of family technology use, in particular, the way people perceive the role of technology, and the way it affects relationships within family life. The effectiveness of our probes was due to two distinct design tactics. The first tactic is to create opportunities for conversations. This means designing probes that can spur conversations between sets of parents, as well as self-reflections – internal conversations of the self. The other design tactic is to shift the perspectives of participants. This means designing probes that require sets of parents to see things from different perspectives, including each other's. Finally, our probes were found to be most effective when designed and put to work as a probe collection, combining these two distinct tactics.

4.1 Creating opportunities for conversations

Our first tactic, of effectively creating opportunities for conversations, was employed in several ways through the design of our probe collection.

4.1.1 Probes that create opportunities for internal dialogue.

By asking participants to make regular contributions to the Experience Jar, we found that people became inadvertently more mindful of their technology use. Logging thoughts about their experiences of technology made people's internal dialogue explicit. This led them to be more aware of the relationships they have with technology which also led to realizations that were sometimes uncomfortable. For example, P13 left some notes in the jar that described her realizations about her technology use: *"Wasting time! realized surfing Facebook is a habit and not very satisfying..."*, *"Frustrated that I keep almost compulsively checking the weather app..."* and *"It has been a real struggle...not using technology as a babysitter"* (P13, Jar).

When interviewed, P9 described how the Family Jar probe had resulted in some surprising realizations of her habits with technology. *"I'd never really tied these automatic habits like just picking up your phone to an emotional motivation. What surprised me was thinking about the emotions around those experiences, rather than just going through the motions without really thinking about it."* (P9, Int). We believe that had we not used this probe, it is unlikely that our participants would have the opportunity to recognize or question their more complicated relationships with technology.

We also used the Journal to prompt participants' internal dialogue. Over two days, participants were told to imagine how their devices would experience everyday domestic life.

Interestingly, most of our participants' journal entries consisted of what they imagined their devices would say to them. For example, P12 had imagined that before bed, his smartphone would tell him, *"I can take you anywhere you want..."* and *"...let me help you sleep, and tomorrow I will wake you up again"* (Journal). Such entries hint at the unspoken conversation or expectations participants have of their devices. They also reveal how much people felt dependent on their personal technologies.

When exploring these Journal entries during interviews, most participants further elaborated upon what their device would say. For example, when P15 described how she imagined her smartphone's experience of not being used would be, *"It would be calling out to me; Use me! Use me more!"* (Int). Encouraging participants to put themselves in their device's 'shoes' led some people to unwittingly reveal the lure they felt technology have, in particular, personal devices, like smartphones.

4.1.2 Probes that allow sets of parents to compare their responses.

We designed our probes to allow sets of parents to compare their individual responses with one another. This was done more subtly with the Family Experience Jar probe. While each parent was prevented from reading the details of what the other(s) had written (since notes had to be folded to fit through the Jar opening) the transparency of the Jar meant that the number and colour of the notes inside were visible. This enabled each parent to deduce the frequency and (positive, negative or ambivalent) nature of each other's experiences.

In the design of the Family Tree probe, the act of comparison was made more explicit. Sets of parents were asked to compare their individual Family Trees with one another, and to note any similarities or differences. In our interviews, we found that this aspect of the probe had enabled sets of parents to realize some of the assumptions they had made about their families' technology use. This allowed them to become more aware of each other's perspectives on technology use. For example, P12 was surprised to learn about the central role TV played in his family, realizing that his family spent more time watching TV in his absence than he had previously imagined, *"I see that the TV is central to the family, but I don't have any connection to it personally"* (P12, Int). We noticed that several of our participants were surprised to learn that their assumptions about their families' technology use were not always right.

By comparing their individual Family Trees, some parents were prompted to re-examine family technology practices that they had previously taken for granted. For example, P2 who allows her children to access her phone had always assumed that her husband did the same. However, in her interview, she described her surprise at noticing that her husband's Family Tree showed no connection between his phone and the children. This had prompted her to ask her husband about this and learn for the first time that he did not, in fact, allow their children to use his phone since he considered it to be a work tool. In this way, we had designed a probe capable of creating opportunities for conversation between parents and raising awareness of different perspectives on technology use that tend to be overlooked in day-to-day family life.

4.1.3 Probes that allow sets of parents to collaborate.

After comparing individual Family Trees with each other, sets of parents were then asked to work together to create a collective Family Tree. By introducing collaboration into this probe, parents had to negotiate their individual

perspectives on family technology use with each other. This created opportunities for a different kind of conversation, which we found, included interesting discussions, realizations, and challenges. Our participants told us that this probe led to some new-found realizations. For example, P8 explained how this task had spurred conversations within his family that led him to reassess the assumptions he had about their technology use: *"I thought that it was a family desktop, but our Family Tree made me realize that it's really just me who uses it. I recognize now that these devices are more personal than shared"* (Int). P9 discussed, *"P10 will tell you a different story...I am surprised at P10's self-opinion of her own use. She doesn't think she uses (her smartphone) that much, but I really do. The (probes) gave me a legitimate lens to have a look at that."* (P9, Int). This appreciation of the opportunities, provided by our probes, to discuss perceptions of technology use with one another, was also expressed by other participants.

4.2 Shifting perspectives (using personification)

Our first second tactic of shifting the perspectives of participants, was achieved through the design of probes that attempted to do this either explicitly or subtly.

4.2.1 Explicit use of personification to shift perspectives.

We used personification in the Device Journal probe to invert the human-centric view of seeing the world, by asking parents to journal experiences from the technology's point of view. Imagine how their devices might experience family life, to complete journal entries in the imagined voice of those devices.

Each journal required an introduction, in which individuals had to write about themselves in the third person, from the point of view of a device that would know them well. Almost all parents identified this device as their smartphone. When we read our participants' journal entries, we found that this probe activity revealed the strong agency these devices had in their lives. For instance, P13 imagined that her smartphone would write *"I do everything for her"* (P13, Journal). P7 had imagined what her smartphone would say of her, *"She can't be separated from me"* (P7, Journal). P1's had imagined that his smartphone would declare, *"I am the center of his life!"* (P1, Journal). Entries like this reveal how central the smartphone is in shaping the experiences of domestic life for many parents.

Using personification when designing this probe provided our participants with the opportunity to confer a character, a voice, opinion and a life to a technology. As a result, they were better able to reflect on their domestic lives from a different point of view. What we read were vivid and colorful descriptions of technologies, having relationships with individuals. Such accounts are not usually the kinds we often read or encounter in HCI. For instance, the imagined envy that one device would feel toward with another, *"I'm a bit jealous that I have to sleep downstairs...the other phone gets to sleep in the bedroom and seems to get much more attention"* (P13, Journal). Entries like these, highlight how personification can lead participants to inadvertently divulge clues about how technology use shapes family relationships.

During our discussions, parents explained how the 'inversion' of hearing what the device would say about them led them to new perspectives of themselves. This includes new realizations about their relationships with these technologies and with their family members, as well as the role these technologies had in their domestic life. Discussions of their journal entries also often triggered parents to reassess their relationships with their devices. For instance, P1 read a Journal entry aloud (written in the imagined voice of his smartphone), *"I am a new addition to my Master's life"* (P1, Journal). P1 looked at us and grinned, *"Actually, it's probably the other way round!"* (P1, Int). P7 also reassessed the relationship she had with her smartphone when discussing her one of her journal entries, *"It would call me its mother...or maybe, actually, not a mother, a daughter. The phone is my mother. I am the daughter"* (Int). For P13, *"My smartphone is like a colleague, not a buddy - I'd go for a coffee with him, but not a beer!"* (P13, Int).

Using personification gave license to people's imaginations and certainly added a sense of playfulness to this probe. It also helped surface a more detailed picture of participants' technology practices. In our interviews we noticed how some participants really enjoyed the task and injected humor into their responses. For instance, P15 laughed as she explained why she imagined her smartphone to be female, *"It's too intelligent and sensitive to be male. It listens to me! It's too organized (to be male)! It's addictive though. It distracts me from doing other things."* (P15, Int). We also saw how effective personification was at freeing the imaginations of participants less eager to express their reliance on, and attachment to technology. For instance, asked about the relationship she had with her phone, P10 initially replied, *"My imagination is struggling...I don't have that sort of relationship with my phone; it's just a thing"* (P10, Int). When urged to consider an object that she felt more enthusiastically about, she conceded, *"My bike would describe me as a hard taskmaster...but then, so would my phone, I reach for it compulsively. I feel physically anxious when the battery is low. I've never personified it before. It's a bit more of a boss, in that I must respond to it. I feel very apologetic if I stuff up something (e.g., miss an appointment by neglecting it)"* (P10, Int).

Using personification in this probe helped to reveal emotional and ambivalent aspects of people's relationships with technology. In general, this allowed usually more concealed aspects of people's technology use to surface. As such, this

probe reveals how people often take their relationships with technology for granted without explicitly reflecting upon it. These revelations would also have been much more challenging to pursue just using interviews.

4.2.2 Subtle use of personification to shift perspectives.

In the Family Tree probe, we asked parents to use a family tree diagram to illustrate relationships between family members and the technologies used in everyday family life. We felt that this is a more subtle form of personifying the technologies. Yet, we were still able to prompt valuable insights. This probe shifted our participants' perspectives (from the conventional view of 'the Self' to 'the Self in relation to others'), and also allowed them to rethink the role and relationships that technology has in family life.

When we asked our participants to review their completed Family Tree probe, they often compared the relationships between family members and devices, to relationships between family members. For instance, P8 pointed to how he had positioned his wife's smartphone between him and his wife when drawing his Family Tree, concluding, "*her device probably knows more about her than I do.*" (P8, Int). His wife came to a similar conclusion in her interview, when she reviewed the way she had completed her own Family Tree, "*my phone probably knows more about me than my family members*" (P7, Int). Reflecting on Family Trees in this way revealed the surprising ways that technology use both mediates and shapes family relationships.

4.3 Combining distinct tactics within a probe collection

In designing our probes, we viewed them as a collection that would guide participants to look at family technology use from a range of different perspectives. By combining the responses to each probe, we hoped to not only build a more complete picture of individual perspectives on family technology use but to also build a more complete picture of the multiple perspectives that exist within families.

During our closing interviews, we asked our participants to reflect retrospectively on their experience of completing this probe collection. What they told us made us realize that by altering the perspective of our participants, and prompting them to detach and de-familiarise themselves from situations, people had begun to interrogate habitual behavior that had been accepted as an inherent part of everyday family life. For example, P9 explained that the degree of conflict associated with her family's technology had become apparent to her as a result of completing the probes, "*Overall (the probes) enabled me to reflect on all the conflict there is because of technology use. I guess I wasn't aware how much that was taking up my energy*" (P9, Int).

In addition, when our participants reviewed their completed probes as a collection, they sometimes noticed contradictions in how they had responded to different probes. This challenged their preconceived ideas about their family's technology experiences. For example, P5 reacted to having a majority of pink notes in her Jar, "*I expected more blue notes*" (P5, Int). She considered this in conjunction with her responses to the Family Tree and Journal probes, which had raised her awareness of her ongoing efforts to limit her children's screen-time. Reflecting on her responses to the collection of probes, she deduced, "*I guess I'm happy with the way we interact with technology...I'm more disturbed by the extent of it*" (Int). What we found was by asking participants to review their probes as a collection, participants were able to consider their various responses at a more high-level and relational view, maybe even noting inconsistencies and mistaken assumptions about the role that technology plays in the lives of their families. In turn, this resulted in more nuanced reflections about the phenomenon.

5 Discussion

Our review of related literature acknowledges an established practice within HCI of using probes in a dialogical approach to support and stimulate discussions with participants in follow-up interviews when working with families e.g. [29, 30, 39]. We use probes in a similar fashion - as a dialogical tool to explore family experiences of technology.

This paper adds to HCI's scholarship by demonstrating how probes can be designed and used productively to support research inquiries, especially when seeking better understandings of technology use in families. We make this claim after examining our participants' responses to our probes, and after interviewing them about their use of our probes. Reflections of our findings have led to a number of methodological insights. These insights pertain to the two distinct design tactics we have found to be effective when employed to design probes aimed at surfacing richer and more holistic understandings of family technology use. The three probes we designed, deployed and presented in this paper, exemplify how these distinct tactics can be combined and used successfully. First, we will reiterate why we need tools that can support researchers to better explicate the multiple perspectives that surround technology use in families.

As many researchers remind us, families are not homogenous units but can be viewed as diverse communities with differences in age, gender and so on [29]. As such, the achievement of shared family aspirations requires the juggling of different individual roles, responsibilities, expectations, and attitudes. To achieve shared understandings within families requires compromise, negotiation, and reciprocity between individuals. Meanwhile, the increasing adoption

and pervasive use of personal technologies in the domestic life of different individuals can and will continue to have significant effects on family dynamics [1, 6, 26, 27, 48]. As such, any HCI efforts to design digital technologies, in particular personal digital technologies that could be used in ways that are supportive of domestic dynamics will greatly benefit from deeper understandings of not only the different roles, but also the different and shared perspectives as well as attitudes of family members with regards to technology use in domestic life. However, this will also require effective tools to help surface and explicate the complex dynamics that surround family technology use. Asking questions through surveys and interviews may help, but there are also many aspects of family dynamics surrounding technology use that are not easily surfaced through these methods.

One challenge of exploring family experiences of technology is that people might not be totally aware of their own assumptions, approaches, and attitudes with regards to technology use. This is especially the case, with personal practices surrounding technology, in particular with personal technologies. This may be because technology use has become so habitual that individuals take them for granted. As a result, people are often unaware of their own perceptions, attitudes, and approaches to technology use. This leads people to make assumptions (whether accurately or not) about their own technology use and that of other family members. As illustrated in our findings section, many of our participants were surprised when confronted with unexpected realizations about themselves and also of other family members.

Another challenge is getting individuals to disclose the cause of tensions that might exist in their family as a result of technology use. Participants may find it uncomfortable or embarrassing to discuss private and possibly socially undesirable topics such as family conflict. The participants may not be fully aware of the underlying causes, or degree of the tension they experience. This is particularly true in families where tension around technology use has become an accepted part of domestic life.

Our work reveals the utility and effectiveness of using probes, or more specifically, probes that use particular tactics that can help surface and explore these challenging but important aspects of family dynamics surrounding technology use. Next, we discuss the two distinct tactics we used to design our probes.

5.1 Tactic 1: Encouraging dialogue

The first tactic we used when designing our probes was to create opportunities for conversation. This can be seen in various ways within our probe collection. In its core, these conversations are occasions for 'dialogue' (in Bakhtinian terms). For Bakhtin, we are always in dialogue, not only with others and with everything in the world but also, internal conversations we have with ourselves [28]. Thus, this tactic can be seen in the design of probes that can *make explicit individuals' internal dialogue*. The Jar probe encouraged individuals to reflect upon their own technology use. This resulted in deeper awareness and greater (and sometimes uncomfortable) realizations about one's use and relationship with personal technologies. The Journal took a completely different approach by challenging individuals to rethink their relationships with their devices; asking them to reimagine the relationship and the agency their devices might have on their lives. This resulted in surprising and colourful reconceptualisations of the sometimes intimate and emotional relationships people have with their personal technologies. Their responses to these probes and the interviews also provided further insights into the individuals' dialogical sensemaking process with regards to their technology use [41].

This first tactic also involved the design of probes that *make explicit one parent's relational sensemaking process to the other*. In other words, surfacing how parents perceive and in turn, makes sense of their technology use in relation to one another. This approach was used in the Family Tree probe where sets of parents compared their own responses about technology use with responses from one another. This probe activity led to self-awareness and also an awareness (or at the very least, a consideration) of how one another perceives family technology use.

This first tactic is also seen in the design of probes that try to *make explicit collaborative dialogical sensemaking* [37, 41]. The Family Tree probe involves sets of parents collaborating to complete a probe about their family's technology use. The probe aimed to surface both individual and shared perspectives. This probe reveals not only realizations of similarities, but also recognition of differences in perspectives, assumptions, and gave sets of parents insights into how one another made sense of their own technology use.

By designing our probes to engage sets of parents in activities to compare and talk about individual perspectives; to collaborate and to negotiate a common perspective, they were prompted to rethink the assumptions they had about each other. Using different approaches to provide opportunities for dialogue and collective sensemaking have surfaced discussions regarding the way technology use can trigger family conflict.

Of course, there are many other ways to provide opportunities for conversations. When designing probes, it will be helpful to think strategically on how to find ways to spur conversations; not only to help individuals to be aware of their own perspective towards technology use but also to surface their perceptions of how others in their family perceive and approach technology use. Finding productive ways to support families to explicate these different perspectives is crucial if we wish to develop a richer and more holistic understanding of family technology use.

To the best of our knowledge, we not come across any explicit discussions in HCI of how probes can be designed strategically to support such explorations. Of course, there are many researchers who have used probes when researching families. Some designed probes for families to complete together [12, 29, 53]. For example, Horst et al.'s [29] probes, designed to explore empathy and to elicit inspiration from families, asked family members to work together to provide a single response. A follow-up interview was then conducted with all family members present to discuss their response. However, in their case, individual perspectives regarding empathy were absent. There are researchers working with families who have asked individuals to complete probes independently. For example, in studies of intimacy between couples [35, 52] and between children and their grandparents [13], where individuals were asked to complete some of the probe activities independently. However, the interviews to explore the probe responses were conducted with the participants together, instead of separate interviews with individual participants. Their work did not seek to explicate differences of perspectives but sought agreements to inform designs. In that respect, potential tensions and differences between individual perspectives were not explored.

In this study, we found that these opportunities for conversations also benefitted families beyond the value they provide for researchers. For our families, having these conversations have helped to reduce assumptions and potential misunderstanding about technology use, that could lead to conflict.

5.2 Tactic 2: Shifting perspectives

The second tactic we used was to design probes that help to shift an individual's perspectives of experiences of technology use within everyday family life. We found this to be particularly useful when trying to explicate practices and attitudes surrounding technology use that have become habitual and taken for granted.

One effective approach to this tactic was to use the personification of personal devices. As we have described, the Device Journal asked people to give a voice and personality to their personal devices. Asking them to imagine how these devices would experience their family life was an effective strategy to shift (or even invert) the perspective of participants - from that of 'the self', to how an inanimate object such as their smartphones might experience their family life. This shift in perspective was able to reveal greater insights into roles, relationships and the agency that people ascribe to their personal technologies (e.g., smartphone as a mother-figure, TV as a peacekeeper), as well as the strong emotional pull their technologies seem to play, both in the lives of individuals and families.

We also attempted to shift our participants' perspective through the Family Tree probe. Here, the approach is to instigate a slightly subtler shift in perspective (when compared to the Device Journal). We accomplished this by tapping into people's natural tendency to anthropomorphise [18], asking individuals to consider their relationships with their devices, if these devices are seen as part of the family.

These two probes helped to free people's imagination and allowed them to rethink their relationships with their technologies. They are successful because our participants found these tasks to be playful and engaging. Our participants injected humour into their responses and provided all kinds of elaborate details such as the imagined feelings, relationships, and even gender that their technologies might have. More importantly, the probes were able to reveal surprising and unthought-of realizations and insights for both researchers and participants. Many of our participants were surprised when they 'discovered' their routine, and habitual use of technology, through the voice of their technologies. As researchers, these probes encouraged our participants to disclose aspects of their families' technology use that they were less enthusiastic about, such as conflict and parenting challenges.

Researchers have used probes to get participants to see things in a new light. For example, Berkovich [5] asks people to imagine themselves at some point in the future to explore their financial goals. While Berkovich's approach guides participants to think about their finances in different ways, individuals remain in the point-of-view of 'the self' throughout the seven probe activities. As we explained, when exploring technology use, there is definitely value in ensuring that our understandings and inquiries shift beyond human-centric views. Only through gaining multiple perspectives (including that of our technologies) can we paint a more holistic picture of our complicated relationships with technologies, especially within domestic lives.

In HCI, defamiliarization has been offered as a useful strategy to help designers reimagine the design of domestic technologies [4]. However, we have not found any explicit discussions of how defamiliarization can be used productively to reveal hidden aspects of people's relationships and experiences with technologies. As Shklovsky [14] suggests, defamiliarization can provoke and refresh people's perception by heightening it through unfamiliarity and strangeness. By making something familiar and taken for granted (such as one's habitual use of personal technologies) strange, people are compelled to examine their automated perception. The Journal and the Family Tree were able, to a different extent, trigger reassessments that led to surprising realizations about their own practices and attitudes surrounding technology use.

On a side note, we also see the potential usefulness of using personification as a design tactic beyond our work. This design tactic has the capacity to prompt people to imagine the agency of technology, and to become aware of the

potentially active and strongly emotional roles technologies can play in domestic life. As such, we posit that this tactic may very useful in explorations of domestic connected devices such as the IoT, and imaginations of how we can design future IoT devices that can be more supportive of family life.

5.3 Combining tactics to understand the collective

Finally, another methodological contribution we offer is to *value of combining distinct tactics within a probe collection*. Working with participants to review and consider their responses— comparing and contrasting responses they provided from one probe to the next, and as a whole collection, – shifted participants’ perspectives of the phenomenon. This led to deeper reflections about technology use in their family because they can start to see patterns and inconsistencies. Designing a probe collection that combines two distinct tactics allowed insights to be built cumulatively and gradually from one probe to another, with the overall findings greater than the sum of the insights gathered from each probe.

While the use of probe collection is common within HCI [54], with the exception of [5], designing probe collections to intentionally combine two distinct tactics has not been explicitly described. Our work provides yet another example of how probes can be designed and used productively as a collection. [5] used a number of probes to guide participants to take different perspectives on a particular topic, and added the responses of each probe to “build a holistic understanding of the participant’s perspective”. We also used our probes to guide participants towards different perspectives. However, our probes were used to consider the different perspectives of individuals towards shared experiences. In addition, our probes were used to raise participants’ awareness of the perspectives of other family members. While [5] uses a probe collection to build a better understanding of individuals, we use our probe collection to build a better understanding of not only individuals but also of the collective. This is because our probes enabled reflection on co-experiences and other family members’ experiences with technology, even when our participants were absent.

Many researchers have used probes as a source of data triangulation. However, when designed, conceptualised and put to work as a set, the sum of the insights can add to probes’ potential value for triangulation within research inquiry [53]. That is why we have a newfound appreciation for the value of designing and putting probes to work as a collection, rather than viewing probes as a series of separate artefacts used to capture fragmented aspects of a phenomenon of interest. We recommend that this approach is considered in any research involving the use probes, not only when exploring families.

6 Limitations and Recommendations

Our work has demonstrated the utility of a probe collection to effectively explore the differing perspectives within sets of parents, on their family’s technology use. This collection is designed to both encourage conversation between sets of parents, whilst shifting their perspectives through the use of personification. This requires a reflective and skilled designer/researcher, able to conceptualise how individual probes can be designed to work synergistically, to elicit insights that are greater than the sum of their parts. It also requires probes to be deployed strategically to allow a combination of individual and collective responses to be captured. While probes that use of personification, to shift the perspective of participants, can be insightful, their abstract nature may demand a certain level of imagination of participants. Mindful of this, we suggest the need to support participants by providing some type of scaffolding material, in our case, the use of a podcast. When designing a probe collection, these more abstract probe activities should be preceded by probe activities that require less imagination and provide an easy entry point. While this method helped to reveal deeper understandings of parent’s perspectives on family technology use, we suggest further work into how to utilise such design tactics to explore the experiences of all family members, including children, and wider social groups such as within workplaces.

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“It’s The Same Conflict Every Time, On Repeat.”

How Digital Technology Use Can Contribute Towards Conflict in Parents’ Relationships

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ABSTRACT

Family technology use can create or amplify conflict in parents’ relationships – we found four key factors that contribute to this issue. We conducted a probe and interview study with eight sets of parents, to explore how and why technology use might cause conflict in their relationships. This paper presents data from two particular sets of parents to illustrate our findings. In doing so, it complements existing work that primarily focuses on parent-child relationships, and contributes to a more complete understanding of how family technology use can affect family dynamics. We also suggest directions for further work to address this issue of conflict between parents, associated with their family’s use of technology.

CCS CONCEPTS

• **Human-centered computing** → Human computer interaction (HCI); Empirical studies in HCI.

KEYWORDS

Parents, Parenting, Conflict, Technology, Family, Children, Relationships

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1 INTRODUCTION

Digital technology use has become an integral part of the lives of children and parents. As such, many in HCI have been interested in exploring how technology use can impact family dynamics [7, 26]. Researchers have found that managing pervasive technology use within families can be a considerable source of stress for parents and contribute towards tension and family conflict [17, 29]. Substantial research reveal conflict in parent-child relationships; arising primarily from parents’ attempts to mediate their children’s technology use [8, 16, 18]. Recent work also indicate that conflict in family can result from children’s disapproval of how their own parents

use technology [16, 23]. On the other hand, very little research has explored how family technology use can foster conflict in parents’ relationships. This is despite recent indications that conflict can arise between parents when they have differing expectations, either of how one should manage children’s technology use or how one another uses technology at home [1, 11, 24]. Furthermore, conflict (over technology) between parents has been linked to lower overall relationship satisfaction and perceptions of less parenting support [24]. Yet, we lack more nuanced understandings of how and why technology use within families might negatively affect relationships between parents.

We conducted a two-week probe and interview study to explore how family technology use affects the dynamics between eight sets of parents with at least one child under 12 years old. This paper reports on the data from two particular sets of parents. This is because data from these two families were found to exemplify the ways in which technology use can foster tension and conflict in the relationships of all the other parents in our study. We found four key factors that enabled technology use to foster conflict, or to amplify existing conflict, between parents. They are: (i) *differing parenting values*, (ii) *misperceptions*, (iii) *imbalance* and (iv) *inconsistency*. We describe how this conflict can play out between parents within everyday family life. In doing so, we provide a more nuanced understanding of the ways in which technology use can lead to conflict within families. We also discuss directions of future work that would help designers of future domestic technologies to address the conflict that parents associate with technology use.

2 RELATED WORK

We discuss two areas of related work within HCI that investigate ways whereby technology use can contribute towards tension and family conflict: (i) efforts to understand parents’ attitudes towards their children’s use of technology, and how conflict can arise from their attempts to mediate (ii) efforts to understand how conflict can arise from parents using technology themselves.

2.1 Family Conflict: Parenting Children’s Technology Use

Managing children’s technology use at home is an increasingly complex endeavor and can present a significant source of stress for parents [10, 20, 34]. Many have described how parents’ efforts to mediate children’s technology use can lead to tension and conflict within parent-child relationships [8, 18, 31, 33]. For instance, when parents try to limit children’s exposure to screen-based devices [18, 30], when parents try to work out what their children are using personal devices for, especially online [8, 34], or when parents try to maintain authority when engaging with voice-activated speak-ers [15, 28]. Studies have described how conflicts can arise when

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parents and children have different expectations as to how much, when and what kind of technology use is appropriate [8, 9, 16]. When children reject, or are found to have broken technology use rules, disagreements abound.

Further work has suggested that parents' experiences of mediating children's technology use is highly nuanced and that their different approaches depend on the particular complexities and dynamics of individual families [22]. The individual approaches of parents can also vary; suggesting that tension and conflict can arise between parents when their individual attitudes on how to manage children's technology use don't align [11]. But technology use has also become more pervasive in the lives of parents themselves [6, 25, 27, 32].

2.2 Family Conflict: Parents' Use of Technology

Parents turn to technology to support their parenting goals and to fulfill their individual needs [6, 25, 27, 32]. However, parents must also consider how much time and attention they are giving to their digital devices, especially when spending time with their children [17, 35]. They must also consider how family members might feel about particular aspects of their technology use, such as privacy [1]. For many parents, the challenge is trying to manage their own use of technology, at the same time as attempting to mediate their children's use of technology [8, 11, 27]. This can lead to tension and conflict within families especially when parents struggle to adhere to the rules around technology use that they themselves have established for their family [1, 11, 17, 19].

Tension and conflict can cause parent-child relationships to suffer when children disapprove of their parents' inability to stick to their own rules around family technology use [16, 23]. However, there are also suggestions that the relationship between parents can suffer when one parent's technology use is perceived by the other parent as undermining family technology rules, setting a bad example for children or disrupting family interaction and communication [1, 11, 24]. A recent survey of over 400 participants suggests that parents' use of technology can create conflict between them, and in turn, negatively impact on their overall relationship satisfaction on perceptions of how supported they are in raising their children together [24]. The authors of this study recommend further qualitative research to try and understand how and why parents' use of technology can actually contribute towards such conflict in their relationships [24]. Our study addresses this gap in our understanding of how and why family technology use can contribute towards tension and conflict in the relationships of parents who are raising children together.

3 METHOD

Our two-week probe and interview study was designed to tease apart the individual attitudes towards family technology use that exist within sets of parents. We recruited eight sets of parents (with at least one child under 12 years old) to participate in our study (see Table 1). Our collection of three probes offered each set of parents opportunities for individual as well as shared responses. It also prompted parents to reflect on both positive and negative aspects of their family's technology use. We conducted joint, semi-structured, Opening Interviews with each set of parents in which

we introduced our probe collection. We later held individual, semi-structured, Closing Interviews with each parent, to discuss their probe responses in private. We clearly informed parents about which responses would be shared with the other, and which would be kept private. This study was conducted with ethics approval from the University of Technology Sydney. For more information on our method, particularly the design of our probe collection, see [12-14].

3.1 Data Collection and Analysis

We audio-recorded interviews and took handwritten notes to support our thematic analysis of these data. Next, we draw on the responses of two particular set of parents, to exemplify the ways in which technology use can generate experiences of conflict and tension within sets of parents, and how this can play out within everyday life.

4 FINDINGS

We focus our reporting on two of our eight sets of parents, because their experiences are good exemplars and representative of experiences reported by the other parents who took part in our study. We found 4 key factors whereby technology use fostered conflict, or amplified existing conflict, within parents' relationships. First, (Section 4.1) reports on our findings from P9 and P10 to explain how (i) *differing parenting values* and (ii) *misperceptions* enable aspects of family technology use to create tension in their relationship. Next (Section 4.2), we report on our findings from P7 and P8 to describe how (iii) *imbalance* and (iv) *inconsistency* allow family technology use to create conflict between them.

4.1 Differing Values and Misperceptions:

P9 (47yrs) and P10 (45yrs) are a married couple raising their son (6yrs) and daughter (2yrs). They described home life as busy, even chaotic; shaped mostly by the needs of their children and their work. P10, a lawyer, works full-time, and often during evenings and weekends at very little notice. Meanwhile, P9, who had just returned to a full-time position in IT has shorter, more regular working hours. She is relied upon as the children's more primary caregiver.

Of all our participants, P9 and P10 were the most explicit about the ways in which technology use contributed to family conflict. They were particularly candid about how aspects of technology use created ongoing disagreements between them. We found that the main factors that led to conflict between P9 and P10 are their *differing parenting values*, and *misperceptions* about one another's attitudes, regarding their family's technology use. As we will show, these two factors play out in a variety of ways, within this set of parents' day-to-day life.

Differing Parenting Values: We found that P9 and P10 had different values regarding the use of digital technology within the family, which contributed to persistent conflict between them. A major difference, that frequently triggers conflict, relates to using screen-based devices to placate or entertain children. P10's view on children's technology use was "*I'm generally more negative...I just don't like it very much*" (P10). Meanwhile, P9 said "*I like the convenience of it*" but "*it drives P10 nuts that I'm so lenient when it*

Table 1: Participants

| Sets of Parents | Age | Cultural Background | No. of Kids (Age) |
|-----------------|-----|---------------------|-------------------------|
| 1: P1 (Mother) | 46 | Indonesian | 2 (9yrs, 7yrs) |
| P2 (Father) | 52 | British Indian | |
| 2: P3 (Mother) | 36 | Japanese | 3 (7yrs, 5yrs, 3yrs) |
| P4 (Father) | 38 | French | |
| 3: P5 (Mother) | 42 | Indonesian | 3 (7yrs, 5yrs, 3months) |
| P6 (Father) | 48 | Australian | |
| 4: P7 (Mother) | 39 | Iraqi | 2 (15yrs, 3yrs) |
| P8 (Father) | 42 | Iraqi | |
| 5: P9 (Mother) | 47 | Vietnamese | 2 (5yrs, 3yrs) |
| P10 (Mother) | 45 | Australian | |
| 6: P11 (Mother) | 34 | British | 2 (6yrs, 2yrs) |
| P12 (Father) | 36 | Spanish | |
| 7: P13 (Mother) | 48 | Australian | 1 (6yrs) |
| P14 (Father) | 51 | Australian | |
| 8: P15 (Mother) | 41 | Australian | 3 (9yrs, 7yrs, 5yrs) |
| P16 (Grandma) | 74 | Australian | |
| P17 (Aunt) | 44 | Australian | |

comes to the screens. . . and it's the same conflict every time, on repeat." (P9). P10 concurred "It's just the same old arguments, an ongoing struggle really. The parenting challenge, for me anyway, is keeping it under control so that everyone is not just sitting around looking at different devices." (P10).

While P10 voiced her negative opinion of using technology to entertain children, "it's just a way to get them to sit down and shut up, by distracting them with a screen" (P10), P9 described feeling "judged (by P10) on my abilities to parent. . . and that its lazy parenting" (P9). Additionally, P10 believed that P9 spent too much of her time using technology while at home. P9 was aware of this and explained, "I don't feel judged about my own use of tech by anyone apart from P10. . . because she hates it" (P9). These stories suggest that P9 and P10's differing values can lead them to make judgments that are, in turn, perceived as disapproval. Both parents acknowledged that this judgement and disapproval frequently triggers conflict within their relationship. Given the associations they each drew between family technology use and judgements on parenting ap-proaches, it was easy to imagine how technology use could become the contentious issue within their relationship that both P9 and P10 described.

Misperceptions: Sometimes, conflict between P9 and P10 is caused by their lack of awareness of one another's attitudes and practices, especially with regards to technology use. For example, when we initially interviewed this set of parents together, P10 immediately dismissed the idea of their children having their own smartphones. P9 was clearly surprised to hear this, instead, suggesting it was an inevitability that might even support some aspects of parenting. Later, in the same interview, P10 claimed that neither she nor P9 used social networking sites. P9 hesitantly contradicted her, "But. . . as someone who's home a lot with the kids, I have been surprised how much I rely on Facebook" (P9). This indicated a lack of awareness and assumptions within this set of parents about one another's attitudes and practices surrounding technology use,

which were confirmed when we interviewed P9 and P10 on their own in the Closing Interviews.

Misperceptions could arise when parents were unaware of the reasons behind one another's differing individual attitudes to technology use, leading them to feel isolated or unsupported by each other. During our Closing Interviews, we learned how P9 had come to rely more on technology since becoming a parent, owing to feel-ings of loneliness and a sense of "missing out on everything else", especially while P10 was working. As she explained her enthusiasm towards family technology use, she admitted to using technology "as a babysitter" and turning to her phone with "a feeling of hope" in an effort to distract herself from a sense of housebound isolation. She felt that P10, unable to understand this, frequently overruled her decisions on technology use in front of their children, and described this as an isolating experience as well. Meanwhile, P10 justified her stricter attitude towards their children's use of tech-nology, by revealing that it was based on various fears, including those triggered by her upsetting experience of finding her young son watching inappropriate content online. She perceived P9 to have dismissed her fears, leaving her to manage their family's tech-nology use alone, "It's frustrating and isolating. It would be more of a positive experience if it felt like something we were united on." (P10).

This lack of awareness between parents, and the resulting mis-perceptions, judgements or disapproval, can lead to parents not only feeling alone and unsupported, but also resentful of each other. With P9 and P10, we saw that this resentment can build up over time and eventually culminate in conflict. Both P9 and P10 mentioned that another source of resentment came from compromising on aspects of family technology use. For instance, P9 revealed that despite wanting to share photos of her children on Facebook, she reluctantly resisted out of consideration for P10's privacy concerns. On the other hand, P10 expressed that she regularly suppressed

her dislike at returning from work to find all her family members engaged in technology use.

We observed that conflicts over technology use had become such an accepted part of everyday family life that it often went unnoticed. P9 recognized the extent to which technology use contributed to family conflict, “I wasn’t aware how much conflict (over technology use) was taking up my energy” (P9). We also noticed that both P9 and P10 seemed relieved at having discovered some of the misperceptions and misunderstandings they had about one another’s attitudes towards family technology use. For instance, when P9 reflected on what she had learned about P10’s feelings she said, “I was surprised by that, and I guess doing this study gave me a legitimate lens to have a look at it” (P9). This might suggest that within the ‘everyday chaos’ of the family life described by P9 and P10, they might not usually find opportunities to share, communicate and negotiate their individual attitudes on technology use with one another in a rational manner.

Overall, P9 and P10’s responses offer insights into how differing parenting values and misperceptions of one another’s attitudes towards family technology use can foster ongoing conflict within sets of parents. We now turn to a second set of parents, to provide an example of other key factors that enable family technology use to contribute to conflict, and how this plays out within everyday life.

4.2 Imbalance and Inconsistency

P7 (39yrs) and P8 (42yrs) are a married couple raising their two daughters, aged fifteen and three. They described themselves as an aspirational, yet time-poor family, who often found everyday life to be tiring and tense. Despite P7 working four days a week as an engineering draftsman, she is relied upon as the children’s primary caregiver, and to manage most aspects of domestic life. Meanwhile, P8 focuses on running his IT company, which involves regular business travel.

This set of parents described how patterns of technology use within family life gradually contributed to growing tensions within their relationship. We saw that when these tensions built up over time, they eventually culminated in conflict between P7 and P8. We now explain the different ways in which this can play out in their relationship.

Imbalance: We found that apparent imbalance in the way that responsibilities are distributed within P7 and P8’s relationship might encourage technology to be used in ways that can foster tension and conflict between them. Specifically, P8 regularly spends long periods of time alone, on his personal devices, while P7 is left to continue with domestic chores and attending to their children while P8 described how his habit of spending most of his evenings watching Netflix on his laptop developed as a way to unwind, “I’m addicted...the only way to switch off after work is to put my head-phones on and isolate myself from everything...” (P8). P8 also mentioned that his wife, P7, strongly dislikes this behavior yet, we found that he was not fully aware of the reasons behind this.

While technology use is how P8 unwinds from his daily stresses at work, for P7, it reminds her of the uneven distribution of their parenting responsibilities, where she is responsible for a much greater share of parenting and domestic duties than he is. P7 explained that she also used to enjoy watching movies in the

evening with her husband, but that since having children, she had become too busy to join him, “to be honest, there’s no free time for me anymore” (P7). P7 revealed that while she tolerates the way that P8 regularly uses technology on his own, she does find his behavior to be excessive and selfish. She described feeling like it also allowed him to disengage from her; “with his Netflix, laptop on his lap, headphones on, that’s it, he’s out. Even if I talk to him he can’t hear it. I have to come to him, to nudge him.” (P7). She went on to describe how his habit prevents their children from engaging with him, thus makes them even more reliant on her for attention. At the same time, P8 admitted feeling guilty for wasting time that could be better spent with his daughters.

P7 acknowledged feeling jealous of P8’s preoccupation with technology, and expressed her desire to spend more time with him. Finally, she revealed the tension that builds up between them over the course of the week, and how this often culminates in conflict, “our only free time together is Saturday and Sunday, but by then we’ll be lucky if there wasn’t a fight between us...then everyone’s tense, we don’t talk and we just start again on Monday” (P7). Both parents agreed that the way in which P8 regularly uses technology alone disengages them from one another and is therefore detrimental to their relationship. P8 said he had tried to reduce the amount of time he spent alone on his devices. But, at the same time, he still maintained his need to unwind after a stressful day at work, and that technology promised him with the most convenient means to do this. This lure of technology, to provide personal entertainment as described by P8, can encourage technology practices to form that allow parents to disengage from one another. We see that when parents regularly use their devices in this way, it can amplify existing imbalance in relationships, causing tensions to grow over time and eventually creating conflict in parents’ relationships.

Inconsistency: P8’s habit of using technology to unwind and entertain himself while at home with his family also compounds the difficulties P7 and P8 already have in agreeing on, and enforcing, rules around their children’s device use. Both parents agreed that ideally, they would prefer their daughters to spend less time using screen-based devices. Yet, P7 explained that she sometimes found it helpful to relax technology rules, especially to make aspects of domestic life easier and less stressful. For instance, she described allowing her younger daughter to use an iPad while she prepared dinner, or to allow her daughter to play with a smartphone while drying her hair. On the other hand, P8 claimed that relaxing rules and using technology to placate his daughter in this way reflected badly on their parenting, “we put our daughter on there to watch something when we are lazy and become bad parents” (P8). However, hearing P8’s opinion prompted P7 to highlight the inconsistency between his expectations of his daughter’s behavior and the behavior that he role-models to them by regularly watching Netflix alone, on his laptop with his headphones. Furthermore, P7 feels especially justified in relaxing technology rules to afford her the peace and quiet to tend to the domestic chores and household routines that she is left to deal with alone, while P8 uses his devices. In such a situation, we could see how P8’s requests for P7 to uphold technology rules appeared hypocritical and frustrating to P7.

P8 admitted having difficulty reconciling his own use of technology with his parenting views, “I know it might not be the healthiest habit, yet I’m giving it to my daughter” (P8). He expressed his

guilt at having failed to break his habit, but conceded apathetically that, "I'm too lazy (to stop) because I'm too tired from working 10 hours a day and I just want to switch off". He also perceived his own technology over-use to be part of a wider problem in society, in which people's dependency on technology use created a challenge within family life, "balancing the relationship of the family over the needs of the individuals - it's a struggle, we try, try, try and fail." (P8). We observed that existing tensions between P7 and P8 over how to mediate their daughters' technology use, are particularly exacerbated by the inconsistency between P8's own overt use of personal devices, and his stricter parenting views on how children should use technology. We saw that such inconsistency can contribute towards tensions and conflict in P7 and P8's relationship.

5 DISCUSSION

Our findings confirm that family technology use has the potential to negatively affect the relationships of parents who are raising children together. We have revealed four key factors that were found to enable technology use to create conflict between two exemplar sets of parents, and how this played out within their everyday lives. We now discuss how our findings might relate to parents in general and suggest directions of future work that address the conflict that parents associate with technology use.

When parents have (i) *different parenting values* they might have differing individual expectations of how their family uses technology. This can lead to each parent setting different rules around technology use and/or enforcing them to varying extents. We have demonstrated that tension and conflict can then arise between parents who disapprove of the different ways in which they each manage their children's technology use.

Our findings also demonstrated that parents might have (ii) *misperceptions* about one another's attitudes towards family technology use. This can lead to parents making incorrect assumptions about each other's actions and lead to misunderstandings between parents. This can create conflict between parents and lead to tensions in their relationship because they feel unsupported by one another, and alone in their efforts to manage their children's technology use.

We revealed that (iii) *imbalance* in parents' relationships can encourage parents to use technology in ways that actually amplify this existing imbalance. For instance, domestic work was unevenly distributed between P7 and P8, and this allowed P8 to spend a lot of time alone on his personal devices, disengaging from his family. In turn, this reminded P7 of the fact that domestic work was not shared equally, and led to her feelings of frustration. This contributed towards tensions in P7 and P8's relationship that culminated in conflict between them. This supports McDaniel et al.'s [24] suggestions about the potential for parents to use technology in ways that lower their relationship quality.

Our example of P7 and P8's differing attitudes might support suggestions that traditional gender norms can help to explain differences in how parents utilize technology [4, 21]. While HCI's tendency to study mothers and fathers separately provides valuable glimpses into how they might manage family technology use differently [2, 3, 5], our initial results show that more work is needed to understand how sets of parents do this together.

Parents use technology extensively at home, while at the same time attempting to manage their children's technology use. We found that (iv) *inconsistency* between a parent's own behavior, and the expectations they set out around how their family should use technology can contribute towards tension and conflict between parents. This is because parents look to one another to provide positive role-modelling for their children, and can feel undermined, and less supported by each other when messaging around technology use is inconsistent.

Contexts of Technology Use. Parenting is usually a collaborative endeavor, and when parents have very different individual attitudes on how one should manage children's technology use and/or on how one should use technology (especially in front of children), we see that family technology use can indeed become a contentious issue within parents' relationships [1, 11, 24]. Our findings indicate that whether or not a particular use of technology leads to tension and conflict between parents depends on a variety of contextual considerations such as what device is being used, by whom, where, with who else present, how often, and for what purpose. While this aligns with findings of previous work on parent-child relationships [18, 35], we require further work to examine in more detail, how these contexts of technology use can contribute towards conflict between parents.

One-Off Instances of Technology Use vs. Recurrent Behavior. Our findings indicate that one-off instances involving technology use can lead directly to arguments between parents, or instead, recurring behavior might contribute over time to growing tensions that eventually lead to conflict. We observed that parents make comparisons, assumptions and judgements about how they each use technology, and how they each manage their children's technology use. When it comes to parents disapproving of each other's technology use, it seems more likely that recurrent behavior contributes to disengagement, resentment, frustrations that grow over time and build to eventually result in conflict. On the other hand, one-off instances involving children's technology use are more likely to directly lead to disagreements between parents about how to manage them. We acknowledge that more work is needed to verify these observations.

Lack of Opportunities to Communicate. Overall, our findings demonstrate that within the messiness of everyday life, parents lack opportunities, a framework or even a language with which to calmly and constructively communicate and negotiate upon their individual perspective towards technology use. Given that conflict between parents over technology use can be detrimental to their overall relationship, and parenting satisfaction [24], we strongly encourage further work to explore how we might assist sets of parents in regularly reflecting on, and sharing their views on family technology use with one another. This would be a valuable enterprise, especially since parents need to constantly adapt their attitudes to consider growing children and the adoption of ever-evolving technologies [10].

6 CONCLUSIONS

Our work found four key factors that could enable family technology use to create conflict in parents' relationships. By exploring how family technology use affects parents' relationships, it complements current understandings of conflict in parent-child relationships [8, 16, 18], thus helping to create a more complete picture

of how technology use can impact on family dynamics. This work demonstrates that a variety of contextual factors determine whether or not technology use might lead to conflict between parents. It also reveals that one-off instances of technology use can trigger conflict between parents, and that recurrent technology use can cause tensions to accumulate over time within their relationships. The issues raised within this work suggest a need for further exploration of how sets of parents work together to manage their family's use of technology. In particular, we need to examine strategies that might help parents to better communicate and negotiate on their individual attitudes on family technology use. Overall, our results indicate that design opportunities exist to address the conflict that parents report is created within their relationships, as a result of family technology use.

NB. Future work should also consider any potential effects that the COVID-19 pandemic might have had on how parents have had to adapt their attitudes and practices regarding family technology use, as this work was conducted before these were fully felt.

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Family Technology Use: Sources of Conflict In Parents' Relationships

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ABSTRACT

The use of digital technologies, particularly mobile devices, play an increasingly critical role within everyday family life. However, recent research indicates that family technology use can create conflict in parents' relationships. In this paper, we present four sources of this conflict, discovered by conducting a probe and interview study with eight parent dyads. By providing an understanding of how family technology use can create conflict between parents, this research complements existing work that primarily focuses on parent-child relationships. Thus, we contribute to a more complete understanding of how technology use can affect family dynamics. Finally, we consider how designers might address these sources of conflict between parents, when creating future technologies that are destined for use in domestic settings.

CCS CONCEPTS

• **Human-centered computing** → Human computer interaction (HCI); Empirical studies in HCI.

KEYWORDS

Parents, parenting, conflict, technology, family, children, relationships

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1 INTRODUCTION

Family technology use has become an integral part of the lives of children and parents. As such, many in HCI have been interested in exploring how technology use can impact family dynamics [7, 40]. Researchers have found that managing pervasive technology use within families can be a considerable source of stress for parents and contribute towards tension and family conflict [25, 45]. Substantial research reveal conflict in parent-child relationships; primarily arising from parents' attempts to mediate their children's

use of technology [8, 24, 26]. Recent work also indicates that conflict can occur when children disapprove of how their own parents use technology [24, 36]. On the other hand, very little research has explored how family technology use can foster conflict in parents' relationships. This is despite recent indications that conflict can arise in sets of parents who have differing expectations of either how one should manage children's technology use, or how one another uses technology at home [1, 14, 37]. Furthermore, conflict (over technology) between parents has been linked to lower overall relationship satisfaction and perceptions of less parenting support [37]. Yet, we lack more nuanced understandings of how and why technology use within families might negatively affect relationships of parents who are raising children together.

To explore how and why family technology use might contribute to conflict in parents' relationships, we conducted a two-week probe and interview study with eight sets of parents. Our probe study was designed to tease apart the individual perspectives that exist within sets of parents, and we have previously reported initial findings of how this conflict between parents can play out, in which we focused on the responses of two particular sets of parents [17]. This paper expands on these initial findings, by drawing on the responses of all our participants, and identifying four main sources of conflict in parents' relationships; (i) *Monitoring each other's technology use*, (ii) *Using technology as escapism*, (iii) *Regulating children's technology use and* (iv) *Using technology to placate children*. We explain how these sources of conflict relate to how parents themselves use technology (when with their family) and to how parents manage their children's technology use. We also consider how we might approach the design of digital technologies, in order to help to address this issue of conflict between parents. By exploring how technology use can affect parents' relationships, we complement existing work that predominantly focuses on parent-child relationships, and thus contribute more nuanced understandings of the ways in which technology use can lead to conflict within families.

2 RELATED WORK

First, we discuss two areas of related work within HCI in which we find suggestions that technology use might contribute towards family conflict. They are: (i) efforts to understand parents' attitudes and approaches towards managing their children's technology use and (ii) efforts to understand how parents use technology themselves.

2.1 Parenting Children's Technology Use

Managing children's technology use at home is an increasingly complex endeavor and can present a significant source of stress for parents [12, 31, 53]. Many have described how parents' efforts to mediate children's technology use can lead to tension and conflict between them [8, 26, 48, 52]. In particular, when parents try to limit

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children's exposure to screen-based devices [26, 47], or to work out what children are using mobile devices for [8, 53]. Studies have also described how conflict can arise when parents and children have different expectations as to how much, when and what kind of technology use is appropriate [8, 10, 19, 24, 44]. When children reject, or are found to have broken technology use rules, disagreements abound. Hiniker et al. [23] propose that technological interventions might help alleviate some of these disagreements between parents and children, by mediating the communication and negotiation of children's screen-time limits.

These prior research provide helpful depictions of the difficulties involved in parenting children's technology use, and examples of the conflict that can result. However, by predominantly focusing on parent-child dyads, these efforts tend to overlook the conflict that might arise within sets of parents who are attempting to manage their children's technology use. This is despite Mazmanian and Lanette [35] revealing that parents' individual experiences of mediating children's technology use are highly nuanced and that their different approaches depend on the particular complexities and dynamics of individual families. Furthermore, Clark [12] suggests that cultural differences can affect parents' approaches towards how their children use technology while Eastin et al. [18] claim that mothers, more educated, and higher income parents tend to engage more in monitoring and limiting their children's technology use than fathers, less educated and lower income parents. That the individual approaches of parents' can vary, supports recent indications that more work is needed to explore the potential for tension and conflict to occur when sets of parents struggle to align their individual attitudes on how to manage their children's technology use [9, 13].

Meanwhile, technology use has also become more pervasive in the lives of parents themselves [6, 39, 42, 50].

2.2 Parents' Use of Technology

As technology use continues to become more pervasive, researchers have shown a growing interest in the tensions that can arise between family members who perceive that devices are being overused when spending time together [8, 9, 25, 45, 49, 51]. For instance, Odour et al. [40] demonstrate that technology use can introduce feelings of frustration and uncertainty between family members and Salmela et al. [46] reveal the effect it can have on the bedroom dynamics of intimate couples. By testing a provocative prototype, Bruun et al. [9] propose that family members might appreciate being able to interrupt the constant connectivity that currently disrupts family dynamics, in order to enjoy spending device-free time together. However, scant research explicitly examines how parents' relationships are affected by ways in which they each use devices in family life.

This is despite studies revealing how parents increasingly turn to digital technologies to support their parenting goals and to fulfill their individual needs [6, 30, 39, 42, 50]. Moreover, parents have been shown to struggle to balance the time and attention that they give to their digital devices, with the needs and desires of their children [25, 54]. They must also consider how other family members might feel about particular aspects of their digital technology use, such as privacy [1]. For many parents, trying to manage their

own use of technology, at the same time as attempting to mediate their children's use of technology presents an additional challenge [8, 14, 24, 42] and can lead to tension and conflict within families [1, 14, 25, 30]. In particular, parent-child relationships suffer when children perceive that their parents technology use breaches the very rules that they have established [24, 36]. However, once again, we find that efforts to explore this tension and conflict predominantly focus on parent-child dyads.

However, there are early indications that parents' relationships can also suffer if parents use devices in ways that are perceived to disrupt family interaction, undermine technology rules or model undesirable behavior in front of children [1, 9, 14, 37]. In their recent survey of over 400 participants McDaniel et al. [37] concluded that the conflict that can arise from sets of parents disapproving of each other's technology use also negatively impacts parents' overall relationship satisfaction and on how supported they feel in raising their children. Yet, [37] calls for more qualitative research to provide more detailed and nuanced descriptions, as well as explications of how and why parents' technology use actually contributes towards such conflict between parents. Our work also responds to [40]'s appeal for studies that capture data from multiple family members in order to capture 'the other side' of the story, and corroborate more comprehensive explanations of how technology use can create tensions within family relationships.

This study attempts to address this gap in knowledge about how sets of parents can come into conflict over how best to manage their children's technology use, and over the ways in which they themselves use devices.

3 METHOD

In order to further explore this gap in knowledge, we designed a two-week probe and semi-structured interview study with eight sets of parents. This included a collection of three probes, intended to tease apart their individual attitudes towards technology use. For more detailed information on our motivation and approach to using probes, please refer to [11, 15, 16]. Next, we summarize the design and deployment of our collection of three probes.

3.1 Probe Collection

Probe 1: Family Experience Jar

We designed this probe to encourage sets of parents to log their individual experiences of technology use within family life. We gave each set of parents a Jar (Fig. 1, left), and three coloured paper notepads. Each colour denotes the type of experience being logged: pink for positive experiences, blue for negative experiences and yellow for neutral experiences or those perceived to have both positive and negative aspects. We asked each parent to insert at least one note into the jar each day for the duration of the study, inviting them to make additional contributions as-and-when such experiences occurred.

Probe 2: Family Tree

We designed this probe to prompt each parent to express how they see themselves in relation to their family members, as well as in relation to the technologies used within everyday family life. We provided each set of parents with three pieces of A3 paper on which to create their Family Tree diagrams (Fig. 1, middle). In addition to

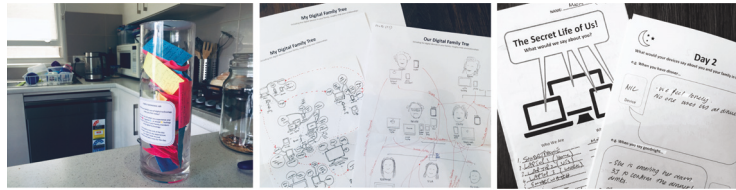


Figure 1: Examples of Our Probe Collection: Family Experience Jar (Left), Digital Family Tree (Middle) & Device Journal (Right)

illustrating the relationships between family members, we asked participants to attempt to depict relationships with the technologies used in everyday family life. During the first week of the study, we asked each parent to complete a Family Tree alone. During the second week, we asked that sets of parents compare their individual responses with one another and collaborate to complete a shared Family Tree. We asked participants to make a note of any shared outlooks, differences in opinion or even points of contention that might emerge during this process.

Probe 3: Device Journal

We designed this probe to encourage parents to reconsider their usual perspective on family life. We asked each parent to imagine how their devices experience family life and to complete a comic-style journal from that imagined standpoint. Participants could pick any two days on which to complete this probe and sets of parents were not asked to align, or discuss this task with each other. We anticipated that this playful probe would help parents to reflect on their family's technology use from a fresh perspective. Thus, we hoped that this probe might prompt reflections about experiences that might have otherwise been taken-for-granted, uncomfortable or socially undesirable.

3.2 Probe Deployment

On Day One of our study, we conducted in-home interviews with each set of parents. These semi-structured, Opening Interviews were designed to gain an initial understanding of each parent dyad, their attitudes and experiences of integrating technology use into their family's everyday life. We also introduced each set of parents to our research topic and explained our probe collection. On Day 14, we collected our participants' completed probes for review. Given our aim of teasing out the individual perspectives within sets of parents, we decided to conduct semi-structured Closing Interviews with each parent, to discuss their probe responses with them, alone.

3.3 Participants

We recruited eight sets of parents of young children (with at least one child under 12 years old) to participate in our study. A range of cultural backgrounds and family structures were represented. Our collection of three probes offered each set of parents with opportunities for both individual and shared responses. In addition, we conducted joint opening interviews with each set of parents, whilst we held individual closing interviews with each parent, to discuss their probe responses in private. This study was conducted with ethics approval from the University of Technology Sydney. We

informed parents about which of their responses would be shared with the other, and which would be kept private.

3.4 Data Collection and Analysis

We audio-recorded interviews and took handwritten notes to support the thematic analysis of our data. We iteratively analyzed these data using an open-coding approach, initially coding instances in which family technology use contributed towards any kind of misunderstanding, tension, disagreement or conflict between parents. Finally, we developed categories relating to the causes of conflict that can arise between parents because of how they use technology, or how they manage their children's technology use.

4 FINDINGS

Our study confirmed that parents rely on, and embrace, the use of digital technologies within their families. Yet, it also revealed that family technology use (particularly the use of mobile devices, such as smartphones and tablet computers) can contribute to tension and conflict in parents' relationships. Within the stories we heard from our eight participating sets of parents, we identified four sources of conflict that relate either to how parents use technology when spending time with their family, or to how parents manage their children's technology use. These sources of conflict are; (i) *Monitoring each other's digital technology use*, (ii) *Using technology as escapism*, (iii) *Regulating children's technology use* and (iv) *Using technology to placate children*.

4.1 Monitoring Each Other's Technology Use.

We discovered that parents often monitor one another's mobile device use at home, and that this can contribute towards conflict between in their relationships. Examples of monitoring were found within the responses of all eight participating sets of parents, and included parents making observations, assumptions and comments regarding the other parent's device use. Furthermore, we found that parents often make comparisons between the other parent's device use, and their own device use. Our participants tended to mention these comparisons when reflecting on responses to the Digital Family Tree probe.

As an example, we can turn to P15 and P17, two sisters who live together with their mother (P16), and share the parenting responsibilities of P15's three young children. As P15 elaborated on the sketched connections in her Digital Family Tree, she claimed to use her phone much less than her sister, "P17's (my sister's) phone is hard to get out of her hot little hands!" (P15). Interestingly, when

Table 1: Summary of Participant Details

| Sets of Parents | Age | Occupation.(Part-Time/Full-Time) | Cultural Background | No. of Children(Age) |
|-----------------|-----|----------------------------------|---------------------|----------------------|
| 1: P1 (Mother) | 46 | Customer Service (PT) | Indonesian | 2 |
| P2 (Father) | 52 | Management Consultant (FT) | British Indian | (9yrs, 7yrs) |
| 2: P3 (Mother) | 36 | NA (Full Time Parent) | Japanese | 3 |
| P4 (Father) | 38 | Software Developer (FT) | French | (7yrs, 5yrs, 3yrs) |
| 3: P5 (Mother) | 42 | Biologist (PT) | Indonesian | 3 |
| P6 (Father) | 48 | Software Engineer (FT) | Australian | (7yrs, 5yrs,3mos) |
| 4: P7 (Mother) | 39 | Engineering Draftsperson (PT) | Iraqi | 2 |
| P8 (Father) | 41 | IT Consultant (FT) | Iraqi | (15yrs, 3yrs) |
| 5: P9 (Mother) | 49 | IT Technician (PT) | Vietnam | 2 |
| P10 (Mother) | 47 | Lawyer (FT) | Australian | (5yrs, 3yrs) |
| 6: P11 (Mother) | 34 | Veterinarian (PT) | British | 2 |
| P12 (Father) | 36 | Veterinarian (FT) | Spanish | (6yrs, 2yrs) |
| 7: P13 (Mother) | 48 | Physiotherapist (PT) | Australian | 1 |
| P14 (Father) | 51 | IT Consultant (FT) | Australian | (6yrs) |
| 8: P15 (Mother) | 41 | Transport Planner (FT) | Australian | 3 |
| P16 (Grandma) | 74 | NA (Retired) | Australian | (9yrs, 7yrs, 5yrs) |
| P17 (Aunt) | 44 | NA (Disability) | Australian | |

P17 came to review the same sketches, she suggested that it was actually P15 who used her phone excessively, *"I would prefer her to put it down, I can't imagine there's anything so desperately important that it can't wait half an hour while we all have dinner and bathe the children."* (P17) and that P15's claims about device use were hypocritical, *"I get very frustrated with P15 about technology... (she) will stand there talking about how much she hates screens, while scrolling through her phone! I don't think she's conscious that she's actually (doing it)"* (P17). Furthermore, P17 was sceptical of P15's assertion that her phone use at home was solely necessitated by the demands of her job, *"She says it's just work but it's not... I've no idea if she's on work, or Facebook, LinkedIn, or scrolling the news"* (P17). We noticed that when sets of parents misunderstand, or distrust, each other's intentions for using devices, they might monitor one another's device use more closely.

That conflict can occur between sets of parents who are unable to fully appreciate, or to accept, each other's different motives for using devices, was also demonstrated by P9 and P10. Of all our sets of parents, P9 and P10 were particularly candid about their struggle to align contrasting perspectives on technology use, and how this could cause conflict in their relationship. P10 vehemently expressed her disapproval of what she perceived as P9's excessive technology use, describing her as, *"umbilically connected to her phone and the TV"* (P10). However, P9 claimed that since becoming a parent, her reliance on technology had increased, owing to feelings of loneliness and a sense of *"missing out on everything else"* (P9) which she felt were exacerbated by P10's absence while working long and often unsociable hours. She recognized that she had developed *"automatic habits"* (P9) - predominantly scrolling through feeds on social networking and news sites - that she had less awareness of, and thus found difficult to control.

On the other hand, P10 argued that her smartphone use stemmed solely from a need to be contacted for professional reasons. While she admitted that she sometimes found it difficult to *"switch off"*

from work completely, P10 claimed to reduce her device use drastically when spending time with the couple's two young children. However, when P9 reflected on what she had learned about P10's feelings by completing our probes, she said, *"I was surprised by that, and I guess doing this study gave me a legitimate lens to have a look at it"* (P9). She went on to question P10's self-awareness and her honesty, *"I am surprised at P10's self-opinion of her device use 'cos she's actually on the phone a lot and she doesn't think that she is"* (P9). She also accused P10 of frequently using her iPad for online shopping during mealtimes, and expressed her dislike of P10 flouting the very rules around technology use that she, herself, had imposed. P9 revealed that completing our probes had prompted her to confront P10 about using her iPad in this way, to which, P10 had denied doing so. Reflecting on this, P9 suggested that neither herself, nor P10, remained fully aware of their own actions when using technology, and even proposed that they paid more attention to each other's device use than they did to their own.

While P9 and P10 were particularly skeptical about one other's ability to reflect accurately, or honestly, on their own device use, we heard all eight sets of parents express a degree of uncertainty around each other's use of devices. Some participants justified their uncertainty by citing particular examples in which the other parent's device use had been proved to be unwarranted. However, we observed that parents' doubts about one another's ability to remain aware and intentional while using devices, were largely informed by their own experiences of losing track of their time and attention while using devices, which they then tended to project onto the other parent. We heard all 17 parents express a degree of frustration at continually struggling to control their own use of devices, especially smartphones.

These examples conveyed the particular importance that parents typically place on limiting their device use when spending time with children, in order to demonstrate desired behavior. For example, reflecting on his responses to the Device Journal probe

prompted P2 to acknowledge that he struggled to adhere to rules he himself had set for his family, by using his phone during dinnertime, *"I'm not always successful, I tend to yield to temptation."* (P2). We observed that parents' ongoing struggles to balance their own technology use within the competing interests of family life can lead to sets of parents questioning the necessity of each other's device use, motivating them to monitor each other, and thus introducing opportunities for tension and conflict.

4.2 Using Technology As Escapism.

We found that when parents use technology in ways that are perceived as attempts to escape from the realities of family life, tension and conflict can arise in their relationship. This was evident in four sets of parents, including P9 and P10. As P9 reflected more deeply on how her mobile device use had changed since becoming a parent, she explained that feelings of boredom and loneliness fueled her anticipation at checking for messages, social media notifications and news. She described these behaviors as attempts to escape from what she described as "housebound isolation" (P9). This sense of using technology as escapism was echoed as she discussed her evening routine of watching television after putting her children to bed, *"It's just about getting lost in it. . . free of that role, that responsibility."* (P9). While P9 justified using technology in this way, she acknowledged that P10 disapproved of it, *"she sees it as me distracting from her but I'm just really tired because it's been a long day, the kids were a nightmare. . . I want to feel disconnected, disengaged. . . to totally escape, but she hates it."* (P9). P9 claimed that she felt judged by P10's vocal criticism of her technology use, even when with friends and family, and that this added to the tension and conflict in their relationship.

We discovered various reasons why parents sought to use technology as escapism, and various ways in which this could create conflict in their relationships. For instance, P7 and P8 described how patterns of mobile device use within their family life contribute to tensions in their relationship that can build up over time, eventually culminating in conflict. Specifically, P8 admitted to a particular habit of devoting most evenings to watching Netflix, alone, on his laptop, *"I'm addicted. . . the only way to switch off after work is to put my headphones on and isolate myself from everything"* (P8). He justified this behavior as necessary in order to *"unwind after a stressful work day"* (P8). While his wife, P7, tolerates this conduct, she complained that it leaves her alone to continue attending to their two children and domestic chores. She also perceived that her husband's device use allowed him to disengage from her, and from family life, *"sitting with his Netflix, laptop on, headphones on, that's it - he's out. Even if I talk to him he can't hear it, I have to come and nudge him."* (P7). P7 disclosed that she considers P8's behavior to be excessive and selfish and suggested that it prevents their children from engaging with him, thus making them even more reliant on her for attention. She also revealed feeling jealous of P8's preoccupation with his devices and expressed a desire to spend more time with him. Furthermore, P7 revealed that it can create a sense of ongoing tension between them that builds up over the course of the week, *"by the weekend we'll be lucky if there wasn't a fight between us"* (P7). Both parents independently stated that the

way in which P8 regularly uses mobile devices alone, disengages them from one another, and is thus detrimental to their relationship.

We found that even when a parent's heavy device use is motivated by work, rather than entertainment, sets of parents can become disengaged from one another, and tensions can arise in their relationships. We observed that using mobile devices for professional reasons contributed to some level of dissatisfaction within seven of the sets of parents in our study. In particular, P11 and P12 portrayed a lifestyle that revolved around P12's ongoing need to respond to professional calls and emails throughout evenings and weekends. This typically left P11 caring for their young daughter alone, and turning to her own devices in an attempt to keep herself occupied. During her interview, P11 voiced her discontent at the extent to which she perceived her husband's device use to not only disrupt their family's dynamic, but to encourage her own increased device use. She suggested that the affordances of digital technology had introduced unrealistic expectations into her husband's work culture, that negatively impacted their family's lifestyle. These claims of technology's culpability continued, as she expressed her frustration at situations in which P12's video-conferencing schedule interfered with plans for him to spend time with their young daughter, *"(Our daughter's) aware that his job is taking her away from him, because of that technology"* (P11). Despite her best efforts to support and justify her husband's behavior, P11 revealed her dissatisfaction at a lifestyle in which connection and engagement with her husband had become scarce. We also noticed that several of P11's probe responses mentioned feelings of jealousy and neglect, similar to those voiced by P7.

4.3 Regulating Children's Technology Use

We noticed that conflict can arise between parents who struggle to align their different individual approaches towards regulating their children's technology use. All 17 participants discussed the importance of providing children with appropriate supervision, and boundaries, while allowing them to use mobile devices. Yet we heard various individual attitudes and approaches.

On one hand, we heard parents express concern about the potentially negative impact that excessive device use might have on children's physical, social and emotional development. Parents typically justified these concerns by citing their own experiences, and observations, of undesirable behavior in children who engaged in screen-based activities, such as playing games, or watching videos. Some parents raised particular fears such as children's online safety and access to inappropriate adult content. It was apparent that these concerns are also informed by messaging received from mainstream media and wider society, warning parents of the perils of children using technology excessively. Our participants also discussed the negative social judgements that can be associated with parents who fail to curb children's device use, through terms such as, *"lazy parenting"* (P17). Despite parents complaining that such judgements were unhelpful and untrue, we observed that they made similar judgements themselves.

On the other hand, we heard parents assert that technology use plays an increasingly pivotal role in children's education, and social development, and that it was their responsibility to encourage and provide opportunities for this. Most parents pointed to the onus

placed on them, and their children, to use mobile devices in order to actively participate in school and community life. Our participants also acknowledged the enjoyment that their children found when engaging in screen-based activities, and the resulting convenience and benefits that this brought to them, as parents. Overall, the stories shared by our eight sets of parents revealed varied attempts to manage children's device use in a way that reconciled these individual fears and motivations.

The eight sets of parents in our study all acknowledged that their relationships were impacted by the challenge of establishing common, consistent approaches to regulating children's technology use, given each parent's very individual attitudes, experiences and concerns. In particular, we found that this challenge was often intensified by sets of parents assuming fixed, opposing stances towards children's device use. For example, one parent might assume a role of being "stricter", "cautious" or "resisting" and the other of being "more lenient", "techy" or "enthusiastic". We discovered that taking such contrasting stances often introduces opportunities for conflict in parents relationships by exaggerating existing imbalances in individual attitudes, and in the distribution of parenting efforts. Thus parents' efforts to create cohesive approaches to regulating their children's device use can be hampered.

In some cases, parents referred to these individual stances during their joint opening interviews. For instance, as P5 and P6 considered the process they usually go through before purchasing a new device, P6 claimed, "He (P6) is pretty much the initiator of technology. . . and then I end up being a resistor, well a regulator" (P5). However, participants were usually prompted to discuss these individual stances in more detail, when reviewing their responses to the Digital Family Tree probe. In particular, when considering the connections drawn between each parent's individual devices, particularly smartphones, and their children. This is because each parent's individual stance towards regulating children's technology use often corresponded to the amount of smartphone access they granted children. For instance, when we asked P1 to elaborate on why lines had been drawn to connect children with her phone, and not her husband's, she replied "The kids wouldn't use his phone" (P1). On Contemplating this, she asked her son (who was present during her interview), "Why do you use my phone more than (Daddy's) phone? I'm curious too. Because I am nicer? Will (Daddy) scold you if you use his phone?" (P1). Her son nodded, substantiating both parents' portrayal of P2 being "less tolerant" than P1 towards their children's use of technology.

We found that sets of parents typically express their differing stances on children's technology use by sharing their opinions about the appropriacy of children's device use, in various contexts. The parents we spoke to were primarily concerned with the amount of 'screen-time' children were allowed at particular times, and under what level of supervision. Sets of parents can also differ on how to motivate children to meet these expectations, and enforcing consequences when they are not. Hence, regulating children's technology use can become a contentious issue. For instance, we discovered that P9 and P10's relationship was negatively impacted by their struggle to align their very different attitudes towards regulating children's device use. P10's explained that her "stricter" approach was primarily based on various concerns she held about the potential negative effects associated with excessive screen time.

However, P10 perceived P9 to dismiss these concerns, which left her feeling frustrated and unsupported. She described feeling alone in worrying about her family spending too much time engaged in individual, screen-based activities, rather than interacting with one another. She verified P9's account of how their different approaches to managing their children's technology use creates ongoing conflict in their relationship, "It's just the same old arguments, an ongoing struggle really. The parenting challenge, for me anyway, is keeping it under control so that everyone is not just sitting around looking at different devices – and that's our family time." (P10). However, P9 claimed that P10's attempts to intervene often included criticizing, or over-ruling her decisions, in front of their children, which she saw as only furthering the conflict within their family. She disclosed that these ongoing disputes about how to manage their children's device use, and P10's obvious disapproval of her approach, left her feeling, "judged (by P10) on my abilities to parent" (P9).

4.4 Using Technology To Placate Children.

We discovered that tension and conflict can also arise in the relationships of parents who hold significantly different attitudes on using mobile devices to entertain, distract or pacify their children. While all our participants considered it appropriate to do so in certain situations, attitudes on exactly which situations were appropriate varied greatly. We observed that within each of our eight sets of parents, one parent spent more time taking care of their children and managing domestic responsibilities, than the other. Though this differential varied considerably across our sets of parents, in all eight sets we heard that the 'primary carer' used devices to placate children on more occasions, and for longer durations, than the other parent. As anticipated, this was typically justified as a means of enabling parents to attend to other needs, as P11 put it, "I would have used (devices) as a babysitter – for want of a better word, to enable me to cook the dinner, get the washing hung out." (P11). Parents often voiced feelings of guilt at using technology in this way, and some cited their concerns for encouraging children's excessive device use. For instance, P17 who lives with, and cares for, her grandchildren, admitted to using screen-time as a way of entertaining them, despite their mother's (P15) strong disapproval. She justified her behavior by explaining that she lacks the energy to keep up with three young children. She also went on to express her own disapproval of what she perceived to be a generation of younger parents, unnecessarily encouraging their children's excessive device use, "They think that keeping their children quiet and well behaved in public, or even all of the time seems to be desirable. And to me, I think children are being cheated. It's a pacifier and its preventing them from (having) more valuable experiences."

Meanwhile, we heard P15's perspective, as she reflected on her completed probes, "My mother (P16) uses (devices) as a bit of a babysitting device. . . so she can get on with cooking dinner or whatever she's doing at times when I'm not there. Yes, I imagine it's a free for all when I'm not there, whatever keeps the kids quiet. I try to get a gauge of what's happening but I always get the kickback that I'm not there to impose it, so it's not fair of me to make the rules." (P15). This corroborated the stories of recurrent compromises and complaints, around how to manage children's device use, that we had first heard

when interviewing P15 with her mother (P16) and sister (P17) at the start of our study.

Using technology to placate children had become a source of contention in at least six of the sets of parents we spoke to and we observed various ways in which it could play out. While P15 was resigned to relinquish control of her children's device use at times when she wasn't there, other parents felt that their wishes should still be respected even in their absence. For instance, P4 who also works full time, described intervening to prevent his wife (P3) from using her smartphone to placate their children in his absence. During their opening interview, P3 and P4 revealed their disagreement over P3's decision to allow their oldest son to play games on her phone. P3 explained, *"With the three kids, it was convenient for me... so that (my son) was busy with something. So that's how he started to play those games"* (P3). Yet, she recalled how P4 had immediately objected to her decision. *"(My husband) P4 wasn't very happy about it"* (P3). P4 interjected to clarify, *"because there was no discussion, it was already decided by her"* (P4). We heard that P4's initial objections had become more vehement as he perceived that playing games was negatively affecting their son's behavior. *"I think that's when P4 (my husband), started to comment about the games, again"* (P3). P4 claimed that despite his wife initially dismissing his concerns, *"She didn't believe that there was an issue"* (P4), she had eventually conceded that he was right and agreed to disallow their son to play such games. While both parents claimed in their opening interview, to have resolved the matter, we later discovered that this was not quite the case. As P4 reflected on his Digital Family Tree during his Closing Interview, he considered why connected his children were shown to be connected to his wife's phone, and not to his. He revealed, *"They know not to (play) with my phone, they know they are going to be in trouble. But of course sometimes mum (P3) puts a game on because she is busy with something, so it's convenient to help them stay quiet"* (P4). He further explained how he was aware of which devices his children used in his absence, *"Sometimes I hear them ask, 'Mama can I have your phone because I want to play that game', then I think 'Ah, OK', that's how I find out."* (P4).

The way in which conflict could be triggered by sets of parents struggling to align their individual attitudes on using mobile devices to placate children was yet more palpable between P9 and P10. P9 admitted that she often considered screen-based devices to be *"a free babysitter"* and justified this approach with her need to make aspects of domestic life easier, especially since her wife (P10) spent so much time at work. However, P9 acknowledged that P10 disapproved of this approach, *"I like the convenience of it, but it drives P10 nuts that I'm so lenient when it comes to the screens... and it's the same conflict every time, on repeat."* (P9). When we interviewed P10, she confirmed that P9's habit of using devices to entertain their children caused ongoing disputes in their relationship, *"Children's technology use is contentious within our family because P9 (my wife) has quite different views from me and she's very happy as a parent to use TV and screens as a way of buying time, as a bribe and to achieve other things, whereas I'm much stricter"* (P10). P10 explained that her stance was based on fears that using technology in this way might negatively affect their children's behavior and development. We found that concerns such as these were cited by other parents

in our study who shared P10's reluctance towards using technology to placate children.

Our findings have focused on illustrating four sources of the conflict that can arise in parents' relationships, as a result of their family's technology use. While our participants did mention several other causes of this conflict (e.g. adopting new technologies and managing privacy), these were found to be less prominent across the eight sets of parents in our study. Next, we discuss the implications of our findings, with a focus on how we might think about the design of digital technologies that are used within families.

5 DISCUSSION

Our study revealed that, despite digital technology use being a critical and enjoyable part of family life, it can also contribute towards conflict in parents' relationships. We identified four common sources of this conflict, that are primarily associated with the use of mobile devices (such as smartphones, tablet computers and laptops) when family members spend time with one another (often referred to as 'family time'). We now discuss three areas of consideration, that might help to address this conflict between parents, when designing future technologies that are destined for use in domestic spaces. This includes considering ways in which we can; (i) *Help parents feel more in-control about how their family uses technology*, (ii) *Provide parents with a greater sense of certainty around their family's technology use* and (iii) *Support sets of parents to manage their family's technology use collaboratively*.

5.1 Helping parents feel more in-control about how technology is used during family time

Almost all the parents in our study described their own struggles to maintain self-control when using technology, particularly mobile devices. They voiced realizations about 'unintentional' and 'distracting' behavior, and expressed regret at losing track of time while engaged in activities that they deemed as less necessary and meaningful. This supports recent suggestions that by over-prioritizing user engagement, the design of mobile technologies might currently risk eroding user's agency and autonomy [34]. When parents struggle to feel in-control of their own device use, they can be motivated to **monitor each other's technology use**. As parents typically consider it important to model desired behavior in front of children [19, 38], they tend to monitor each other's device use particularly closely in situations which children are present, and rules have been established around how technology should, or should not, be used (e.g. using devices at mealtimes). We also noticed that a sense of competition can develop between parents who are both keen to play down, and defend, the extent of their own device use. Parents often justify this monitoring as a necessary, and even supportive, means of helping each other curb excessive device use amidst the chaos of everyday family life. However, we observed that this monitoring often encourages comparisons, assumptions and critical comments, that can foster feelings of disapproval and distrust, and ultimately tension and conflict in parents relationships.

People often turn to devices in an attempt to break from their role and responsibilities [34, 40] and our study showed that parents are no exception. When parents who intentionally seek alone time by **using technology for escapism**, also have difficulty controlling

their own device use, technology practices can form that foster tension and conflict in their relationships. This is because when one parent finds it challenging to be mindful, or limit their own device use when with their family, it can create feelings of disconnection, disapproval and jealousy in the other parent. We also observed that when one parent regularly uses technology for extended periods of time, it can both highlight, and amplify, existing imbalances in the way parenting and domestic responsibilities are shared. This builds on recent studies that have revealed how conflict can arise between family members who perceive that technology is overused when spending time together [40, 46].

Parents' own experiences of struggling to remain fully in-control when using devices often inform their assumptions that children are even less able to limit their own screen-time. These assumptions are often buoyed by parents' unsuccessful attempts to monitor and regulate their children's use of devices. These experiences can add to parents' concern around the negative effects that technology use might have on their children's development and behavior, that are often established by the messaging of media and wider society. In addition, this messaging can instill a sense of social judgement, by implying that children's technology use was indicative of lower parental interest or ability. This aligns with previous depictions of what a complex, and morally loaded endeavor parenting can become in our technology-saturated world [25, 26, 35]. Our study found that tension and conflict can arise in sets of parents who don't align on how tightly they need to *regulate children's technology use*, or how to go about this. This is because feelings of disapproval, frustration, stress and isolation can be introduced when parents make differing assumptions about their children's ability to control device use, or take different approaches to attempt to control it.

Similarly, tension and conflict can arise in sets of parents who disagree on the appropriacy of *using technology to placate children*. When deciding to put devices to use in this way, parents typically weigh up the immediate benefits that it might bring them, with their longer-term concerns about children developing technology practices that foster undesirable behaviour, or impede their development. These concerns are driven by assumptions that children become over-engaged in screen-based activities, and are thus unable to remain fully in-control of their device use. We observed that a parent who spends most time caring for children also tends to be responsible for a greater share of domestic work, and therefore feels more justified in using technology to placate children. Yet, another parent who spends less time at home with children often feels less enthusiastic about using technology this way and might assert a desire, even expectation, for the other parent to align with this. Furthermore, parents who feel judged for using technology in this way can also feel that their parenting abilities are being brought into question. Thus, using technology in this way can become a source of conflict in parents' relationships.

Overall, parents perceive that the use of mobile devices can be over-engaging, and that it is therefore difficult for themselves, or their family members, to remain fully in control when using them. Parents fear that this can disrupt their family's time together, and impact negatively on their children's development. These fears often drive parents' various attempt to intervene in order to control each other's device use and as well as their children's, and to associate family technology use with tension and conflict in their

relationships. This aligns with [40]'s description of family dynamics being disrupted by technology use, and we repeat their calls for the ways in which device notifications and alerts are used to engage with people to be reconsidered. We are also encouraged by recent appeals and attempts to consider how technologies might be designed to support people to limit device use, or to remain more intentional when using them in the presence of others e.g. [9, 20, 22, 23, 32]. Our work suggests a need for further work to explore how such approaches to designing technologies might address some of this conflict that can arise in parents' relationships, by helping them to feel more 'in-control' of how they, and their family members, use mobile devices, especially during family time.

5.2 Providing parents with a greater sense of certainty around their family's technology use

It is clear from our study that there are high levels of uncertainty involved in technology use, and that this presents parents with a major challenge when attempting to integrate it into family life. Parents rely heavily on the use of devices, particularly mobile devices, and appreciate the benefits that this can offer their families. Yet at the same time, they perceive the use of such devices to disrupt the cohesion of family life by drawing individual family members away each other. This aligns with observations made in families and couple relationships e.g. [21, 40, 46]. Our study showed that this uncertainty around what family members are actually using devices for, and how long they intend to do so, can contribute towards conflict between parents, through the four sources described in our findings.

We found that a lack of certainty around what each parent was using their mobile device for lead to parents *monitoring each other's technology use*. Parents often questioned the urgency and duration of the activities one another engaged in on their devices. Parents expressed their frustration at not knowing what the other parent was doing on their device, particularly when they perceived that family time was being disrupted. Parents monitored each other's device use more closely when children were present, for two reasons. Firstly, parents look to each other to model behaviour they want their children to emulate [13, 19, 24], and secondly, parents look to each other for support in attending to children and domestic chores [37]. While monitoring each other's use might help parents to ensure that they both participate fully in family life, parents expressed their frustration at feeling scrutinized and judged by the other. We observed that disapproving comments, as well as misassumptions that parents made about each other's device use could contribute towards feelings of tension and conflict in parents relationships.

We heard accounts of parents, such as P8, regularly using mobile devices alone to entertain themselves, for extended periods of time, while their family members are unable to easily see, or hear, what they were engaged in, and without providing any sense of how long they might spend. When one parent sought to unwind from their parenting, or work responsibilities in this way, by *using technology as escapism*, we observed that the other could easily become frustrated by their lack of certainty of what they were doing on their device, or their motivation for doing so. We heard that when one parent turned to technology this way the other parent

might disapprove, feel ignored and even jealous, and that this could contribute towards conflict in their relationship. This was especially the case when children were present for the previously discussed reasons of role-modelling unwanted behaviour and disengaging from domestic responsibilities.

Our study found that parents efforts at *regulating children's technology use* were also motivated by concerns that were driven, in-part, by the uncertainty that they associated with mobile device use. Parents feel responsible for monitoring children's device use and find it more difficult to keep track of what children are using smaller, mobile devices for, as these can be easily moved away from view (e.g. to children's bedrooms) and tend to offer online connectivity. While parents tend to associate these devices with greater uncertainty, they concede that they are a convenient choice. This is because they are usually within reach and parents report that children prefer, and are easily able, to use them [27, 43, 54]. In contrast, parents discussed feeling less uncertain, and therefore less concerned, about their children using devices that offer greater visibility, such as TVs and desktop computers with larger displays, and devices with limited capabilities such music players and e-book readers. These different considerations highlight the role that uncertainty can play in parents' decisions on how to regulate children's technology use. Our study found that different levels of uncertainty regarding children's technology use, can lead to parents taking different approaches to limiting it, and this can provide a source of tension conflict in their relationships.

Our findings show that this lack of certainty regarding what children are engaging in while using screen-based devices, also introduce various concerns for parents who are *using technology to placate children*. These concerns range include children accessing content deemed to be 'meaningless' or inappropriate. These concerns were primarily driven by parents own experiences and observations, yet also informed by messaging in media and wider society. This aligns with prior explorations into parents' motivations and attempts to curb children's device use [26, 52, 53]. Our findings show that sets of parents can have differing levels of concern and uncertainty, and that this can create disagreements about how appropriate it is to use technology to placate children.

Overall, we have demonstrated that parents are often uncertain about various aspects of their family members' mobile device use. This uncertainty presents sets of parents with the challenge of keeping track of what one another, and their children, are using devices for, when, for how long, and why, and thus can be associated to the four sources of conflict identified in our findings. This aligns with [40]'s portrayal of tensions that develop between family members who struggle to deduce what someone is doing on a device, and whether or not they deem it to be worthwhile. As such, we echo [40]'s suggestion for designers to explore ways of providing more activity awareness in order to reduce this uncertainty. We are motivated by recent attempts to reduce this uncertainty by providing a greater sense of transparency and awareness [21, 28, 29, 41], and suggest further work to examine the potential of such design approaches to address some of the conflict we have identified in parents' relationships.

5.3 Supporting sets of parents to manage their family 's technology use collaboratively

Overall, our findings demonstrate that within the messiness of everyday life, parents lack opportunities, a framework or even a language with which to calmly and constructively communicate and negotiate upon their individual perspective towards technology use. Taking part in our probe study prompted several sets of parents to express their curiosity and surprise at discovering aspects of each other's perspectives on family technology use. These included various realisations about another parent's attitudes, practices and motivations. We also heard participants voice their gratitude for the chance to reflect on how technology is used in their family, and to share their thoughts with the other parent. This suggests that sets of parents might seldom find opportunities to communicate and negotiate their individual perspectives on technology use with one another in a constructive manner.

Instead, we heard of the misassumptions and misunderstandings between sets of parents, not to mention the criticism, frustration, distrust and disapproval that can be involved with their current attempts to integrate technology use into family's life. The differing individual attitudes of the parents we spoke to might also support suggestions that traditional gender norms can help to explain differences in how parents utilize technology [4, 33]. While HCI's tendency to study mothers and fathers separately provides valuable glimpses into how they might manage family technology use differently [2, 3, 5], our initial results show that more work is needed to understand how sets of parents do this together.

We suggest that there is an opportunity for designers to better consider the collaborative nature of parenting. This could include exploring how to provide sets of parents with more regular opportunities to reflect on, and to align their individual perspectives on various aspects of technology use. Our findings indicate that parents' relationships would benefit from better understanding, and appreciating, one another's individual expectations about how they each use technology (especially when with their family) as well as their individual attitudes to managing children's technology use. After all, we have shown that when sets of parents are unable to align these individual perspectives, they often disagree about *monitoring each other's technology use, using technology as escapism, regulating children's technology use* or *using technology to placate children*. Just as we are not aware of any prior work to explicitly explore these individual perspectives that exist within sets of parents, we are unaware of any specific efforts to support sets of parents in making more collaborative efforts to integrate technology use into family life.

Given that conflict between parents over technology use can be detrimental to their overall relationship, and parenting satisfaction [37], we strongly encourage this further work to explore how we might assist sets of parents in regularly reflecting on, and sharing their views on family technology use with one another. This suggestion builds on Bruun's [9] argument for design interventions that allow us to consider how current technology practices introduce tensions within families, by encouraging family members to reflect on the issue, together. It also responds to those who have highlighted a need for more nuanced and dynamic solutions that can involve multiple family members within the varied and evolving

contexts of family [8, 26, 40]. Encouraging designers to consider how to support the collaborative nature of parenting raises an open design issue, yet we consider it one well suited for future interactive design interventions and explorations. We also believe it is a valuable enterprise, given parents' attitudes must constantly adapt to consider both the changing needs of growing children, and the adoption of ever-evolving technologies [12].

6 LIMITATIONS AND RECOMMENDATIONS

Our findings are based on responses from the eight sets of parents who participated and are therefore limited in the extent to which they can be generalized across wider populations. While we took an inclusive approach to recruitment and a range of family structures and ethnic backgrounds are represented in our sample, the demographic diversity of our sample was somewhat limited since all 17 parents were recruited through a local network of schools and community groups in Sydney, NSW. To further investigate how technology use can create conflict in parents' relationships, we recommend engaging with a broader group of parents, from more diverse backgrounds (e.g. culture, age, income, education level). Finally, our study was conducted before the full effects of the COVID-19 pandemic were fully felt, and we suggest future work should also consider any potential effects that this might have had on how parents have had to adapt their attitudes and practices regarding family technology use.

7 CONCLUSIONS

This paper explores how and why family technology use can contribute towards conflict in parents' relationships. It reports on a probe study designed to tease apart the individual perspectives within eight sets of parents. By exploring how family technology use affects parents' relationships, our work complements current understandings of conflict in parent-child relationships [8, 24, 26]. Thus it contributes to a more complete picture of how technology use can impact on family dynamics. We found that conflict can arise from the different ways in which parents use digital technology themselves, and how they manage their children's use of technology. Specifically, we identified four main sources of this conflict: (i) *Monitoring each other's technology use*, (ii) *Using technology as escapism*, (iii) *Regulating children's technology use* and (iv) *Using technology to placate children*. These sources of conflict involve sets of parents struggling to align their individual attitudes on how to integrate digital technology use within their family's everyday life. Overall, our findings suggest that we might help alleviate some of the sources of this conflict by considering how to design technologies in ways that help parents feel more in-control, and more certain, about how their family uses technology, and by helping sets of parents to manage their family's technology use collaboratively.

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“It’s A Drag”: Exploring How to Improve Parents’ Experiences of Managing Mobile Device Use During Family Time

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ABSTRACT

Research reveals that managing mobile device use during family time can be a source of stress for parents. In particular, it can create conflict in their relationships. As such, there is a need to understand how these problematic experiences might be addressed by new approaches to technology design. This paper presents a study in which 14 parents were prompted to reflect on how their experiences and relationships could be improved by four design proposals. These proposals resulted from ideation workshops involving 12 professional designers, and were presented as scenario-based storyboards during interviews. Our interviews revealed three design approaches that appealed to parents. We describe seven benefits that parents imagined these approaches would have, and discuss ways in which they should be further explored. Thus, we contribute to a more complete understanding of how technology design might better support parents’ aspirations for how devices are used within the family.

CCS CONCEPTS

• Human-centered computing; • Human-computer interaction (HCI); • Empirical studies in HCI;

KEYWORDS

Mobile Devices, Family Technology Use, Parental Mediation, Parents, Experiences

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1 INTRODUCTION

Human-computer interaction (HCI) research into the increasingly critical role that technology use plays within everyday family life has demonstrated the ways in which parents and children have come to enjoy, and depend on the use of mobile devices, particularly smartphones, tablet computers and laptops [19, 69]. However, researchers have also surfaced many challenges that can arise from

pervasive technology use, some of which can adversely impact family dynamics and relationships. One of these challenges pertains to parents associating their family’s use of mobile devices with a range of problematic experiences, including conflict in their relationships [7, 15, 17, 74].

Parents often struggle to reconcile the appeal of mobile devices, with concerns that excessive use might negatively impact their family relationships and child development [13, 50]. As a result, mediating family technology use can become a complex and emotive parenting challenge, associated with experiences of apprehension, ambivalence and guilt [15, 37, 38]. Previous reports on how mobile device use is managed within families have included descriptions of parents’ various efforts to regulate children’s device use [12, 36, 38], monitor each other’s use [2, 17] and minimize their own use when children are present [37, 62]. Recent work has also revealed the tension and conflict that can arise between parents who are raising children together, when they struggle to align individual expectations on how technology should be used within their family [17, 59]. These disagreements can be triggered by the differing ways in which parents themselves use devices, as well as the different approaches they might take to managing their children’s device use [17]. In particular, tension and conflict abound when parents perceive mobile devices to be overused when family members are spending time together, often referred to as ‘family time’ [18].

Whilst studies have explicated how the use of mobile devices within families can negatively affect parents’ experiences and create problems in parents’ relationships, scant research exists into how we might design technologies that help address this [74]. In this paper, we present our efforts to develop an understanding of if, and how, parents’ experiences and relationships might benefit through reimagining the design of mobile technologies used in homes. Four ‘reimagined’ design proposals were developed through workshops involving 12 professional designers. After fleshing these proposals out as four scenario-based storyboards, we presented them to 14 parents, to stimulate discussion, feedback, views and opinions about how their experiences and relationships might be improved by each proposal.

Our participants’ responses to our storyboards reveal their perceptions of how particular approaches to designing interactive technologies might help alleviate some of the problematic ways in which family technology use currently impacts their experiences. These three approaches are: (i) fostering *awareness* and (ii) encouraging *proximity* between collocated family members, and (iii) supporting *communication about technology use* within families. We present the benefits that parents perceived each of these approaches would have, and discuss opportunities for further work to explore how they might best be integrated into existing technologies, or into

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future technologies designed specifically for families. By considering the effect that family technology use can have on parents' relationships, this work also complements existing research into understanding experiences within parent-child dyads, thus contributing to a more complete understanding of how technology design can better support parents' aspirations and values.

2 RELATED WORK

Digital technology use plays an increasingly critical role in everyday family life, as it does in society [15]. HCI researchers have found that both parents, and children, perceive a wide range of benefits from using digital technology, particularly mobile devices, such as smartphones and tablet computers [19, 40, 65, 69]. Despite this, concerns remain over the potentially negative consequences that pervasive technology use might have on family relationships [5, 21] and child development [6, 22]. In response to these concerns, many within the HCI community have explored the unintended and undesirable effects that technology use might have on family dynamics e.g. [7, 44, 70, 74].

2.1 Understanding how family technology use can shape parents' experiences

A significant research focus of family technology use is to understand parents' approaches to mitigate the negative effects that technology use might have on children [12, 14, 23, 37, 44, 70]. This research often reveals the problematic experiences parents face. For example, despite various tools that offer parental control of technology use, mediating children's device use can be a significant source of stress [74, 84]. In particular, parents and children clash over how technology should be used during family time [7]. Parents' experiences of conflict and problematic experiences when managing technology use are heightened as mobile devices appeal to increasingly younger children [6, 38]. This has led to research seeking to better understand how this has shaped experiences of early childhood parenting [29, 48, 66, 71].

Hiniker et al. [38] highlight that, while parents enjoy the convenience of using mobile devices to entertain young children, they often worry about the consequences that device overuse might have on children's safety, health and development. Furthermore, [38] describe the struggle, and conflict, that parents often associate with transitioning kids away from screen-based activities [56, 77]. Investigations into parents' efforts to establish technology 'rules' have emphasized the importance that parents place on family time, and their observations that device use can impede their aspirations for family members to be attentive and responsive to one another when they are together [36, 57]. This has inspired a specific interest in the use of devices during family mealtimes [24, 25, 36, 72], which have revealed how parents, as well as children, can struggle to adhere to household technology rules [7, 12, 62].

Indeed, how parents themselves use devices has become an area of increasing interest within and beyond HCI. Explorations of 'digital motherhood' e.g. [5, 28], and (albeit to a lesser extent) fatherhood e.g. [3, 53] have revealed how pervasive technology use is changing parenting practices. While these studies tend to focus on specific technologies (e.g. mobile phones [37, 69] and social network sites [2, 47, 79]), they reveal how parents can struggle to reconcile

their own desire to use mobile devices, with concerns that it might not always align with their broader aspirations and family values [28, 37, 58, 62]. In particular, parents feel that they should minimize their device use when children are present, in order to supervise, respond to, and act as good role models for them [37, 62]. This can lead to parents associating their own device use with problematic experiences such as apprehension, conflict, ambivalence and guilt [15, 37, 86].

Alas, mediating technology use within family life can be a complex and emotive issue [57]. Parents' approaches to it have been shown to not only vary widely [4, 22, 85], but to be heavily influenced by their relationships and social context [24, 37, 62]. Recent work has also exposed the conflict that can arise between sets of parents who disagree about how technology should be used within their family [2, 15-17]. This reveals how sets of parents can differ over how to manage their children's technology use, as well as each other's device use [2, 17]. For instance, parents can struggle to regulate children's device use, to decide when it is appropriate to use devices to placate children, to agree on how one another should use devices, and to reduce their own device use, especially when children are present [17]. Tension and conflict in parents' relationships have been shown to be especially rife when mobile devices are perceived to be overused, and to cause family members to disengage from one another when they are together [17, 59].

The above review reminds us that, despite being a critical part of family life, the use of digital technologies (especially mobile devices) within families can negatively shape parents' experiences, and create challenges in their relationships. However, we lack an understanding of how parents' experiences of managing mobile design use during family time might be improved by new approaches to designing interactive technologies. Our attempt to develop this understanding relates to existing efforts into understanding and designing for collocated device use.

2.2 Design strategies to address the social challenges of collocated device use

Digital technologies have greatly transformed the way in which people interact with each other. At the same time, HCI studies have highlighted some of the unintended social challenges that can arise due to the increasingly pervasive way in which they are used [55, 67, 80]. In particular, mobile devices can disrupt the interactions between collocated people, by persistently offering opportunities for communication with remote others [68]. It has been suggested that these digital disruptions can introduce feelings of frustration, disconnection and loneliness, and thus reduce the sense of relationship satisfaction, especially within families and intimate couples [17, 67, 81].

In response, several recent studies have explored how technology design might help address the problems that can arise from collocated device use in domestic settings. Principally, the studies are aimed at exploring how technologies might be designed to better support digital wellbeing. Cecchinato et al. [11] highlight the influx of screen time management features by technology companies who traditionally tended to design technologies to maximize user engagement. The conventional approach is to introduce some form of timer to track, or limit, aspects of device

use [11, 87]. HCI researchers have explored regulating device use employing similar strategies, often inspired by tools designed to support self-management of physical health and wellbeing. These range from providing users with real-time awareness of their device use e.g. [82], to those that more actively intervene after a set time period to limit particular activities e.g. [34, 45, 46]. These efforts intersect with a recent HCI movement calling for the intentional 'non-use' of digital technologies to be studied more closely [55]. To explore non-use strategies within family settings, Bruun et al. [10] designed Pup-Lock, an application that enables all the mobile devices in a household to be locked by any individual family member. This design provocation revealed that families might benefit from technologies that both support non-use during family time and encourage families to reflect on how they use devices.

Despite HCI's growing interest in investigating non-use as a strategy to help manage screen time, Cecchinato et al. [11] emphasize the need to explore additional strategies to support people's varying contexts and individual goals. For instance, they recommend research into understanding how promoting more intentional interactions with technology might support users to self-manage their device use and achieve their goals [54]. Hiniker et al. [35] have examined how this strategy might improve parents' experiences of transitioning young children away from screen-based activities. Besides helping to manage screen time, this strategy was shown to create valued opportunities for parents and children to reflect on, and to discuss, their device use. While [35] provide helpful indications of how we might attempt to address the challenges currently facing parents, they do not consider how the responsibility of managing family technology use is shared between sets of parents, or how parents use technology themselves.

Meanwhile, Hasan et al. [32] have explored the strategy of raising activity-awareness to tackle smartphone overuse in the presence of others. Specifically, they study an app designed to allow collocated partners to share information about their smartphone activity with one another. This strategy of addressing the private, personal way in which mobile devices are designed to be used, has also been explored by Jarushriboonchai et al. [41, 42] as a way of enhancing social interaction between collocated people, though not within families. In Olsson et al.'s [68] review, they identify a further strategy of enhancing collocated social interaction by engaging people in collective activity. Within the context of families, this strategy has been explored by Ferdous et al.'s [25] system to transform mobile devices into a shared display, aimed at encouraging mealtime conversation. This challenges common perceptions of devices as disrupting the social aspects of mealtimes, by suggesting that family experiences can be enriched by devices that enable activity sharing.

These examples provide valuable insights into various strategies that might effectively help people to better manage their device use, particularly within the contexts of families and intimate relationships. However, none explicitly seek to explore how technology design can improve the problematic experiences of parents when trying to manage mobile device use within everyday family life. Nor do they consider how we might help to alleviate the conflict that family technology use can create in parents' relationships. This is despite calls for deeper understandings of how design might address the challenges arising from pervasive device use in specific social contexts [10, 11, 68].

3 METHOD

Our study sought to establish an understanding of how technology design might help address the problematic experiences that parents associate with managing mobile device use during family time. To do this, we took inspiration from the way in which critical research practices (e.g. speculative design [83] and design fiction [8]) create design proposals for the purpose of probing into the ideas and values that they envision [27]. Specifically, we held interviews with 14 parents, to capture their reflections on four scenario-based storyboards [73]. These storyboards depict design proposals that reimagine new ways in which collocated family members could interact with, and through, mobile devices. These proposals evolved from ideation workshops involving 12 professional user-experience (UX) designers. These proposals were sketched as storyboards, to serve as interview stimuli and prompt parents to imagine, reflect on, and discuss how their experiences and relationships might benefit from the proposed ideas within each narrative. The proposals were not intended to represent complete, detailed concepts, nor to serve as design tools. This paper focuses on presenting parents' interview responses, to reveal what they perceive to be useful and desirable design approaches, and how they believe these approaches would help alleviate the problematic experiences they face when managing mobile device use within the family. But first, we will briefly describe our four storyboards and how they were created.

3.1 Creating our scenario-based storyboards

Our four scenario-based storyboards evolved from two 90-minute ideation workshops, held remotely due to COVID-19 restrictions. During each workshop, we challenged six professional UX designers to propose technology-based solutions aimed at addressing the problematic ways in which mobile device use within families can affect parents' experiences, and create conflict in their relationships [17, 18]. Both our workshops followed the same format, informed by well-established idea generation methodologies commonly used within design practice e.g. [26, 39]. They were facilitated by the first author, who is very experienced at using these methodologies within their professional capacity as a senior UX design researcher. It was through their professional network that we recruited our UX designers. All 12 have 10-20 years of experience of working on digital design projects at companies including Google, IBM and Microsoft Research, and in particular, generating speculative design proposals through insight-driven ideation workshops.

To help the designers prepare for our workshops, we sent them each a presentation, summarizing our research context and objectives. Our workshops used Zoom as our video conferencing platform, and Mural as our remote collaboration environment. After introductions, we guided the designers through four key activities. First, designers used virtual notes to post short descriptions of initial ideas onto a shared board. They were offered three categories of prompts; (i) challenge areas (e.g. *Conflict between parents who monitor each other's device use*) (ii) opportunity areas (e.g. *Helping parents by designing for self-control*) and (iii) design triggers (e.g. *Gamification*). In each workshop, this activity lasted 20 minutes and over 30 initial ideas were generated. We then spent 10 minutes clustering initial ideas into seven themes (e.g. *Proximity Alerts* and *Shared View*). Designers then worked in groups of three, for 20

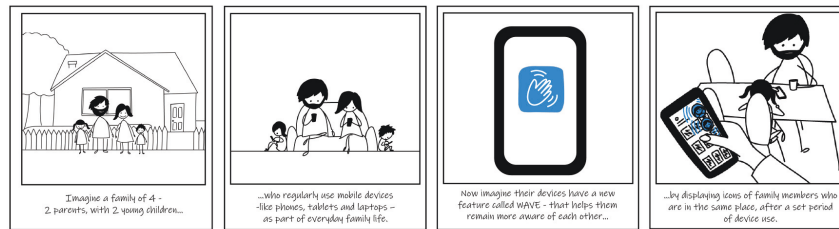


Figure 1: Examples of some of the 16 annotated sketches from 'Storyboard 1 - Wave'

minutes, to develop two themes into annotated scenarios, including a sketch, title and description of various aspects (e.g. *How would it work?* and *How would it benefit parents?*). They were also asked to consider the potential challenges and limitations of each proposed scenario. Finally, all six designers presented their scenarios during a feedback session.

A total of eight scenarios resulted from our two workshops, which the authors then reviewed and distilled into four interaction design proposals. This was done by considering similarities, and how well they each met the design brief. We also considered plausibility. Since our objective was to prompt parents to imagine and reflect on how they might benefit from our proposals, we did not want them to be confused or distracted by questioning their technological feasibility. Thus, we decided to couch each proposal as a mobile application that enables new features and device capabilities when installed, a process that we expected parents would be familiar with, and understand well.

The first author then sketched each design proposal as a scenario-based storyboard comprising 9–14 scenes. We commissioned an experienced communication designer who provided guidance on storyboard development as well as the style and fidelity of our sketches. Our storyboards were to be used as interview stimuli; prompting (and probing) parents to imagine, reflect on, and discuss how these design proposals might improve their experiences and relationships. Consequently, we chose an annotated, comic style to suggest that our design proposals are rough and incomplete; intended to broadly communicate *what* they allow users to do, but without detailing *how* [73]. Each of our four storyboards demonstrates the use of a design proposal within a family (comprising two parents and two young children) by highlighting the main steps and key features involved. We are constrained by space, to only include example sketches in this paper (Fig. 1), together with a brief description of each storyboard. More detail can be found in the Appendices.

3.1.1 Storyboard 1 – Wave. Our first storyboard describes *Wave* which proposes to help collocated family members remain more aware of one another while using their mobile devices. It is designed to do this by displaying icons of family members who are nearby on the user's screen, after a set period of device use. These icons initially appear as faint avatars, which become more prominent over time, by growing larger, bolder and eventually 'jiggling' to gain the user's attention. A variety of options allow families to determine when, and how, these displayed icons appear, as well as

the ways in which users can respond to them. By helping family members to remain more aware of each other, *Wave* also aims to encourage families to discuss and agree on how much attention they wish to pay to devices during family time. This storyboard includes a scenario in which a parent is reminded by *Wave* to curb their mobile phone use when other family members are nearby.

3.1.2 Storyboard 2 – Traffic Lights. Our second storyboard shows the use of *Traffic Lights*, proposed to help collocated family members gauge how 'busy' or 'available' one another are when using mobile devices. It does this by displaying color-coded icons on the users' screen, that indicate the 'availability status' of family members who are using devices nearby. *Traffic Lights* offers a range of options for how family members set their status. For example, by selecting a status color when unlocking a device, or by assigning status colors to applications (e.g. email) or times of day (e.g. evenings). Thus, *Traffic Lights* tries to help family members to understand how available they are to each other, while maintaining a level of privacy around precisely what a device is being used for. By providing this level of awareness, *Traffic Lights* also aims to encourage families to set intentions around everyday device use. This storyboard includes a scenario in which a parent uses *Traffic Lights* on their phone to ascertain how 'busy' their family members are on their devices, without disturbing them.

3.1.3 Storyboard 3 – Shared Space. Our third storyboard depicts *Shared Space*, proposed to increase collocated family members' awareness of what mobile devices are being used for. It tries to do this by allowing multiple family members to easily, and simultaneously, make their individual screens visible to each other via a large, shared display (e.g. smart table or TV). *Shared Space* also allows family members to make their screens visible to each other's mobile devices. Families can decide when, and how, the screens can be shared. For instance, to limit sharing during particular times, or between particular devices. *Shared Space* attempts to encourage communication and collaboration within families by offering them more transparent experiences of device use. This storyboard includes a scenario in which a parent and two children can see, and engage with, what each other are using mobile devices for while sitting together at a smart table.

3.1.4 Storyboard 4 – Family Goal-Setter. Our fourth storyboard envisions *Family Goal-Setter*, proposed to help parents integrate technology use into everyday life in a way that aligns with their family's values and aspirations. It aims to do this by encouraging

families to set intentions for physical and digital activities that can be tracked over time. It allows both individual and joint activities to be tracked and displays everyone's progress on individual devices, as well as on shared displays. This aims to foster motivation by serving as a reminder and promoting a sense of teamwork. Families can also choose to aim for shared rewards (e.g. movie) and to avoid shared penalties (e.g. Wi-Fi break). This storyboard includes a scenario in which family members discuss and set their goals together, and view their progress on a shared display, mounted on a smart fridge.

3.2 Using our storyboards as interview prompts

Our storyboards were used in interviews to prompt parents to consider, and reflect upon, how new ways of interacting with technology might improve their experiences of managing mobile device use within family life. We recruited 14 parents through a network of local primary schools and community groups. Each participant was interviewed separately, for between 40-60 minutes, via Zoom (due to COVID-19 restrictions). All participants lived with at least one child under the age of twelve, and with another adult with whom they shared parenting responsibilities. Parents had between one and four children, ranging in age from one to 16 years. On average parents had 2.3 children, with a median age of seven years. Parents were aged between 37 and 55, with a median age of 42. Five described themselves as fathers, and nine as mothers. While all 14 participants lived in Australia, seven identified as being of non-Australian heritage. Ethics clearance for this study was granted by the University of Technology Sydney.

We familiarized each participant with our research context by sharing a short summary and asking a couple of introductory questions relating to attitudes around family technology use. We explained that we would be showing them four storyboards, each depicting a design proposal, or 'concept' being used within a family. We expected that the term 'concept' would be more familiar and easier to understand for our participants, than the term 'proposal'. However, we emphasized that our storyboards were not descriptions of fully developed designs, but rather suggestions of alternative ways in which mobile devices could be used within families. We also clarified that we were interested in hearing how they imagined parents' experiences and relationships would be shaped by these design proposals, and that their feedback was not informing concept development. We then animated each of our storyboards manually, by narrating a sequence of scenario sketches presented in PowerPoint. While this format created a similar experience to viewing a video, it enabled us to pause and respond to questions from participants, who we invited to interrupt. It also allowed us to iteratively adapt our narration over the course of the 14 interviews, based on participants' contributions.

After each presentation, we confirmed whether participants felt that they understood what was being proposed by our storyboard. We then asked them to explain what they perceived to be positive and negative aspects of the proposal they had been shown. These questions were intended to be easy to answer and encourage parents to start sharing their opinions with us. We aimed for them to create opportunities for initial lines of enquiry and to serve as an 'icebreaker' before we asked questions designed to prompt deeper,

more focused reflection on how each proposal might improve parents' experiences and relationships. When all four storyboards had been discussed, participants were asked which of the four design proposals they imagined would best improve parents' experiences of managing mobile device use within the family, and which would be most helpful at alleviating the conflict that family technology use can create between parents. Lastly, we asked them if they had any additional contributions to prompt participants to confirm, or reconsider, their initial responses to the individual proposals. These final questions also provided us with opportunities to identify new lines of enquiry and to interrogate responses more deeply.

3.2.1 Analyzing our Interviews. Video and audio recordings were made of each of our 14 interviews. After each interview, we transcribed the recording and took an inductive approach to develop codes [78] from this data, using NVIVO software. The first author read through each interview and noted codes, which were then independently reviewed by each co-author. The authors then discussed these codes and created an initial set of themes. Since we aimed to establish an understanding of how we might improve parents' experiences of managing family technology use, our primary focus was on participants' positive responses to each of our storyboards. This led to the identification of three design approaches, that parents found particularly appealing. We then created a more comprehensive list of codes by collaboratively conducting another round of coding on each of these three approaches. By organizing these codes into a second set of themes, we identified the main reasons why parents perceived they would benefit from these particular design approaches.

4 FINDINGS

Our use of scenario-based storyboards was successful at prompting and stimulating rich, reflective discussions with the parents we interviewed. Our participants' responses demonstrated their ability to understand and relate to the four design proposals, and to envision further possible use experiences within their own families. Their responses point to opportunities for approaches in the design of future technologies that may be helpful in improving parents' experiences of managing mobile device use within families, and in alleviating the resulting conflict between parents. In particular, we found that parents were enthusiastic about three approaches to technology design: (i) fostering *awareness* between collocated family members, (ii) encouraging *proximity* between collocated family members and (iii) supporting *communication about technology use* within families. Furthermore, we identified seven ways in which parents perceived their experiences, and their relationships, would benefit from technologies informed by these three design approaches.

4.1 Fostering awareness between collocated family members

Parents told us that the idea of fostering awareness between collocated family members through mobile devices could help improve parents' experiences, and their relationships, because of three main reasons.

4.1.1 Supporting parents' existing efforts to curb device use. The first reason participants welcome the idea of raising collocated family members' awareness of each other, is that they believed it could support parents' existing efforts to curb device use during family time. This benefit was highlighted by the discussions prompted by our first storyboard, Wave. Participants imagined that by using icons to remind family members to be more attentive to one another, Wave would reduce the need for parents to do so. For example, P11 suggested,

"I think it's good to have those kind of reminders and this would be a nice way of keeping everybody in the family aware of their screen time. And I think that awareness is the first part of limiting technology use." (P11)

Reflecting on this perceived benefit triggered several parents to discuss their efforts to curb mobile device use during family time. We heard that these efforts were usually motivated by parents' expectations for family members to engage with one another, and observations that device use was impeding this. Several parents complained that the over-engaging nature of device use often meant their efforts were unsuccessful, and their expectations of family time were unfulfilled. For instance, when considering Wave, P6 described her ongoing, unsuccessful attempts to curb her children's device use, as 'a drag' and could imagine how her experience might be improved by this proposal,

"It'd be a great way to help manage the situation, I reckon (my son) would feel really guilty if he saw my little face on the screen trying to tell him to get off (the iPad). When they're on the devices they're kind of blocking out everything else in real life... it's a sad problem and I'm trying to fix it." (P6)

Finally, participants were especially enthusiastic about the role that providing this awareness might have, in curbing activities considered to be less meaningful, and overly engaging (e.g. social networking sites, entertainment and news). Parents told us that they found these types of activities especially challenging to regulate, and that failing to do so could result in them feeling self-critical and guilty. In particular, parents cited their own struggles of remaining attentive to their children while using devices, and hoped that providing collocated family members with more awareness of one another could alleviate these particularly challenging aspects of family technology use. For instance, P7 reflected on the potential benefits of using Wave, when she recalled an unpleasant, yet familiar experience,

"It's sad when the kids go, 'Mum... you've been on there for too long, get off the phone!' It's happened to me... so yeah, I think it's good to have that kind of reminder, or at least awareness, because you get lost in it – that's the problem." (P7)

While most participants felt that displaying visual icons of collocated family members after periods of device use could support parents' efforts to curb family technology use, they also emphasized the importance of allowing families to continually update and negotiate decisions regarding, when and how such icons are displayed.

4.1.2 Reducing uncertainties about technology use. Another reason why our participants appreciated the idea of raising collocated family members' awareness of each other, is they believed that it could reduce some of the uncertainties parents currently associate with their family's use of devices. This benefit was predominantly discussed in relation to our second storyboard, Traffic Lights, which uses color-coded icons to represent the attention levels of collocated family members who are using devices. This storyboard prompted suggestions that this approach of raising awareness could bolster parents' existing efforts to establish shared understandings about how much attention family members should expect from one another when together, despite devices being used. Parents expressed their hopes that this increased clarity might reduce some of the misunderstandings and problematic experiences that families currently encounter. For instance, P8 imagined the benefits of Traffic Lights,

"When I'm on my device the kids can't tell whether I'm interruptible, and this idea signals that really clearly to them. I love the idea, because it would take away some of my guilt about when I use my devices... I like the idea that I'm signaling to them that I am open to them... I guess it clarifies communication. And (with my husband) as well, if he's red, then I will not disturb him...and it forces him to think about when he might want to be available as well." (P8)

Parents described how the lack of certainty around mobile device use can contribute to communication difficulties in their relationships. For instance, P8 anticipated that having greater insight into her husband's device use might help her avoid disturbing him unintentionally, and in turn, experiencing his irritated response. As well as helping to prevent unwanted interruptions, parents also embraced the potential for collocated family members to demonstrate that they remained available to one other, despite being on devices. For instance, P12 imagined that this added clarity to awareness could help alleviate some of the conflict that she felt regularly arose between her and her husband, as a result of them making misassumptions about one another's device use, which often led to unwanted disruptions or feelings of disapproval and dejection. Meanwhile, P13 anticipated that this way of raising awareness between collocated family members would help collocated family members recognize when they are simultaneously 'killing time' on their devices, which he hoped would encourage physical interaction between them, as well as transitions toward device-free activities. When responding to Traffic Lights, most participants mentioned that they were familiar with similar technological systems which they used to establish communication boundaries between colleagues in workplace environments. Thus, parents could easily imagine how it might improve their experiences of working from home. Despite these positive responses to this proposal, we did notice that not all our participants were enthusiastic about translating the idea of boundary setting from workplace settings into family contexts. For instance, P11 felt comfortable using Microsoft Teams [60] to display her availability to colleagues, yet she believed that family members should always prioritize one another over their devices when in each other's company. Meanwhile, P3 expressed his concerns when considering this proposal,

"It's OK in the work environment...but when you're at home with family members, you don't have to go very far to find out what they're doing. And I think you need to be able to look at somebody in the face to be able to talk to them rather than avoiding face-to-face communication...there's a lot of physical contact as well in a family environment...if you remove the physical and emotional and aspects of communication, that's detrimental to children's development." (P3)

P3 also vehemently objected to the idea of children being able to set their status to 'busy',

"I think it is actually quite rude. It's basically (allowing children to say) "Talk to the hand! Don't talk to me." (P3).

We also heard slight concerns from parents about feelings of mistrust that might be fostered by offering family members availability awareness through their mobile devices. For instance, P12 wondered whether having access to availability information about her husband's device use might lead to her questioning it more than she does already. These concerns remind us of the challenges involved in translating technologies used to mediate aspects of device use within workplace settings, into the more complex and nuanced settings of family homes.

4.1.3 Promoting a sense of connected presence. Finally, our participants also perceived that fostering awareness between collocated family members could introduce a sense of connected presence within families. In particular, parents envisaged that, by simply displaying icons of collocated family members, Wave might help to reduce the feelings of social isolation and disconnection that they currently associate with device use during family time, and thus their need to restrict it. For instance, P7 anticipated that technologies designed to help family members remain more visible to one another would help lower her disapproval of device use during family time. Similarly, P5, who had initially focused on how Wave could help curb family members using devices in each other's presence, began to consider how it might actually enhance the very experience of collocated device use by, "providing a sense of connection - that we're still 'here'" (P5). When parents discussed how Wave could promote a sense of connected presence within their families, we noticed that they often referred to the playful nature that they envisaged this proposal to have - describing it as 'fun' (P11), 'cheeky' (P6) and 'cute' (P8). This highlights the importance of considering playfulness when designing technologies to promote a sense of presence within families.

Parents also envisaged that making collocated family members visible to one another through their devices, such as with Wave, would promote a sense of connection by encouraging more social interaction. They imagined that it would enable subtle forms of communication between family members' mobile devices, such as 'pokes' (P6) and 'waves' (P8). Furthermore, parents could imagine that this might prompt in-person communication, physical interaction and even transitions away from device use. For example, despite being quite accepting of collocated device use within her family, P8 described various situations in which she felt that Wave might satisfy her desire for more communication,

"I like it because it enables what I often want to do with the kids when we're all on our devices sitting next to each other - just to nudge them and sort of go 'Hey, what're you up to?' or 'Hey, shall we go out, take a break, have a breather?'. . . Often I want their attention because I want them to stop the devices and let's say, set the table." (P8)

Some parents, like P8, who felt more comfortable about their family members' use of devices in each other's presence, were able to imagine how this could offer families more opportunities to segue between digital and physical experiences. For instance, P13, who was opposed to the idea of using Wave to limit technology use, strongly believed that it would enhance his family's experiences of being together, despite using their separate devices,

"I'm imagining that we are all at home, but we're all busy on our own devices...and sometimes you want to share and interact with your family members as you do it. I like that online presence is merging into physical presence - you are at home together, but virtually...living together digitally, in parallel to living together physically." (P13)

In contrast, we heard a few parents question the idea of encouraging collocated family members to communicate through devices, fearing that this would displace in-person, verbal communication within families. For example, despite perceiving its potential benefits, P5 wondered whether this proposal should be considered as a last resort,

"Maybe you shouldn't need to use a device to do that. You should still have to use verbal communication, and say "Hey (son), look up!" But yes, it could provide help with that when he's still ignoring you." (P5)

We recognize that parents often place value on nurturing in-person communication, especially in their children.

4.2 Encouraging proximity between collocated family members

Parents were also enthusiastic about technologies that could encourage proximity between collocated family members. There were two key reasons for this and they were primarily prompted when participants reflected on our third storyboard, Shared Space. Parents particularly liked the idea of screen-sharing to a large, communal display.

4.2.1 Prompting communication. When considering screen-sharing to a communal device, as depicted in Shared Space, most participants enthusiastically imagined that it would encourage proximity between family members, thus prompting communication. Participants also felt that this proposal could foster a greater sense of openness and inclusivity within families. Our storyboard depicts a smart-table being shared by a father and his two children, and we observed that participants tended to consider the benefits of using such a device when with their own children. In particular, parents were excited by the idea that it might help them remain aware and involved in their children's activities.

“It’d improve my experience. . . knowing what (the kids) are watching and understanding what they like. (My son) loves to show me things but I’m always busy. I’d use it to see what they’re doing, as a regulatory thing, but also out of interest” (P6)

Upon further reflection, P6 suggested that using such a communal display could benefit the whole family by, “*sharing, unifying and being in each other’s space, but in a non-threatening way*”. We found that parents often associate their family’s use of mobile devices with a reduction in attentiveness, visibility and communication. Therefore, parents hope that the use of larger, communal devices, would help support their existing efforts to foster interest and involvement between family members. For instance, P7 explained why she felt positively about her family members using Shared Space together, when she currently objects to them using their mobile devices during family time,

“Behind the screen feels like there’s so much secrecy. . . that transparency is good because it can open up discussions.” (P7)

Furthermore, P7 suggested that Shared Space might help to improve the relationship she has with her husband. Firstly, she thinks that it would support their existing efforts to collaborate on practical issues such as planning and organization. Secondly, she feels that it could alleviate misunderstandings between them by providing transparency into what one another are using devices for. These were sentiments that we heard echoed by several other participants.

As we had anticipated, several participants expressed concerns that enabling screen-sharing in this way might risk eroding privacy within families. Some parents who welcomed greater insight into what children were using devices for, felt less sure about the usefulness, and appropriateness, of enabling adults to view each other’s screens. For example, P1 appreciated being able to monitor their children’s device use more easily, yet they imagined that screen-sharing between adults would feel awkward, describing it as “*snooping*”. We also encountered widely varying attitudes towards privacy, especially regarding how much parents should afford their young children who are using personal devices. For example, P2 expected that parents would respect their children’s willingness to screen-share, while P5 assumed that parents had a right to access their children’s screens at all times in order to fulfill their responsibilities and provide parental guidance.

Despite these diverse views around privacy, we noticed parents welcomed the notion of voluntary initiation by the family member wanting to share. For instance, P14 perceived that this would create a sense of inclusivity,

“I’m seeing something that’s really cool. I want to share it with you. . . I’m inviting you into my space.” (P14)

We also found that parents were more concerned about privacy when reflecting on screen-sharing between mobile devices, than on a communal device. For instance, P10, distinguished between how he imagined these two experiences,

“With the bigger screen, everyone can be working on their own thing at the same time – it’s a collage - everyone sees what everyone’s doing. Whereas the small screen, say, on your phone, it’d feel more like spying than sharing.” (P10)

4.2.2 Promoting physical interaction. Another reason our participants valued the idea of technologies that encourage proximity, was that they hoped it might promote physical interaction between family members. Parents explained that they tend to feel that opportunities for physical contact between family members are currently reduced by collocated device use within families. For example, as P10 described why they welcomed the idea of their family using Shared Space,

“Technology isolates you, pulls you away. This. . . brings the family back together and into physical contact.” (P10)

All of our participants emphasized the impact of physical scale in determining the experience afforded by particular devices. They perceived larger, communal displays to afford more collaborative and inclusive experiences than current mobile devices. For instance, P14 imagined that, compared to existing mobile devices, sharing content through a larger screen would create more meaningful experiences that better align with her aspirations for how family time should be spent. Other participants emphasized the importance that the physicality of a shared smart-table might have, in fostering family unity. For instance, P13 expressed their excitement at the idea of leveraging a shared physical object,

“If we’re sharing through our own (mobile) devices. . . it’s not as intimate or as ‘family-like’ as when we’re around a table; the actual physical thing that we’re touching at the same time and interacting around. . . it definitely feels like a centerpiece that represents that we are family, we are one unit, represented by this single thing.” (P13)

While the parents we spoke to imagined that sharing through a communal device could prompt valued physical interactions within families, we detected some skepticism about the benefits of encouraging family members to screen-share between mobile devices. In fact, two parents, including P9, raised concerns about this exacerbating their existing struggles to ensure that collocated device use does not reduce physical interaction, particularly between children.

“This would be convenient. . . but I actually think it’s slightly worse than them picking their device up and walking over to the person they want to show. . . that creates communication. . . I wouldn’t want it to replace that physical interaction.” (P9)

4.3 Supporting communication about technology use within families

Our participants also valued design approaches that support more communication between family members, about how technology is used. This was seen to improve parents’ experiences and relationships because of two main reasons.

4.3.1 Supporting collaborative efforts to manage mobile device use. Our participants believed that the way in which our four proposals either involve, or affect, multiple family members would offer opportunities for them to reflect, discuss and negotiate their attitudes on how technology should be used, particularly when spending time together. In turn, they perceived that our proposals would support more collaborative efforts to manage family technology

use. Parents admitted that discussions around technology use currently tend to be infrequent and unconstructive. This can encourage parents to take individual, rather than collaborative approaches to managing their family's technology use. When parents struggle to establish or enforce shared expectations of how technology should be used within their family, misunderstandings, communication breakdowns and conflict can arise in their relationships. Therefore, participants were enthusiastic about the ways in which our proposals seemed to create opportunities for more structured dialogue about aspects of technology use. For instance, P11 suggested that Traffic Lights would prompt valuable discussions in which both parents, and children, could align on their expectations about how mobile devices should be used when spending time together.

Our participants envisaged that using Family Goal-Setter to track family members' mobile device use, with the aim of balancing it with other activities, would be especially effective at generating recurrent family discussions. Parents considered this to be an important benefit, given the changing nature of technology, and evolving family dynamics. Furthermore, participants hoped that using this proposal would help to alleviate the conflict that can arise, particularly between parents, when trying to manage family technology use. For instance, P4 felt that using Family Goal-Setter would encourage her and her husband, to reflect on their individual aspirations for their family, and to align them through '*open communication*' that she believed would alleviate misunderstandings and improve their relationship.

As participants reflected on using technologies that would help family members mediate their individual attitudes on how devices should be used, they revealed feelings of animosity that can currently arise from ad-hoc, unstructured communication around technology use. For instance, when family members attempt to affect, or even just enquire about, each other's behavior. Thus, participants like P4 envisaged that using Family Goal-Setter would be more constructive than current approaches to managing family technology use,

"I think that when there's no structure around it, it can feel like nagging. But if you've all agreed that you're going to have the discussions, and that you're going to check in on your own use, and the whole family is involved, then it provides something external, and not me saying, 'Oh! You're on the phone again?'" (P4)

By compelling family members to discuss and establish collective goals, participants perceived that Family Goal-Setter might encourage collaboration between parents who disagree about how to manage their children's technology. This was especially welcomed by parents claiming that the responsibilities of monitoring, and curbing children's device use were unevenly distributed between them. We observed that imbalances can result from practicalities ranging from technological limitations (e.g. different operating systems) to differences in parenting roles. While these imbalances are often justifiable, they can nevertheless amplify conflict between sets of parents who have differing opinions on children's technology use. P2 explained that her husband expected her to enforce his stricter rules on children's technology use, despite her caring for them on her own most of the time. She complained that this led to her children lobbying her to change or ignore the rules, which in

turn, created conflict with her husband. Therefore, she hoped that using Family Goal-Setter would alleviate some of this conflict by encouraging greater collaboration and co-operation between them.

4.3.2 Empowering families to reach collective goals. When considering our storyboards, participants could envisage how our proposals offered different ways to visualise aspects of family technology use, and expected that this would aid communication between family members, about how technology is used; by either scaffolding conversations or helping to resolve disputes. In turn, they perceived that this would empower families to reach collective goals, by supporting parents' existing efforts to ensure device use does not disrupt, or distract from, their family's other aspirations, commitments and objectives. These include parents' attempts to establish, and enforce, shared family expectations about how the use of devices is balanced with activities deemed to be more productive and beneficial, or to involve more physical movement and interaction.

Parents acknowledge that these efforts are often challenged by a lack of awareness and certainty over issues such as how long family members spend on devices and what they use them for. Therefore, our participants welcomed the idea of using visual cues, as proposed in our storyboards, to provide family members with greater transparency into each other's device use. Parents imagined that this would help alleviate the confusion and conflict they currently encounter when managing family technology use. For instance, P6 expressed her enthusiasm for the visual aspect of Traffic Lights,

"You'd have the plain hard data. . .visual proof, that's better than verbal agreements. My son has a screen-time policy, but somehow every weekend we're confused about how much time he's used. It's never clear because there's multiple devices, two gaming consoles, a computer, iPad and a phone. This is something that'd be clear and visual, so there's less negotiating." (P6)

During our interviews, participants used terms like '*middle man*' (P7) and '*stepping stone*' (P5) to describe the neutral, mediatory role that they perceived our design proposals could serve, in avoiding disagreements between family members, and supporting them to fulfil their expectations around how technology should be used at home. In particular, parents felt that being able to offer family members a shared view of their ongoing progress towards agreed goals, as proposed in Family Goal-Setter could help families to avoid conflict. For instance, P2 reflected,

"If there was a prior discussion and we all agreed on the targets, and then on that chart, everybody can see the progress. . .then there'd be nothing to dispute because it's all there, digitally." (P2)

In addition, parents told us that offering families shared visibility into aspects of their device use would motivate family members to reflect more deeply, and thus take action on their own technology use. For instance, P8 explained that her children made frequent, yet unsuccessful, attempts to raise her husband's awareness of his excessive device use and persuade him to curb it. She expressed her hope that by visualizing aspects of his device use for all to see, Family Goal-Setter might convince him to finally recognize and alter this behavior.

We heard participants suggest that displaying the behavior of family members in this way would introduce a sense of accountability and

unity, not only between sets of parents, but all family members. This led to hopes that shared visualizations of behavior could help to improve parents' experiences, and relationships, by motivating and empowering families to achieve their collective goals together. For instance, P7 imagined,

"It's visual so we can see what our goals are... that would help (my husband) and I a lot because it would align us in terms of what we want for the kids. And seeing that we're coming up to a family reward at the end, that's a wonderful way of aligning us, so it's not the kids versus the parents. It's like we're working together as a family towards a common goal." (P7)

5 DISCUSSION

While the primary aim of our study is to develop insights into how parents perceive they could benefit from specific approaches to designing interaction technologies, it also enriches knowledge about parents' experiences and practices of managing mobile device use during family time. Our parents' responses confirm previous reports that, despite the critical role that mobile device use plays within families, parents often associate it with problematic experiences, including conflict in their relationships [10, 15, 17, 59, 67]. As for whether technology design can help address these problematic experiences, the responses we gathered highlight the various ways in which parents envisage that their experiences would be improved by three main design approaches. These approaches are: (i) fostering *awareness* and (ii) promoting *proximity* between collocated family members and (iii) supporting *communication about technology use* within families.

We now discuss in greater detail, and in some cases, offer considerations of how these approaches to designing digital technologies might help improve parents experiences of managing mobile device use during family time.

5.1 Fostering awareness within families

Our findings reveal various ways in which parents' experiences might be improved by technologies that are designed to raise collocated family members' awareness of one another when using mobile devices. Specifically, by using visual cues, underpinned by a sense of proxemic interactions [30], to foster interpersonal awareness [64] within families.

Fostering an awareness of presence between collocated family members' mobile devices appeals to parents as a means of supporting them to *communicate and enforce household technology limits* (See 4.1.1). In particular, displaying visual cues can serve to remind users to curb their device use when other family members are present. In contrast, mobile devices are currently designed for personal use, and digital technologies tend to be designed to promote user engagement [32, 42]. Such technologies encourage people who engage in activities on mobile devices to create a private "invisible shield" [43]. Within families, this way of using mobile devices can give rise to feelings of social isolation [81], and motivate parents' efforts to monitor and curb mobile device use during family time [51, 87]. Yet, these efforts can be a source of stress for parents, who may also struggle to curb their own device use [62]. Our study extends prior explorations into how technologies might be designed to support intentional non-use within families [10], and suggests a

need for further explorations into subtler, less punitive, and even playful approaches that might be more appropriate within families, and more appealing to parents. For instance, supporting families to limit mobile device use when together, by allowing them to create customized reminders, reflecting their particular values and aspirations.

Parents also welcome technologies that can foster an awareness of presence between collocated family members' because of the social interactions and the *sense of connected presence* [49] that it could promote (See 4.1.3). The sense of social isolation that can be associated with the private, personal way in which mobile devices are currently designed to be used has been shown to create frustrations and concerns within families [32]. This often drives parents' attempts to enforce limits on device use during family time, and encourage family members to remain attentive to one another. However, the experience of continually reminding partners and children of the need to be responsive can be a source of frustration for parents, who admit to their own failings in this regard [7, 15]. Therefore, parents positively perceive technologies designed to promote social interactions and connected presence between collocated device users. This would help reduce their current objections to mobile device use during family time, and correspondingly, their efforts to curb it. The enthusiasm that parents have for technologies that enhance collocated mobile device use might indicate that expectations about what constitutes family time are evolving. This may include parents becoming more accepting, or simply resigned, to mobile device use becoming an increasingly ubiquitous part of family life. As such, it is worthwhile to explore whether awareness-raising strategies used to mediate intimate relationships over distance [31, 33, 52] might help to enhance the relationships of collocated family members, separated not by physical distance, but by their persistent engagement in devices. For example, maybe Griggio et al.'s [31] *Lifelines*, could inspire technologies that foster a sense of connected presence between collocated family members who are on devices, by providing them with peripheral awareness of contextual information about one another's digital activities?

Fostering activity awareness between collocated family members also appeals to parents because it would support their existing efforts to *avoid and resolve the frustrations and misunderstandings* that can arise from mobile device use within families (See 4.1.2). This is because, in addition to being designed primarily for personal use, mobile devices allow users to engage in a vast array of activities, without offering any visible indication of what is being done [42]. This makes it hard for people who are nearby to understand what users are engaged in and how much attention they might expect to receive from them. Prior work shows that, within family contexts, the type of activity engaged in, plays an important role in determining the appropriateness of device use [62] and feelings of uncertainty about what collocated family members are doing on their devices can result in frustrations, misunderstandings and family tensions [67]. Hasan et al. [32] have demonstrated that allowing collocated partners to share activity-related information while using smartphones can reduce these feelings of uncertainty, and provide awareness about how appropriate it is to interrupt each other. However, [32]'s approach of displaying the type of smartphone app in use raised privacy concerns. Our findings indicate that these concerns might be addressed by more subtle ways of raising

activity awareness, such as communicating levels of availability. Overall, parents' interest in technologies that raise awareness between collocated families, lead us to echo prior calls for further explorations into how strategies employed to mediate device use within the workplace e.g. [1, 21, 75] might be translated into technologies intended for use in domestic settings [62, 67, 76]. Yet, when doing so, our findings remind us of the need to consider the very distinct values and dynamics that exist within families [63].

5.2 Promoting proximity within families

Our findings show that parents' experiences can be improved by technologies that are designed to promote proximity between collocated family members by encouraging families to engage in collective activities using communal devices. This is because parents desire technologies capable of creating more *opportunities for communication* (See 4.2.1) and *opportunities for physical interaction* (See 4.2.2) within families. In contrast, the personal, private ways in which mobile devices are designed to be used, can mean that we lose many of the social elements of the activities we engage in [42]. Concerns over the loss of social elements mean that parents often resort to placing limits on mobile device use during family time. As well as appreciating the more social experiences of device use that these technologies might create, parents anticipate that their efforts to monitor and curb device use during family time would be much reduced. This builds on Clark's [13] desire to expand the notion of parental mediation strategies to include parents and children interacting together with and through digital technologies. It also extends current understandings of how encouraging collective activities can be used as a strategy to promote collocated social interaction within families [68]. In particular, it builds on Ferdous et al.'s [25] suggestion for technologies that foster 'togetherness' through engaging in shared activities, by emphasizing the importance that families place on using shared physical objects together, and the physical interactions that this can encourage, particularly with children. Thus, we urge further explorations of how encouraging collective activities through communal devices might improve parents' experiences of managing family technology use.

5.3 Supporting communication about technology use within families

Our findings reveal various ways in which parents' experiences might be improved by technologies that are designed to support communication about technology use within families. Specifically, by offering opportunities for family members to reflect and discuss their current and future technology practices. This is because many of the problematic experiences that parents encounter when managing mobile device use during family time, relate to the ongoing challenge of balancing the immediate individual needs and aspirations of family members with the longer terms goals of the family [50]. Different expectations about how technology should be used during family time, and even different understandings about what constitutes family time, can create tensions and conflict [7]. In particular, conflict can arise between sets of parents who struggle to align their individual perspectives on how their children, and each other, should use technology when spending time together [17]. Our findings reveal that designing technologies that support

family members to communicate about how technology should be used when they are together has the potential to help alleviate this conflict, and thus improve parents' experiences of managing mobile device use during family time.

Our findings demonstrate that technologies designed to allow family members to be aware of, or to affect each other's mobile device use, can create opportunities for joint reflection and discussion, thus helping them to communicate and negotiate their individual attitudes. Currently, the communication and negotiation around how technology should be used within families are often unplanned and unproductive, and parents desire more opportunities for collective reflection and constructive dialogue [10, 16, 17]. Hiniker et al. [35] highlight that most commercial offerings aiming to support parents to manage their family's device use are designed to enable them to impose various restrictions on their children's use. Instead, they call for more collaborative approaches that promote intentional interactions. Our study echoes this call, and further emphasizes the need to explore technologies that can better support sets of parents to *collaborate on managing device use* within their family (See 4.3.1). However, the collaborative aspect of parenting has tended to be overlooked in explorations of family technology use [2, 16, 17]. This is despite recent revelations about the imbalances in parents' relationships that can be created, and amplified by technology practices within families [17]. Our study highlights that a lack of consideration about shared parenting practices leaves parents struggling to collaborate through many of the commercially available tools designed to help parents manage family technology use. Thus, we urge researchers to pursue deeper understandings of the collaborative nature of parenting, in order to explore how we can help sets of parents to distribute the responsibility of managing their family's device use more evenly.

Our findings also show that technologies designed to offer all family members visual feedback about aspects of their collective device use can support joint reflection and discussion, about how devices should be used during family time. Furthermore, technologies that display visual information about aspects of device use to all family members can motivate them to establish shared intentions and reach their *collective goals* (See 4.3.2). Providing opportunities for re-reflection on certain aspects of device use is a common approach taken by many commercially-available tools that have been developed to support individuals to be more intentional about their device use and better able to self-regulate it [82]. Yet, despite demonstrations of how sharing information between family members can enhance their experiences (e.g. of organizing and scheduling [9, 63]), only very few studies have explored how to support collaborative efforts of regulating family technology use. For example, by prohibiting device use within families, Bruun et al.'s [10] work demonstrates that technologies designed to involve, or affect, all family members create valuable opportunities for constructive conversations about their current and future practices. Meanwhile, Dong et al. [20] provide a rare example of how gamification can be used to encourage discussions and reflections about how technology is used within families. While this example deviates from our own focus on addressing some of the parenting challenges associated with family technology use, we echo [20]'s call for further explorations into the benefits of technologies that can transform the individual and rather sober

experience of managing family device use by making it more social, and even playful.

5.4 Further explorations

Overall, our study demonstrates that design opportunities do exist, to help address the problematic ways in which mobile device use within families currently shape parents' experiences and relationships. Furthermore, our work has established an initial understanding of what these opportunities might look like, and highlighted the need for them to be further explored. We would now like to offer some considerations to researchers and designers choosing to do so.

Based on our parents' feedback, it appears that there are some 'quick fixes' which could help alleviate the pain points that parents currently associate with the use of existing mobile devices, and deserve immediate exploration. For instance, how to encourage cross-platform collaboration through applications that aim to support parents manage family device use (e.g. Apple's *Parental Control Settings*), rather than limiting controls to one parent. Similarly, the integration of technologies used in location-sharing applications (e.g. Apple's *Find My*) into the status-sharing features of instant messaging applications (e.g. Facebook's *Active Status*) could be investigated as a means of providing collocated family members with activity awareness and/or a sense of connected presence. Beyond these 'quick-fixes' to technologies that have been appropriated into family homes, our study reveals an exciting opportunity to explore how novel technologies might address some of the challenges faced by parents, by re-imagining and enhancing experiences of collocated mobile device use, so that it becomes something parents feel more comfortable with, or even encourage, during family time.

However, our study reminds us that explorations into any design approach aimed at improving parents' experiences of managing family device use must first recognize the importance of addressing the dynamic and particular nature of families. That families are diverse and parents require technologies that can cater for various aspirations and values. That parents demand technologies that can satisfy the rapidly evolving needs of growing children and newly adopted technologies. That family life can be messy, often lacking consistency and distinct boundaries around aspects such as device ownership. As we have mentioned, this is particularly important to consider when exploring how approaches to mediating collocated device use within the workplace can be effectively adapted, or appropriated, into family contexts.

Finally, our study indicates that parents desire technologies that create more playful, enjoyable and collaborative experiences of managing mobile device use, that better align with their aspirations for family life.

6 LIMITATIONS + FUTURE WORK

By surfacing valuable insights into specific ways whereby three particular design approaches could benefit parents, we are also pointing towards areas of further research that can generate deeper design knowledge into such approaches. It would be great if future studies can address several limitations of our study. First, our results are limited by our participants' ability to fully envisage using our four design proposals and so, when attempting to generate deeper

insights and design knowledge into any specific design approach, we recognize the need to explore the deployment of physical prototypes developed from more complete concepts. When investigating the deployment of such prototypes in family homes, we also emphasize the importance of understanding children's perspectives to them, despite our primary objective of improving parents' experiences. Third, we remind researchers to consider alternative design approaches to try and improve parents' experiences of managing family technology use. After all, the three approaches revealed by our study were directly informed by our selection of four design proposals from at least 60 initial ideas, and so, are surely not exhaustive. Fourth, this paper has highlighted a few concerns that parents raised while reflecting on our proposals, and it is important for such concerns to be further explored when generating more specific design guidance on how to better support parents' efforts of managing mobile device use within families. We also welcome more diverse, cross-cultural insights into how technology design might improve parents' experiences, given that all our participants were from urban areas of Australia. Lastly, at the time of our study, the full impact of COVID-19 in Australia was not being felt by our participants. Yet, it would be of interest to understand how the effects of the pandemic might have influenced parents' attitudes on the use of mobile devices within families, and specifically, what constitutes 'family time'.

7 CONCLUSION

While technologies play a critical role in supporting family life, the use of mobile devices within families often lead to undesirable experiences for parents. Stress arising from misunderstandings and even conflict between parents have been reported. So, this paper reports on our efforts to explore whether technology design might be able to help alleviate some of the challenges and problematic experiences parents face, especially when trying to manage device use during family time. We effectively used scenario-based storyboards to prompt parents to discuss the perceived benefits of four design proposals. This contributed to an understanding of how parents' experiences might be improved by three particular approaches to design: (i) *fostering awareness* and (ii) *promoting proximity* between collocated family members and (iii) *supporting communication about technology use* within families. It also helped to identify several directions of further exploration for those interested in understanding, and responding, to parents' perceptions of how to make family technology use a more appealing and desirable prospect. Through this, we hope to take a small step towards technologies that can support parents' aspirations for how their family's time together is spent.

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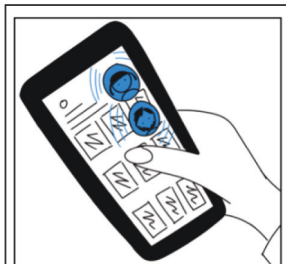
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APPENDICES: STORYBOARDS 1-4

The following pages provide an overview of the annotated sketches used that comprise each of the four storyboards that we presented to parents during interviews. We presented each sketch at full-screen, and in sequence, while narrating the annotation.

APPENDIX 1. STORYBOARD 1 (WAVE)

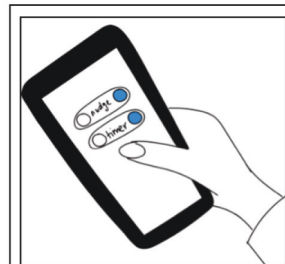




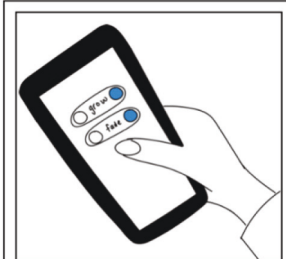
...the icons 'jiggle',
as if waving for attention



Wave can be installed
on multiple devices, and on
multiple profiles of shared devices...



...and a variety of options are available
to easily determine when, and how, icons
appear...

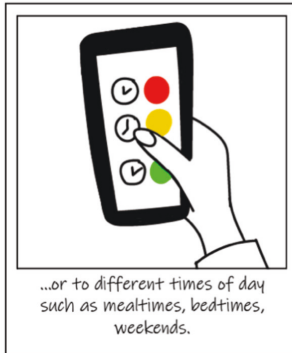
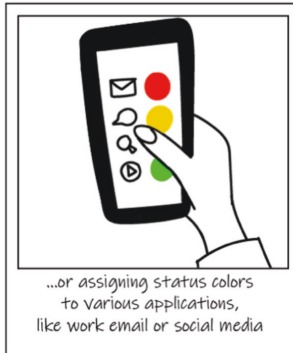
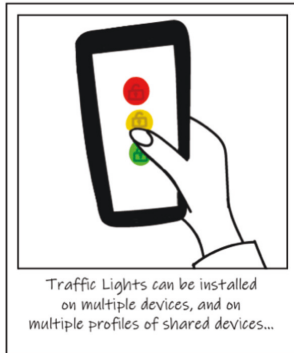
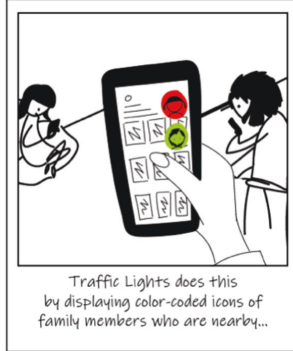
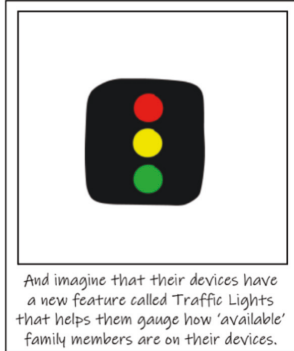
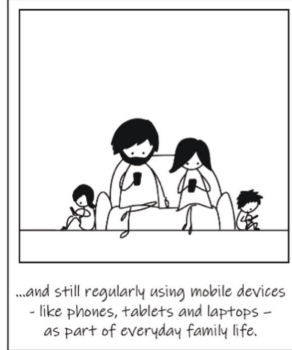
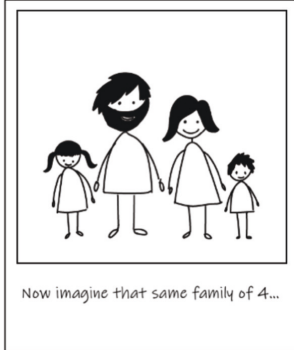


...and a variety of options are available
to easily determine when, and how, icons
appear...



...as well as to determine if and how
family members can respond to
(or ignore) each other's Wave

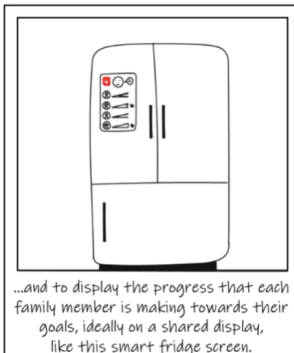
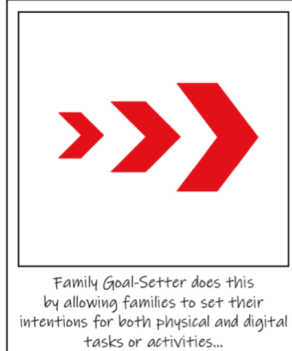
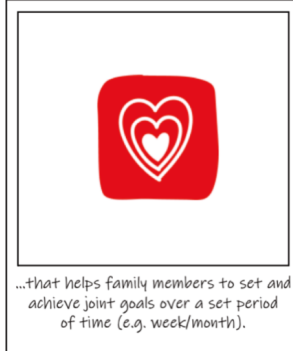
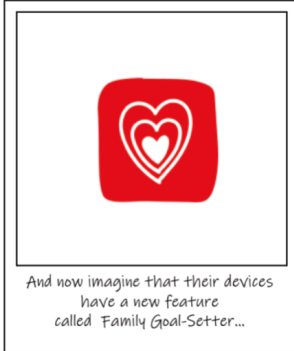
APPENDIX 2. STORYBOARD 2 (TRAFFIC LIGHTS)

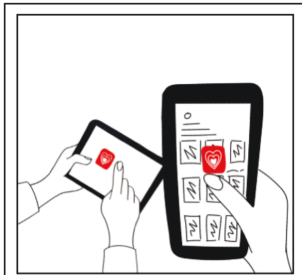


APPENDIX 3. STORYBOARD 3 (SHARED SPACE)

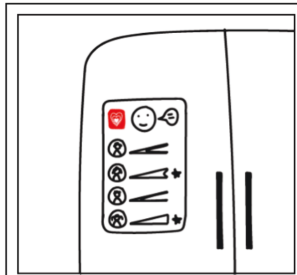


APPENDIX 4. STORYBOARD 4 (FAMILY GOAL-SETTER)





Progress can be viewed on any device at any time...



...and a shared display to foster a sense of teamwork and act as a daily reminder (like sticker charts and notice boards ofused for scheduling chores).

Appendix 2 Study One | Workshop

Appendix 2.1 Photos taken during the Exploratory Workshop





Your Family's Experience with Digital Technology

Parents of children under 12 years needed for a UTS Study

Research Workshop – Sunday June 17th 2018

Digital technology is playing an increasing role in our lives and I am interested in learning about your family's experience with the devices in your home.

- I am looking to speak with parents or caregivers of children under 12 years of age
- To attend a 2hr workshop on Sunday June 17th 2018 (select a time slot)
- Fun, informal, active session at our Design Lab (Ultimo, UTS)
- Shopping Voucher for attendees as a gesture of appreciation
- Children will not be required to attend*
- To sign up, please email: eleanor.c.derix@student.uts.edu.au

ABOUT ME

Hi, I'm Eleanor, a mum-of-two living in Sydney's Inner West studying at UTS.

I'm exploring the role of digital technology in family homes, and want to hear from YOU.

As a designer, I've helped companies create new digital products & services over 10 years. Through this work, and especially after becoming a mum, I have become interested in some of the more complex issues around how we use these devices we have come to rely on.

My aim with this research is to help inform designers about how to create products and services that can support families.

As a parent myself, I understand that time is tight. I hope attending the session will provide you with an opportunity to hear from other parents and reflect on your family's own use.

If you are interested in taking part, please complete and return the attached form eleanor.c.derix@student.uts.edu.au

Thanks!

Oh, and if you'd like to know more about me, my Supervisor Dr Tuck Leong, or UTS you can find some info at the following links:

*www.eleanorchinderix.com
www.tuckwahleong.com*

*(*Please let me know if you might need to bring your child along)*



Your Family's Experience with Digital Technology

Parents of children under 12 years old needed for a UTS Study

Research Workshop - Sunday June 17th 2018

Yes, I'm interested in taking part!

Name:

Mother / Father / Caregiver:

Occupation:

Digital devices most commonly used by you:

Number of child(ren):

Ages of child(ren):

Digital devices most commonly used by your kids:

Do you or have you ever regularly used the Voice Interface on any of your devices?
(e.g. Siri on iPhone). If yes, please describe:

Do you currently have a voice interface device in your home?
(e.g. Alexa, Google Home etc.)

If not, do you have any plans or have you thought of getting one, or

Do you have any other internet-connected devices in your home (connected child monitors/ smart-meters/ in-car systems etc.)

Preferred Session Time: 10am-12pm 2-4pm

CONTACT: email
phone

Thank You!

PARTICIPANT CONSENT FORM

Research Project: 'Family Experiences of Digital Technology'
Design Research Workshop, June 17th 2008

Principle Researcher: Eleanor Chin Derix

Thank you for agreeing to participate in this 2-hour research workshop. We don't anticipate any risks associated with your participation, but you have the right to withdraw from the workshop at any time.

Ethical procedures for academic research require that participants explicitly agree to participate and how the information contained in this workshop will be used.

This consent form is necessary for us to ensure that you understand the purpose of your involvement and that you agree to the conditions of your participation. Please read the following information and certify that you approve the following:

- the workshop will be recorded and a transcript will be produced.
- the transcript of the interview will be analysed by Eleanor Chin Derix.
- access to the transcript will be limited to Eleanor Chin Derix & academic colleagues / researchers with whom she may collaborate as part of the research process.
- any summary workshop content, or direct material from the workshop, that are made available through academic publication or other academic outlets will be anonymized so that you cannot be identified, and care will be taken to ensure that other information in the interview that could identify yourself is not revealed
- the actual recording will be kept by Eleanor Chin Derix of UTS.
- any variation of the conditions above will only occur with your further explicit approval or a quotation agreement could be incorporated into this participant agreement.
- any words from the workshop may be quoted directly.
- all or part of the content of your workshop may be used; in academic papers, policy papers or news articles / on our websites and in other media that we may produce such as spoken presentations / in an archive of the project as noted above.

I hereby agree to the above conditions and to voluntarily take part in this workshop.

_____ Participant Name

_____ Participant Signature

_____ Researchers Signature / Date

Please contact me about future studies (Email address): _____

Appendix 2.3 Examples of Worksheets from the Exploratory Workshop

ICEBREAKER

NAME: *Kim* AGE: *47*
 EDUCATION: *UNI*
 EMPLOYMENT: *IT knowledge Administrator* STATUS: *FT/PT.*

MY FAMILY
 AGE, NAME AND GENDER OF CHILDREN: *6 - Iris - Boy*
 LIVING ARRANGEMENTS: *All together 2 - Vita - girl*
 SUBURB: *ROSEBURN*
 CULTURAL BACKGROUND: *BORN VIETNAM. RAISED COUNTRY AUSTRALIA*

+ DIGITAL TECHNOLOGY
 DEVICES USED BY ADULTS: *TV, iPad, iPhone*
 USED FOR: *work, news, entertainment*
 USED WHEN: *Night*
 DEVICES USED BY KIDS: *TV, iPad, iPhone*
 USED FOR: *Entertainment, games*
 USED WHEN: *Night + mornings*

VOICE INTERFACE DEVICES?: *OWN/INTERESTED/NOT INTERESTED*
 DETAILS - WHY/WHY NOT? *No, affordability, trust*

MY ATTITUDE TO DIGITAL TECHNOLOGY: *loss of security*

←-----→

I can't keep up! *Cautious* *All of these* *Interested* *Can't live without it!*

BECAUSE... *it can be so useful, can definitely live without it, affordability can't keep up. Tech addicts in a service context, not investigate explorative*

MY ATTITUDE (TO TECH) SINCE BECOMING A PARENT:

←-----→

More Conservative *more frustrated with ease of use* *Bit of both* *More enthusiastic*


BECAUSE... *technology is too consuming -> not still being it is the only effective punishment im pretty sure our kids wish there was a parent aristotle*

ESTABLISHING FAMILY VALUES - WHEN IT COMES TO DIGITAL TECH

←-----→

We Set Rules *Bit of both* *unfortunately - it is the most effective behavioral control.* *Easy-going*

BECAUSE... *I am home with kids the most, however, our quality of time together is so much better without them*



ICEBREAKER

NAME: Alexandra Worland Akai AGE: 36.
EDUCATION: M.Bus / MBA.
EMPLOYMENT: Global Opportunities Manager STATUS: FT/PT. PT.
@ Woods Bagot.

MY FAMILY

AGE, NAME AND GENDER OF CHILDREN: 2, Maximilian, male
LIVING ARRANGEMENTS: Renting 15, Alycia, female
SUBURB: Erskineville
CULTURAL BACKGROUND: 1/4 Australian, My husband is Cook Islander.

+ DIGITAL TECHNOLOGY

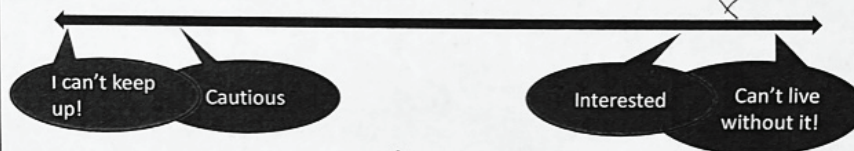
DEVICES USED BY ADULTS: laptops, iPhones, TV
USED FOR: work, personal use, university study.
USED WHEN:

DEVICES USED BY KIDS: iPhones, TV (Alycia uses macbook air too).
USED FOR: distraction @ restaurants! relaxation / education
USED WHEN: Alycia nothing over 9pm, Max we try to limit to 30min max per day

VOICE INTERFACE DEVICES?: OWN INTERESTED / NOT INTERESTED

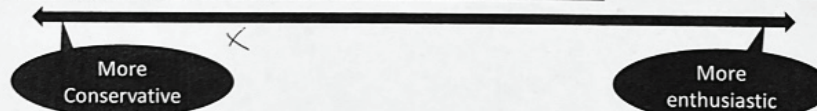
DETAILS - WHY/WHY NOT? excited about possibilities but concerned about privacy aspect

MY ATTITUDE TO DIGITAL TECHNOLOGY:



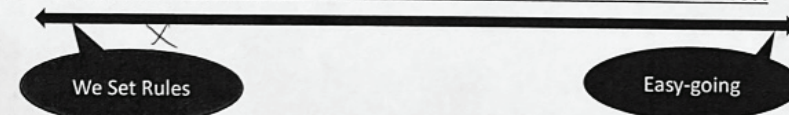
BECAUSE: ... everything in life seems linked to devices or online accounts (social media etc).

MY ATTITUDE (TO TECH) SINCE BECOMING A PARENT:



BECAUSE... makes me more concerned about privacy and security

ESTABLISHING FAMILY VALUES - WHEN IT COMES TO DIGITAL TECH



BECAUSE... time restrictions not at dinner table etc



KIDS

FaceTime connection with grandparents (overseas for 2 weeks) meant Max could connect meaningfully!

EVERYONE

Google Maps - how did anyone get to random sports fields in Sydney before google maps.

this is great for everyone!

Social connection through social channels.

Shared calendars - keeps family organised

PARENTS

ordering UberEats last night meant we had food by time we got home - everyone was tired + hungry!

Small handheld devices used for uni research in bed! while having tea + toast. (no need to sit at desk)

immediate access to knowledge (but this does mean, you don't think for too long, just google)



KIDS

- entertainment, games
- education
- music
- social media (dependent on age)

facebook
instagram


EVERYONE


- weather, date, calendar
- text, google map, travel
- Facetime, Skype
- Family interaction due to distance.
- great communication tool for everyone.
- knowledge is unlimited

PARENTS

- shopping, meals, banking
- more convenient gives us more freedom/time to spend or better allocate our time with kids.
- great communicating tool.
- relaxing techniques/methods




|  | KIDS | EVERYONE | PARENTS |
|---|--|---|---|
| | Games School research / projects | Message / Text * Tickets Digital music Digital assistant * Weather Face time * with family Movies + TV Books | Shopping Shipping Order meals Digital Newspaper / magazines (also worried kids don't see what I'm reading / doing) Maps Banking (but worried kids don't interact with money + banking at all) Facebook Work research / communication |




* Also has negative impacts

ACTIVITY 1a

NAME Bernadette Warbrick

|  | KIDS | EVERYONE | PARENTS |
|---|---|--|---|
| | - Learn about the world around us; videos, documentaries. - | - Seeing photos and videos of the mothers friends baby in email. - Watching things together. | - Seeing photos of and videos of my friends baby in email - Online Shopping; convenient and easy. - Maps; Google Map to get around, on mobile. |



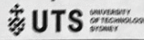


I LOVE IT...

- Web
- Learning apps
- Entertainment services
- Smart voice interaction idea
- Tune at, engage/immersive
- Assisted help around the house
- Touch technology /
- Mobile device / Ubiquitousness
- Communications
- convenience
- 0369 - work

...BUT SOMETIMES I HATE IT

- unstructured + hard to trust sources
- because you're screen dependant
- so easy to use (for the kids)
- untrustworthy / exposed and removes human interaction
- low interaction
- affordable, ~~Cost~~ good for a small number of people
- digging the world up - Environmental impact, hard to get
- too ubiquitous, loss of interaction
- expected to be available
- be ~~exposed~~ lived experience
- always available



I LOVE IT...

- When we can look at photos of my friends together baby
- When we can speak to my friends + family through skype.
- Researching different things like kids activities for school holidays.

...BUT SOMETIMES I HATE IT

- because we lose human interactions.
- Lose human interactions.
- Information overload, too much stuff on there. I get a bit overwhelmed.





I LOVE IT...

- I LOVE TO HAVE EVERYTHING IN MY HAND, ACCESS TO A LOT OF INFORMATION, AND BEING ENTERTAINED WHEN I AM BORED

- TO BE ABLE TO ORDER EVERYTHING ONLINE

...BUT SOMETIMES I HATE IT

- BECAUSE I GOT THE IMPRESSION TO BE TOTALLY PASSIVE IN FRONT OF MY DEVICE, AND ALSO I HATE IT BECAUSE I GOT THE FEELING NOT TO BE A GOOD FUDGE FOR MY KIDS.

- LACK OF HUMAN INTERACTION



I LOVE IT...

Instant gratification

ease

save time

access information

...BUT SOMETIMES I HATE IT


Instant gratification can hurt relationships
replace necessary skill sets ← everyday skills
interpersonal


Waste time b/c of how much there is


a lot of misinformation


- ~~product~~ ~~extra~~





| | THAT'S NOT OK... IN FRONT OF THE KIDS | THAT'S NOT OK... AT CERTAIN TIMES | THAT'S NOT OK...EVER |
|---------|---|--|--|
| PARENTS |  - watching violent movies / adult movies - parents fighting | - using the phone at dinner time at home - using headset | - using phone while driving. - to have access to illegal content. - |
| KIDS | | - using netflix or youtube - playing video games - using headset | - being tracked (with snapchat for example) - access to have access to inappropriate content (psa, violence) |

| | THAT'S NOT OK... IN FRONT OF THE KIDS | THAT'S NOT OK... AT CERTAIN TIMES | THAT'S NOT OK...EVER |
|---------|--|--|---|
| PARENTS |  - ignoring childrens needs - ignoring childrens needs while on technology. | - Using technology at mealtimes unless there's an emergency. | - Driving using a mobile - Fighting with kids over technology; giving them time to finish what they are doing. |
| KIDS | | - Using technology at mealtimes unless there's an emergency. | - Using technology all the time - there should be times when you can use it. |

| | THAT'S NOT OK... IN FRONT OF THE KIDS | THAT'S NOT OK... AT CERTAIN TIMES | THAT'S NOT OK...EVER |
|---------|--|--|--|
| PARENTS |  TV inappropriate Disagreeing about technology social media | screens at the dinner table / breakfast using devices in car Screens | screens at the dinner table Violent games Using devices while driving Tracking / cameras - aristotle advertising |
| KIDS | | too noisy Headphones in public Screens while socialising gaming Screens instead of homework playing with work computer | hook em up + violent games Online shopping Prank calling Pokemon - virtual games unsafe behavior / bullying |

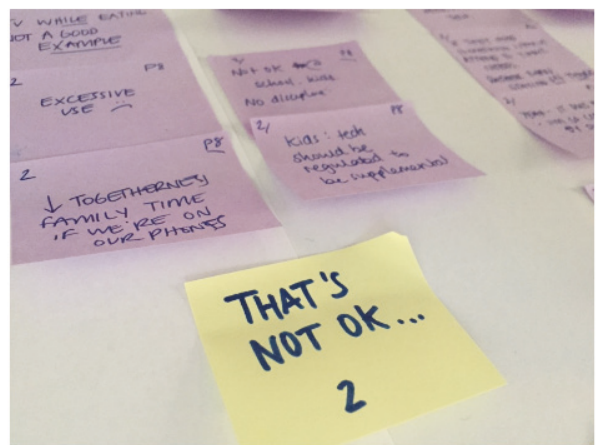
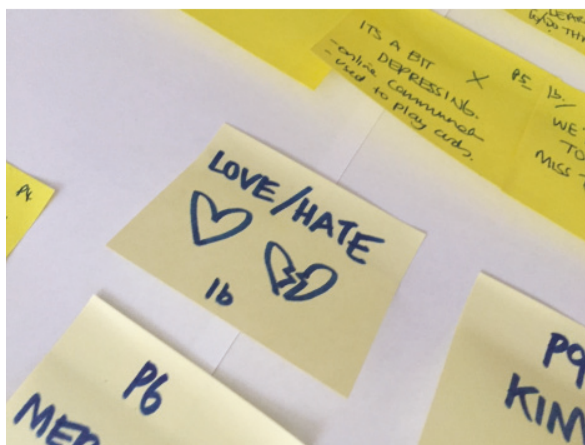
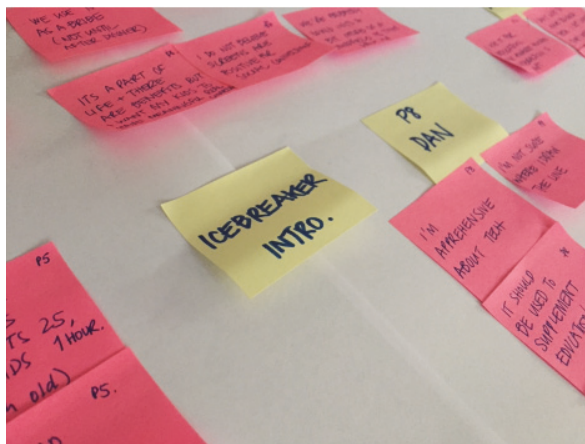
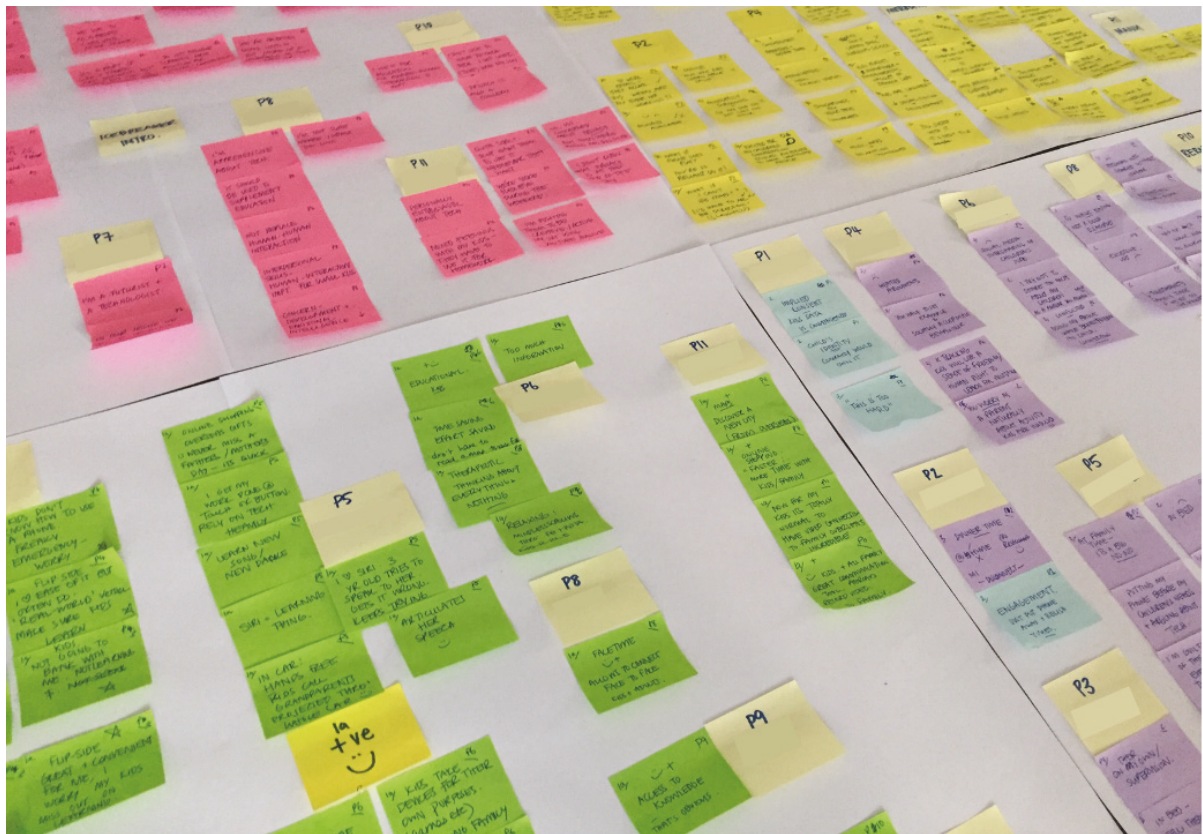


| | THAT'S NOT OK... IN FRONT OF THE KIDS | THAT'S NOT OK... AT CERTAIN TIMES | THAT'S NOT OK...EVER |
|---------|---|---|--|
| PARENTS |  During family time accepting phone calls / social media Putting my phone before my children's needs Arguing about technology | Driving family time (activities, fun time) | Meal time as a family Crossing the road When we have visitors (family or friends) Using technology to bully people |
| KIDS | | At school family time (activities, fun time) | Meal time as a family Crossing the road In bed When we have visitors (family or friends) |



... watching in moderation

Appendix 2.4 Preparing Data from the Exploratory Workshop



Appendix 2.5 Codebook Examples: Parents' Complex Experiences

| Code and description | Examples of in vivo description |
|---|--|
| <p>Apprehensive</p> <p>Parents associate family tech use with fears, concerns and uncertainty.</p> <p>Related early codes:</p> <ul style="list-style-type: none"> • Apprehensive • Cautious • Uncertainty • Concern/Worry • Privacy | <p>P1: I'm quite cautious about the whole idea of putting anything that listens into your house and privacy concerns, I don't have a huge amount of trust in big organisations that are building these things. I guess I find it is one those weird kind of things where I'm very interested in it professionally and personally, but I kind of have this thing where I don't really know yet what I think when it comes to my kids, but hopefully I'll get to work it out as they get a bit older and yeah, that's how it is at the moment.</p> |
| | <p>P2: I think I'm really reliant on technology, I think our family is predominantly, all of us have a bit of a tech addiction. Which I feel incredibly guilty about now being a mother myself. So, a bit like P1, I'm quite cautious, particularly since Max has come along, like what is this tech meaning he has access to? Yeah, so we've tried to set up some kind of tech values, like not having phones at the dinner table and not after a certain time and kind of removing yourself from the family situation, if you want to go and do something online, but it doesn't usually work.</p> |
| | <p>P5: My kids like to use YouTube Kids and I'm very cautious about privacy. So I set a lot of things on the settings, I make sure that they can only search up until a certain point. It's very important to me, so they're only looking for their age appropriate (content).</p> |
| | <p>P6: My own attitudes towards (technology)? Because I'm a marketing professional is that I have to be interested in, that's really important. But probably since becoming a parent, it has made me think about it more, particularly role modelling behavior, you know. And I think it's, you know, it really bothers me, like, last night, I said to my husband, I was like, "you've just taken a call, while we were all having dinner, and you're just telling everybody that that's more important. So, when (our son's) 13, and on a device, how are you going to tell him to stop?" But you know, I think it is a part of life, there are benefits of it, but also I want my children to have meaningful real connections and things like that and I just don't believe that screens are a positive thing for that. Even TV, we have rules around that, you know, around, we actually use that as a bribe. So yeah, I think you just have to have some guidelines that can help you as a parent, particularly when they're younger. We're probably going into a minefield as they grow up, and I don't let him play with my phone, either. To be honest, he'd break it.</p> |
| | <p>P8: Regarding digital technology, I think I'm apprehensive about it. In many respects, I think it should be primarily used to supplement education, not to replace human-to-human interactions. That's one of my biggest concerns is that, the human-to-human interaction is very important for developmental reasons and for emotional intelligence reasons. So, I think that's paramount...generally speaking as a developing child, I think the human-to-human interaction is very important, I think when they get older and establish some of the like I said, the interpersonal traits and ways to meaningfully interact with humans, then you can kind of allow technologies play a little bit of a bigger part. So that's kind of where I stand.</p> |

| | |
|---|---|
| | <p>P9: My attitude to technology? I guess I'm a bit apprehensive about it, though I do love it. I'm at home mostly with the kids and I do appreciate their appreciation of technology so I can do the dishes or whatever. But my wife is, is very strict. So the kids get that conflicting approach, which is a bit tricky for them. Since I grew up without technology, so to see what the kids have these days is a bit sort of overwhelming. So I guess, I work in IT myself and I'm enthusiastic about digital technology as a concept and the futuristic stuff, but I'm not so enthusiastic about it at home. I guess we all use that as a service more than anything else. We don't sort of sit there and Google things and find out about the world and investigate things. And the kids certainly don't they just sort of sit there with one expression on their face the whole time. So yeah, so as a service, I guess. We certainly have some controls over it but I admit we do use it as a behavioural control thing for our six year old and it's, unfortunately the only effective thing that works. So hopefully, I can learn some things one day that hadn't change that.</p> |
| <p>Ambivalent</p> <p>Parents have mixed feelings about family tech use (associate it with pros and cons)</p> <p>Related early codes:</p> <ul style="list-style-type: none"> • Pros and cons • Mixed feelings • Contradiction • The flip side | <p>P1: Our two girls are 3 years and 9 months, so still very young, so far my kids are only really engaged with entertainment - so television, maybe an iPad now and then. But there's no Internet or social media or those concerns yet, I think those types of things will start to come later. I'm quite cautious about the whole idea of putting anything that listens into your house and privacy concerns, I don't have a huge amount of trust in big organisations that are building these things. I guess I find it is one those weird kind of things where I'm very interested in it professionally and personally, but I kind of have this thing where I don't really know yet what I think when it comes to my kids, but hopefully I'll get to work out as they get a bit older and yeah, that's how it is at the moment.</p> <p>P6: I think it's quite reassuring being able to find information online as a parent, but I would caveat that I am quite mindful of going too far with research as there is too much information so making sure I go to the right websites and things. Entertainment is a positive experience, binge TV is one of the most positive things in my life at the moment! Mindless scrolling through Facebook and Instagram once the kids have gone to bed as well, there's something quite therapeutic about that. Just thinking about everything and nothing... (But, later) (Technology use) helps to keep family life on track sharing calendars, things like that; who is where and when, what needs to be bought, that just is invaluable and means it's not just all one person's responsibility. Access to information is good, though too much access to information is difficult and maybe sometimes you should go with a gut instinct. Sometimes you search the Internet to confirm that decision. I also think the time wasting on Facebook, Instagram and social media, I think it makes you a bit stupid and a bit unbalanced – it's that whole point of view on the world. I'm not too worried about privacy whatsoever, I think that horse has bolted.</p> <p>P9: My attitude to technology? I guess I'm a bit apprehensive about it, though I do love it. I'm at home mostly with the kids and I do appreciate their appreciation of technology so I can do the dishes or whatever. But my wife is, is very strict. So the kids get that conflicting approach, which is a bit tricky for them. Since I grew up without technology, so to see what the kids have these days is a bit sort of overwhelming. So I guess, I work in IT myself and I'm enthusiastic about digital technology as a concept and the futuristic stuff, but I'm not so enthusiastic about it at home. I guess some we all use that as a service more than anything else. We don't sort of sit there and Google things and find out about the world and investigate things. And the kids certainly don't they just sort of sit there with one expression on their face the whole time. So yeah, so as a service, I guess. We certainly have some controls over it but I admit we do use it as a behavioural control thing for our six year old and it's, unfortunately the only effective thing that works. So hopefully, I can learn some things one day that hadn't change that.</p> |

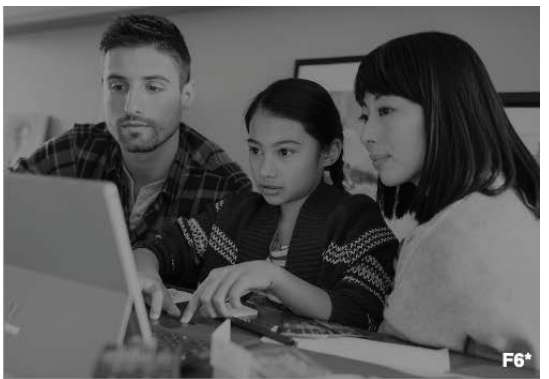
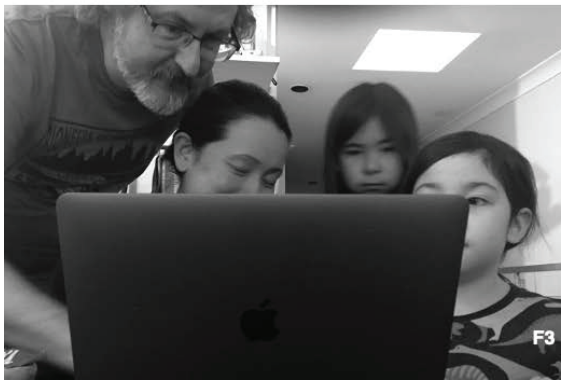
| | |
|--|--|
| | <p>P9: I love social media, Snapchat, Facebook, Instagram. But I also hate that it is like an alternate reality and you just want to shut off from that and remember what's important, that it's not all rainbows. It's just people trying to show how great their lives are and that can get people down as well. I love entertaining the kids with apps like YouTube kids, games, but the flip side of that, socially, as they get older, will they be able to interact with each other? I love using it for shopping and take out but I don't want my children not to know how to buy groceries or how to push a trolley around the shop, or how to feel the fruit. Back in the day my dad used to hit on a watermelon (to tell if it was ripe) to see if it was good. I want them to be able to do that as well not just a click on a button.</p> |
| | <p>P10: In terms of (positive experiences for) parents I said shopping banking, all those apps has just made our lives easier, more convenience, give you more freedom, you know? Which means we have more time to spend with our children. In terms of technology access, I agree that we sort of allow it to dominate our lives. So, learning the basic things like learning to read a map, going down to the bank, down to the shop, to physically get a loaf of bread. That is kind of being diminished – with Uber, we like the convenience at our door so we're going to need that. But we are going to become lazy or pretty consumed in our house by all this technology.</p> |
| | <p>P11: I am personally quite enthusiastic with technology because I used to be an IT consultant, but with my kids I have mixed feelings. They have to use it for school and homework during the week, but we are quite strict, and we don't want them to use it whenever they want. So we try to plan during the week when they can use it for the homework, so like during dinner time, they can't use the phone or that kind of thing. But it's true that during the weekend, we are more flexible and they can play more with their device. On one hand, I want my kids to use devices to develop their creativity, because they can do really incredible things with those iPad and things. So I'm really pushing them to try to be creative and not to be inactive. But I don't like it when they're watching YouTube, clearly I'm trying to stop that. So that's my point of view, I'm trying to make them active with this kind of device. And regarding privacy, we are not willing to have voice interface. We have Siri because of the iPhone, but we're not using it and we didn't buy any (VoI) device because we are concerned about privacy, but at the same time we are using Facebook and putting pictures of our children on Facebook. So, I don't know what privacy is exactly, but knowing that somebody is recording what you're saying all day long – that's too much.</p> |
| | <p>P3: Mine are very similar experiences. For me personally I love the ease of (online) shopping, being able to shop from all the shops overseas that I used to go to and read online (international) newspapers and magazines. And online banking etc. The flip side of that is that while its great and convenient for me, I worry that my kids are missing out on all the opportunities to learn how to do all these things. So, they are not coming along to do all these things with me (physically). They're not coming to the bank with me, they're not learning the money with me. They're not seeing that I am reading the newspaper and not playing a game. Whereas I grew up seeing my parents reading newspapers and learning that they were valuable and important. So I have this flip side of it that I love the ease of it but will often do the real life version of it to make sure that the kids are learning what I am doing. It's the same with the telephone calls as well. My kids don't know how to use the telephone which absolutely freaked me out the other day. When I realised my 8 year old had no idea what a phone number was because they're so used to pressing a button and if they don't have the actual device with them with that same button they would have no idea how to call me in an emergency. That was a bit freaky.</p> |

| | |
|--|--|
| <p>Compromising</p> <p>Parents feel that family tech use compromises aspects of family life and child development</p> <p>Related early codes:</p> <ul style="list-style-type: none"> • Pros and cons • The flip side • Missing out • Long-term effects | <p>P3: Also how individually tailored (online content) is, particularly with my kids. They get used to ‘well I want to watch my things’. And I have 3 kids all wanting to watch separate things and it’s not helping them learn to...share and do things collectively as a group. And sometimes “it’s time to watch your brother’s Pokémon, and I know it sucks but when you grow up you might appreciate it later on”. They also miss out on that randomness of unplanned experiences, everything is very tailored, “<i>I want this, this and this</i>” and they can get it.</p> <p>P3: So, the positives, it gives us freedom in terms of more time and everything is at your fingertips. Its less paperwork and you can synchronise your technology if you have one particular thing like Apple. Benefits are having (access to) knowledge...but with knowledge, on the flip-side I get a bit sick of it being right all the time. You can’t con (the kids) anymore, you used to be the fountain of all knowledge and now they are like ‘ no Mum, you’re wrong’</p> <p>P7: Its interesting having heard that actually. The age that my kids are at the moment, I prefer to take them shopping with me for the real experience of it and its actually some time that we get to spend together. My wife does the amazon stuff.</p> <p>P3: My big (rule) that’s ‘<i>Not OK in front of the kids</i>’ is screens in bed, but then I end up doing the same thing in bed once they’re asleep, and very often they are asleep with me in my bed while I am secretly watching!</p> |
| <p>Conflict/Conflicted</p> <p>Parents associate family tech use with differences of opinion and disagreements. Includes disputes between parents and children and disputes between parents. Also includes parents feeling internally conflicted (guilty) about how tech is used</p> <p>Related early codes:</p> <ul style="list-style-type: none"> • Disputes • Disagreements • Frustration • Disapproval • Differing Roles • Differing Approaches • Differing Values • Guilt | <p>P3: I've got a complicated family set up, living with my mother and my sister, because the kid's father has passed away. So we're sort of a bustling household. And I'm probably the most conservative about technology in the house, my mum and my sister would just go to town on it given a chance. But I sort of set down the rules that we can't use it at the table. And I'm forever chasing the kids off everyone's machines and screens that they've stolen and hidden around the house. <i>(Break)</i></p> <p>P5: I'm a little bit more lenient, as I have a nine month old running around, I've got a lot going on, I can't - I say five minutes, but then I'm like, "Oh, my God, it's been 25 or an hour". And then I'm like "shivers, what do I do?" you know? But I do find it useful for educational reasons as well, like my daughter learnt her ABCs, and uses sounding out word apps, Mathletics is being introduced in schools, that's all gone online as well, that we're going into my five year old, probably in the next couple of years. So, I mean, I like it and I think it's great. But also, as my husband will tell you, I'm a bit more lenient than him. he's very strict. (Break) For ‘That’s not OK, ever’ (I put down) using your phone during family time. Putting my phone before my children’s needs, arguing about technology. I’m guilty of all of this, I can’t even read this, I feel bad. I’ve done all of this</p> <p>P6: My own attitudes towards it, because I'm a marketing professional is that I have to be interested in, that's really important. But probably since becoming a parent, it has made me think about it more, particularly role modelling behaviour, you know. And I think it's, you know, it really bothers me, like, last night, I said to my husband, I was like, "you've just taken a call, while we were all having dinner, and you're just telling everybody that that's more important. So, when (our son's) 13, and on a device, how are you going to tell him to stop?" But you know, I think it is a part of life, there are benefits of it, but also I want my children to have meaningful real connections and things like that and I just don't believe that screens are a positive thing for that. Even TV, we have rules around that, you know, around, we actually use that as a bribe. So yeah, I think you just have to have some guidelines that can help you as a parent, particularly when they're younger. We're probably going into a minefield as they grow up, and I don't let him play with my phone, either. To be honest, he'd break it.</p> |

| | |
|--|---|
| | <p>P6: For 'That's not OK' (I put down) 'breastfeeding my child and checking my phone.' I remember my mum saying to me that that was the time you should be talking to your child and it's so true. That mindless scrolling you do it because you feel lonely and it helps you feel connected. When actually being mindful that you are in fact connecting with your child, that's important. So, conflicted as I was always doing that but I did realise and try to enjoy the time.</p> |
| | <p>P9: One thing I put down (on the worksheet) that we shouldn't do in front of the kids is to disagree about technology. So if we do that they go, 'ah, we'll go to her now' so that's the parents who shouldn't disagree about technology in front of the kids, even though there's definitely a difference between our approaches, towards technology and where the kids are concerned, and it's a bit of an issue that the kids just feed off when they spot it. So when the kids have left the room we can discuss it. Also, the advertising, I can't stand it, it drives you nuts, (the kids) just press all the buttons and see all these things. Also at mealtimes, (my wife) spends quite a lot of time at the dinner table online shopping and I can't stand it. Not ok ever – is gaming, I don't understand gaming, I don't get it. Last night we were at a party and some kids were playing Fortnite, a game, it just was – I'd never seen him so happy, I was just shocked and in the end I had to drag him away from watching the game. And later I will have to teach them about online safety.</p> |

Appendix 3 Study Two | Probe & Interview Study

Appendix 3.1 Photos of the Sets of Parents who Participated in Study Two



* Stock images represent F2 & F6; photos of P3 & P4 and P11 & P12 unavailable.

Appendix 3.2 Participant Information Sheet for Study Two

PARTICIPANT INFORMATION SHEET FAMILY EXPERIENCES OF DIGITAL TECHNOLOGY

WHO IS DOING THE RESEARCH?

My name is Eleanor Derix and I am a PhD Student at UTS. My supervisor is Dr Tuck Leong, also at UTS.

WHAT IS THIS RESEARCH ABOUT?

This research explores the role that digital technology plays within today's families. Specifically, how the use of digital technologies such as smartphones, tablets and other internet-connected devices shape the experiences, interactions and relationships within families.

This research is looking to understand the way digital technology fits into the everyday life of families. While I am interested in what, how and why families use digital technology, I am particularly focused on how this affects the feelings of individual family members and families as a whole.

As such, in households with two parents/caregivers, I will be asking both to participate in this research. While I am interested in learning about the experiences of all family members, this research will limit engagement and active participation with parents and care-givers.

WHY HAVE I BEEN ASKED?

You have been invited to participate in this study since you are the parent/caregiver living in a household with your child/children under the age of 12 years of age.

IF I SAY YES, WHAT WILL IT INVOLVE?

If you decide to participate, I will invite you to participate in a two-week study:

- I will ask you and your partner to participate in an Initial semi-structured Interview that will take approximately 1 hour.
- I will introduce you to a set of activities to be completed over a period of approximately 2 weeks.
- I will ask that some of the activities/tasks be completed individually, and some together with your partner. The activities I will ask you to complete should take no longer than 10 minutes per day.
- I will ask if I can collect the completed activities (completed worksheets etc.) after approximately 2 weeks.
- I will ask you and your partner to participate in a Final semi-structured Interview that will take approximately 1.5 hours in total. I will ask to interview you individually for approximately 30 minutes each and together for approximately 30 minutes.
- Both interviews and the activities will take place at your home, at a time that is convenient to you.
- Both interviews will be audio/ video recorded and transcribed.
- During my visits to your home I may ask to photograph you and your partner, your devices and areas of your home relevant to your description of your family's use of digital technology.
- I will not ask to interview, or take photographs of your children or any other family members other than your partner/co-parent.

ARE THERE ANY RISKS/INCONVENIENCE?

I have designed this study to minimise any risk or inconvenience that you might experience. I will attempt to be as flexible as possible with interview schedules and aim to keep the time required to complete activities to a minimum. If at any time you feel uncomfortable with any of the questions, or activities, please don't hesitate to communicate that to me.

DO I HAVE TO SAY YES?

Participation in this study is voluntary. It is completely up to you whether or not you decide to take part.

WHAT WILL HAPPEN IF I SAY NO?

If you decide not to participate, it will not affect your relationship with the researchers or the University of Technology Sydney. If you wish to withdraw from the study once it has started, you can do so at any time without having to give a reason, by contacting Eleanor Derix.

If you withdraw from the study, any transcripts or information collected from you will be deleted or destroyed. However, it may not be possible to withdraw your data from the study results if these have already had your identifying details removed.

CONFIDENTIALITY

By signing the consent form you consent to the research team collecting and using personal information about you for the research project. All this information will be treated confidentially. Your information will only be used for the purpose of this research project. In all instances your information will be treated confidentially.

I plan to discuss/publish the results in academic forums such as academic conferences and journals. In any publication, information will be provided in such a way that you cannot be identified.

WHAT IF I HAVE CONCERNS OR A COMPLAINT?

If you have concerns about the research that you think I can help you with, please feel free to contact me. (eleanor.c.derix@student.uts.edu.au, [redacted])

You will be given a copy of this form to keep.

NOTE:

This study has been approved by the University of Technology Sydney Human Research Ethics Committee [UTS HREC ETH17-1811]. If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on ph.: +61 2 9514 2478 or email: Research.Ethics@uts.edu.au, and quote the UTS HREC reference number. Any matter raised will be treated confidentially, investigated and you will be informed of the outcome.

Appendix 3.3 Study Two: Probe Activity Pack Checklist

Welcome! And Thank You!

I really appreciate you taking the time to participate in this study.

Activity Pack Checklist

1. My Digital Family Tree

- 2 copies – each parent to complete 1 individually
- To be completed in the first few days – don't compare 😊
- Use icons, write or draw

2. Our Digital Family Tree

- 1 copy – to be completed together
- To be completed in the last few days
- Use icons, write or draw

3. Secret Life of Use

- 2 copies – each parent to complete 1 individually
- To be completed over 2 days

4. Family Experience Jar

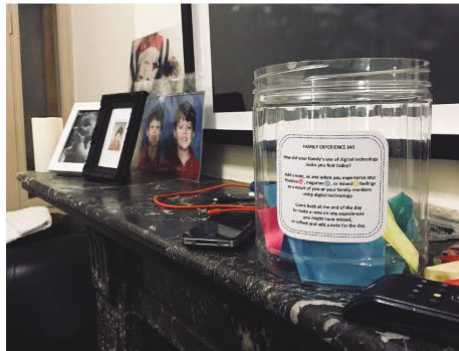
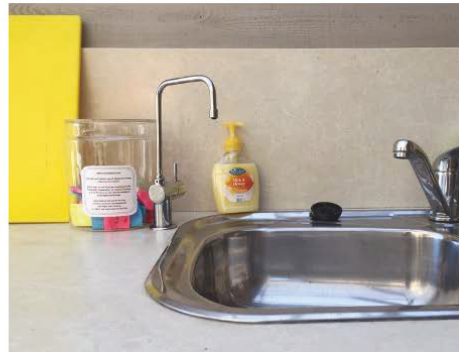
- 1 jar – both parents to fill individually with notes on post-its
- Add a note at least once a day throughout the study

I will collect your completed Activity Pack on the agreed date,
and visit a few days later for a final discussion.

Meanwhile, please don't hesitate to contact me if you have any questions:

eleanor.c.derix@student.uts.edu.au

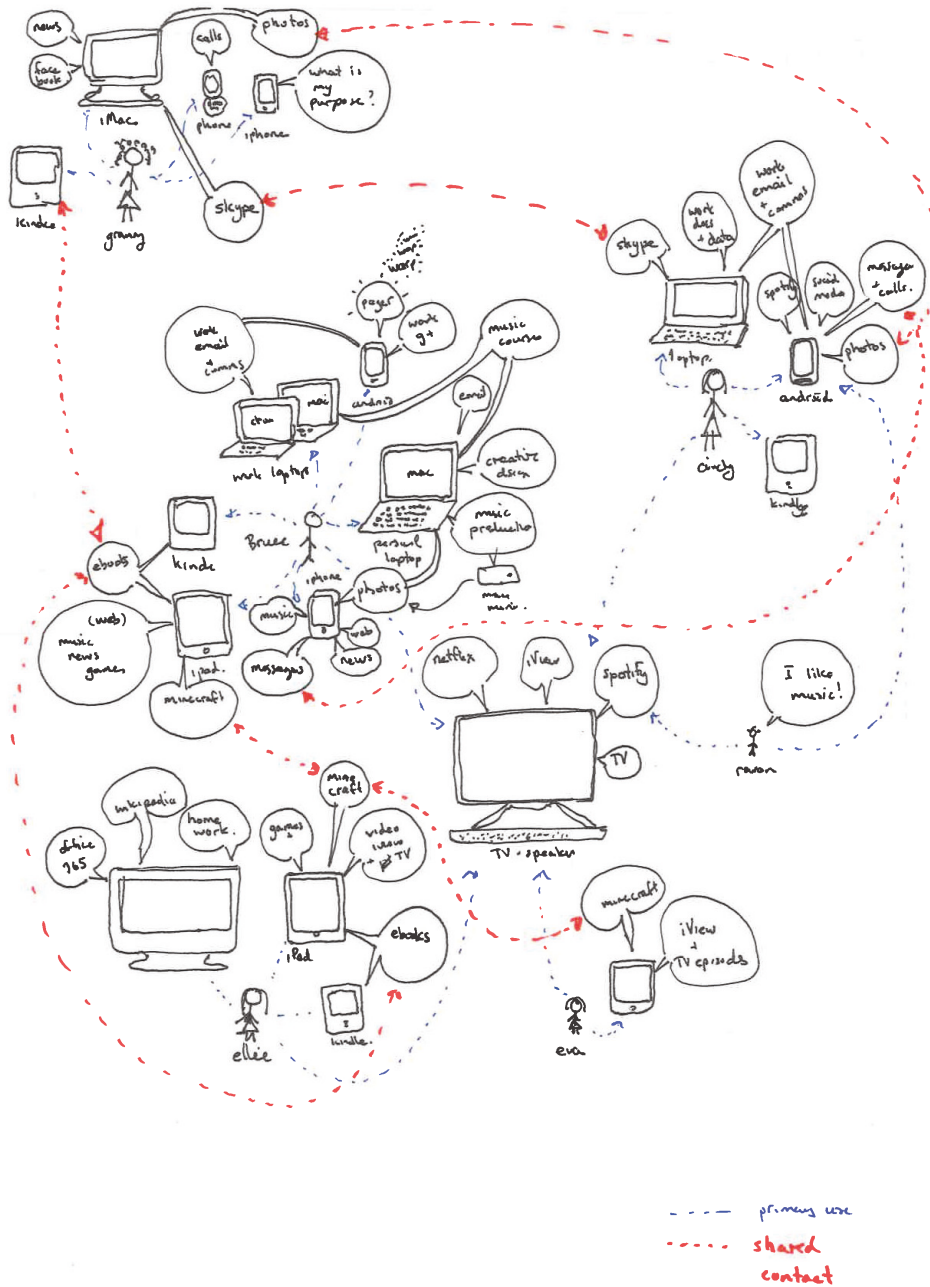
Appendix 3.4 Sample Photos of Probe 1: Family Experience Jar



Appendix 3.5 Example Responses to Probe 2: Digital Family Tree

My Digital Family Tree

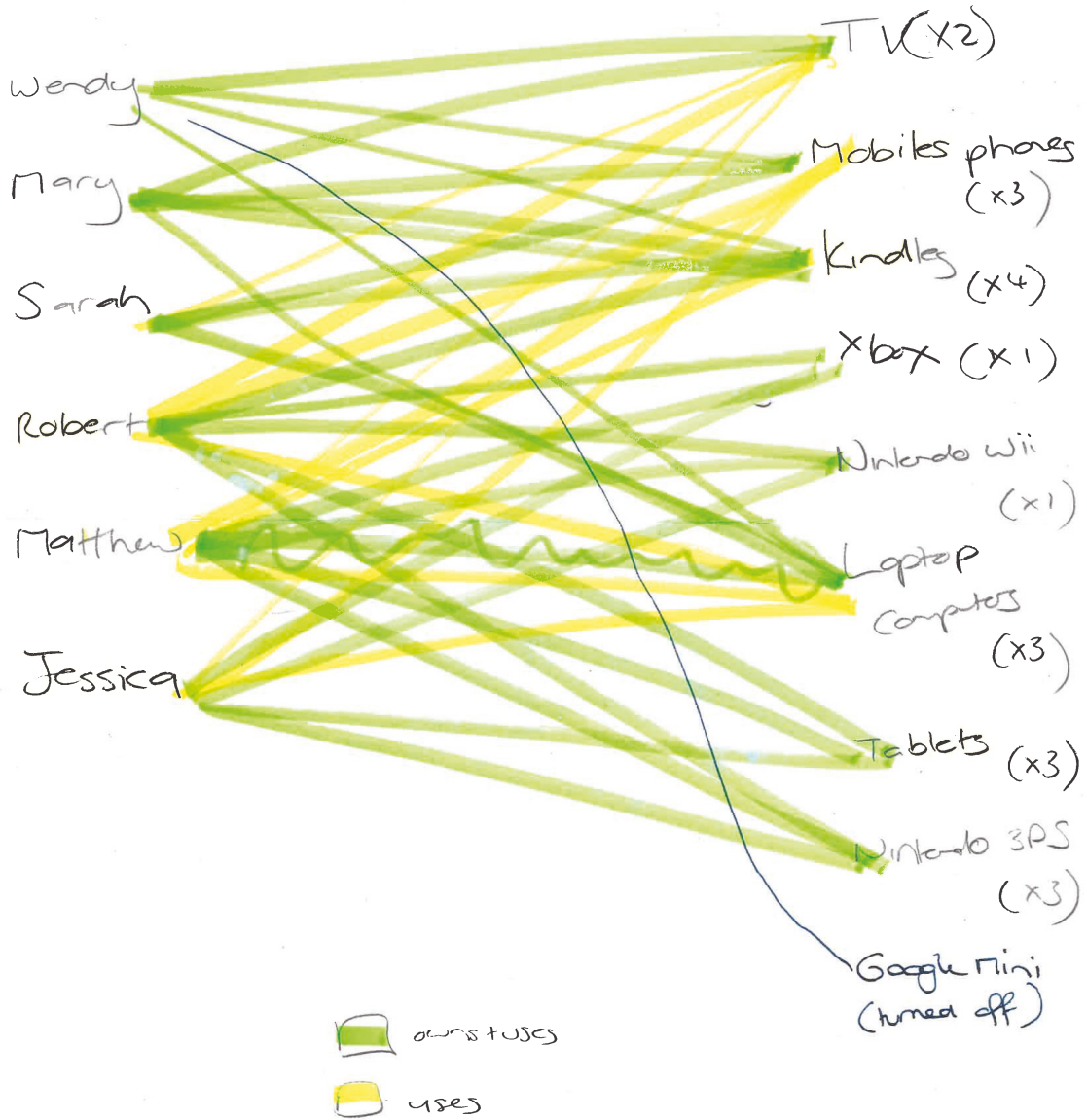
Including the digital devices in your family, roughly map your relationships.



Device-centric tree.

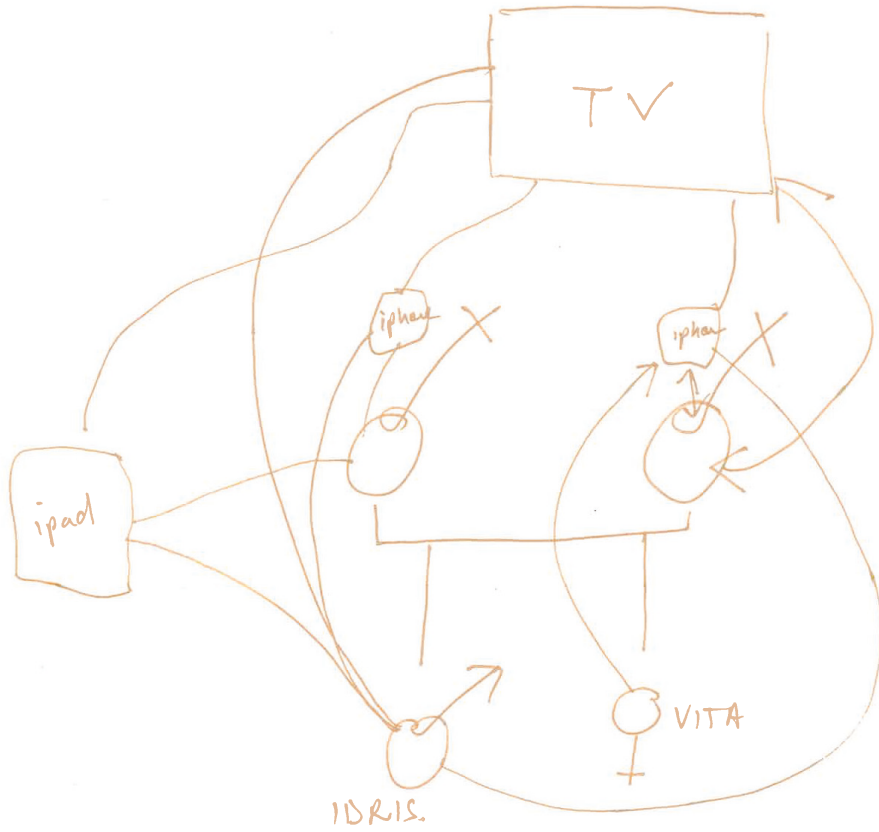
My Digital Family Tree

Including the digital devices in your family, roughly map your relationships.



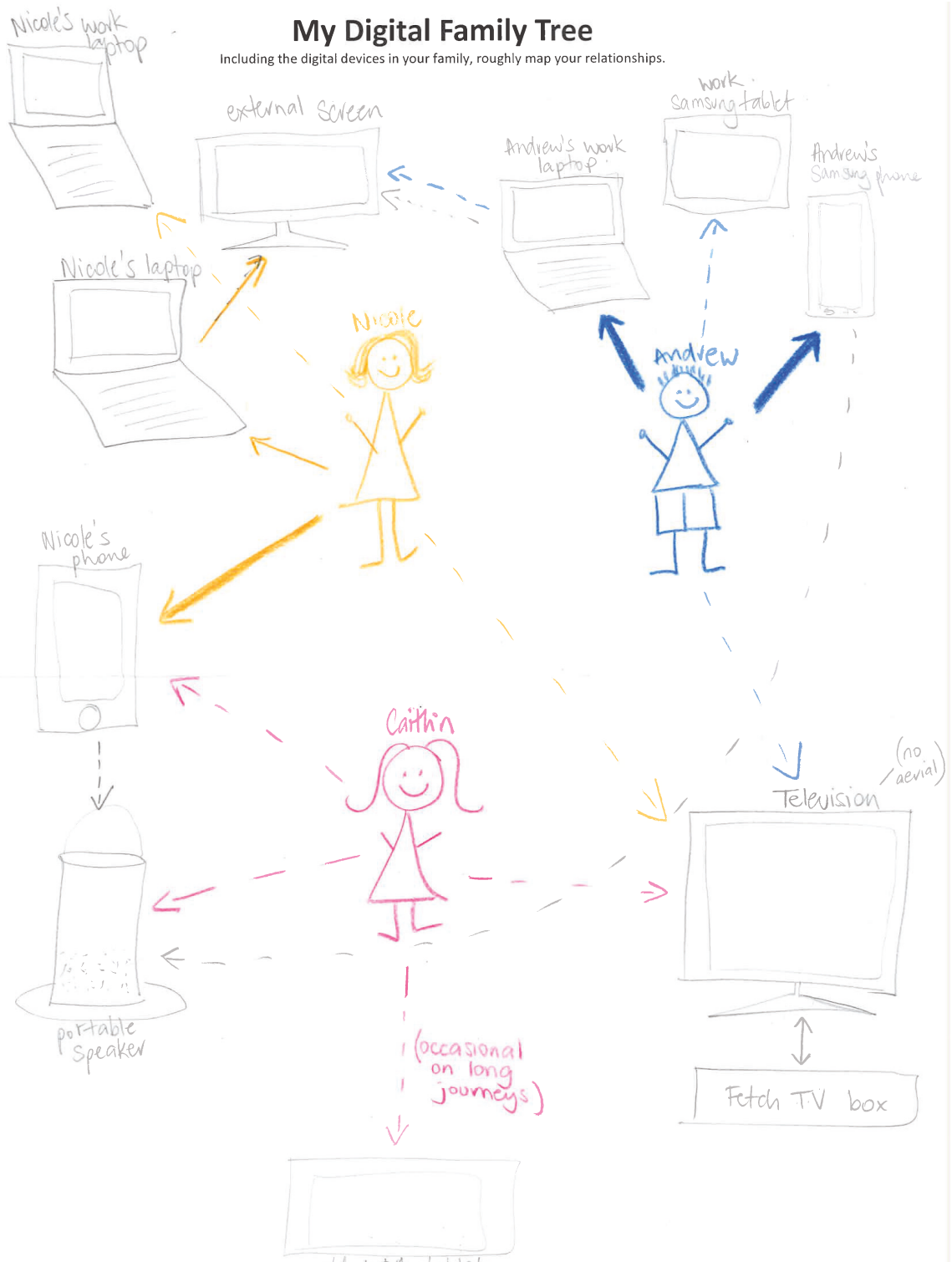
My Digital Family Tree

Including the digital devices in your family, roughly map your relationships.



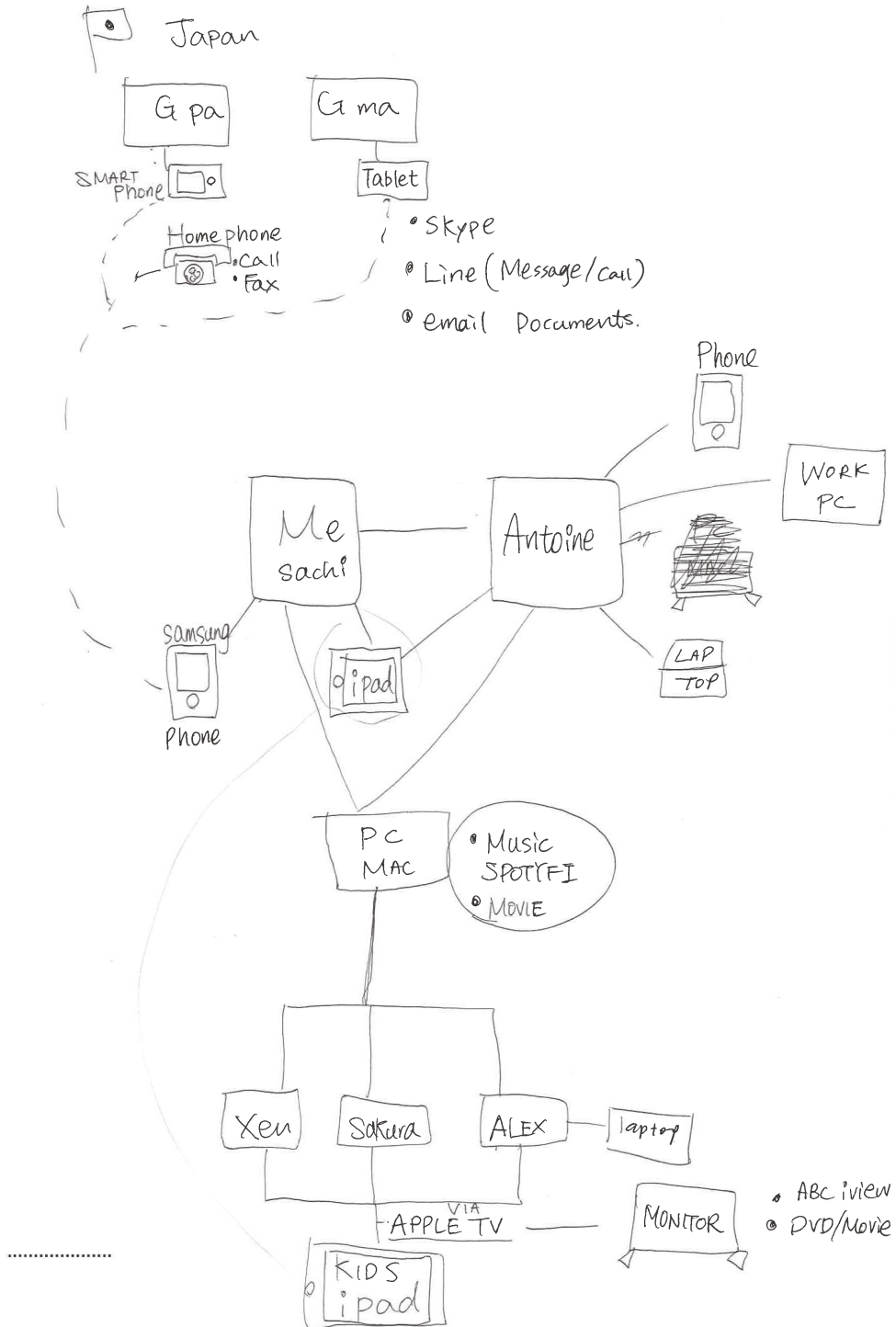
My Digital Family Tree

Including the digital devices in your family, roughly map your relationships.



My Digital Family Tree

Including the digital devices in your family, roughly map your relationships.



Appendix 3.6 Example Responses to Probe 3: Device Journal

Introduce Yourself

Think about the device that YOU use most often.
What would that device say about you?

You seem a bit needy, frequently checking in on various social + work networks, more to see if anyone has tried to reach you. Most of your attention at home goes on the kids, apart from engaging with them pretty much all the time, you are busy with the banalities of housebound life. I can see your dependence on ways to distract from the household, which is where digital devices come into the picture. Generally, you're a typical working mum, well educated, middle class, left voting, champagne social.

Device
iOS (phone)

Introduce Your Family

Think about the device that your FAMILY uses most often.
What would that device say about your family?

You are a close little family who value most spending time together, but that is rare and your device behaviours illuminate four people with vastly different preferences and past times while two of you are fairly independent, self directed, happy doing your own thing, the other two of you are codependants, reliant heavily on the company and attention of those around you. Your family generally seem busy, engaged in separate spaces, work places, children and school everyday and regrouping at the end of each day.

You're country hillbillies, strangers to suburbia, awkwardly placed in inner-city / Pacific suburban PAD Device



Day 1

What would your devices say about you and your family in the morning?

e.g. When you wake up...

You're a loud bunch who no matter how many days are the same, appear completely disorganised and unprepared for the day - its a miracle you manage to get to all your destinations.

e.g. When you get ready to go out...

"Where's my ---"
- sunglasses
- wallet
- glasses
- keys
Honestly, how you navigate this daily chaos is truly amazing.



Day 1

What would your devices say about you and your family in the afternoon?

e.g. When you are out...

You look tired. Do you need help? Are you the nanny? Why are you anxious? Our devices would advise me to enjoy the day together rather than breaking out while the rest of the family did just that.

e.g. When you get home...

Hooray. You made it. While you all seem tired and as withching hour ~~cresces~~ crescendos to its fullest it seems you are all happy to be home together.



Day 1

What would your devices say about you and your family in the evening?

e.g. When you relax...

Device: You are playful + fun reading stories, building things, mucking around, what a nice cosy family

e.g. Before you go to sleep...

Device: Calm wind down, quiet

Anything else?

Any other devices?
Any other comments or gossip? ☺

we both spend our days digitally immersed in office work.

Natasha will say I spend a lot of time watching TV, which is true.

While she spends a lot of time online, on her mobile without even realising.

The messaging around digital behaviour and use is inconsistent between us to our kids.



Day 2

What would your devices say about you and your family in the morning??

e.g. When you have breakfast...

Device: You guys are happy to be sitting doing breakfast together, but in a flash the energy turns to chaps! Idris has snuck off with your phone again

e.g. When you plan your day...

Device: You guys need a roster. You have the same logistical conversations every day, but its impressive that it all works out



Day 2

What would your devices say about you and your family in the afternoon?

e.g. When you are get from A to B...

Device: Good to have a family on bikes though you do have an anxious vibe as you ride along together trying not to crash into too many people. A short distance for dropoffs and work but usually the nicest time together

e.g. When you keep in touch with each other...

Device: Brief and to the point. You definitely worry about getting the kids on time more than Natasha. Most days don't keep in touch during the day.

Introduce Yourself

Think about the device that YOU use most often.
What would that device say about you?

I get used most by the lady in the family but she is a bit unpredictable. Most days she picks me up first thing in the morning and will spend a few minutes checking emails or facebook. Some days she leaves me with the 2 little people and ignores me for a while even when I have important things to tell her. Some days she seems to like me and enjoy using me and will check + unlock me frequently, while other days she just puts me in a bag or a desk and ignores me. I find it hard to read what mood she will be in from one day to the next and some days when she ignores me and my important messages I think I must have done something wrong. But she seems to rely on me at night so she must love me, right?!

Device
Phone

Introduce Your Family

Think about the device that your FAMILY uses most often.
What would that device say about your family?

The lady and the man know how to use me and are very good at finding the right programme. However, the little ones don't always like it and as so I get very confused. I think the lady enjoys watching me and the big little person too, but the little little person often gets upset and sometimes turns me off or hits me. I don't think the man likes me much. If he does put me on he often ignores me and spends more time watching his laptop screen.

The man + lady are gentle and caring with me, cleaning me and looking after me. The little ones are more rough and often put sticky fingers or lips on my screen which I don't like.

TV
Device



Day 1

What would your devices say about you and your family in the morning?

e.g. When you wake up...

TV
Device

I must be the most important thing for them in the morning as I'm the first thing they put on. I'm not on long however, and usually by breakfast time I've been turned off.

e.g. When you get ready to go out...

Often I'm very useful when the family are getting ready to go out. The lady often checks for an activities to do that day, or looks at recipes and makes shopping lists. Sometimes she sets directions in google maps.

Phone
Device



Day 1

What would your devices say about you and your family in the afternoon?

e.g. When you are out...

Phone
Device

Today the lady is with the little people so she is not using me much. She did use me briefly to check her emails while the little people were swimming. The rest of the time she put me away and spent all of her time with the little people.

e.g. When you get home...

This is another important time for me. The lady is a bit stressed with the little people and is trying to get them to sit still so she can hang out the washing and sort out dinner. But the little ones are not paying me much attention until their favourite programmes come on - Hey Dougie and Peppa Pig.

TV
Device



Day 1

What would your devices say about you and your family in the evening?

e.g. When you relax...

phone.

Device

The lady isn't using me much today as she seems tired and wants to relax in front of the TV. She looks at me from time to time but mostly she just watches TV.

e.g. Before you go to sleep...

As usual the lady likes to play games on me for a few minutes before going to sleep. Then it's light's off and we all go to sleep.

phone

Device

Anything else?

Any other devices?
Any other comments or gossip? ☺

Kindle - most days I'm stuck in a bag unloved, but today the lady was using me, mainly in secret. At times while the little people watched TV, she sneaked out to the bedroom to use me for reading. It only lasted 5 minutes before the little people came to find her, but she seemed to enjoy the 5 minutes of peace.



Day 2

What would your devices say about you and your family in the morning??

e.g. When you have breakfast...

TV

Device

I think this is one of the lady's favorite times as she uses me to help keep the little people entertained so she can prepare breakfast.

e.g. When you plan your day...

This is another useful time for me as it allows the lady to search for activities on the internet on her phone while the little people are distracted.

TV

Device



Day 2

What would your devices say about you and your family in the afternoon?

e.g. When you are get from A to B...

phone

Device

Today the lady used me as a Sat nav as she couldn't find the directions on the car Sat nav. I'm usually pretty reliable which keeps her calm so at least getting lost is not something she has to worry about!

e.g. When you keep in touch with each other...

At swimming lessons the lady took some photos and videos of the little people to send to the man. He replied with a smily face.

phone

Device

FAMILY EXPERIENCES OF DIGITAL TECHNOLOGY

OPENING INTERVIEW GUIDE

Ph.D. Research

Researcher: Eleanor Chin Derix

Interaction Design + Human Practice Lab, School of Software, University of Technology Sydney

Participant Information and Consent Form

Discussion Guide (60 minutes total)

DISCUSSION (30 mins)

Introduction (10 mins)

You + Your Family (10 minutes)

You, Your Family + Digital Technology (10 mins)

Digital Technology: Attitudes + Expectations (5 mins)

INTRODUCTION TO ACTIVITIES (30 mins)

Fortune Cookies (5 mins)

Digital Family Tree (5 mins)

Experience Jar (5 mins)

Secret Life of Us (2 Day Journal) – including Podcast (5 mins)

Install App – Moment/Mute/Space etc. (10 mins)

OPENING INTERVIEW GUIDE

Introduction + Housekeeping (10 minutes)

Hi, my name is Eleanor and I am a PhD student at UTS.

Thank you for allowing me to join you today.

Recording.

I would like to record our discussion today, in both video and audio, and will capture certain moments with a camera. This is just to ensure that I capture your thoughts and opinions accurately, and I can assure you that neither your name nor picture will ever be used publically. Is it all right if I turn the camera on?

Participant Information and Consent Form.

My overall goal on this project is to capture insights about how family experiences are affected by their digital technology use. I aim to publish these insights within my PhD thesis and at academic studies. Your identity will be kept completely confidential in the event that any of your information or quotes are published. In order to do this, I need you to read and sign a Participation Information and Consent Form. Basically, it says that you understand the aims and intentions of the study, agree to participate and that I may use the insights that I capture as part of my research and in academic publications.

Please take a minute to read over it and sign it before I start.

Time.

I'll spend the next 30 mins learning about your family's experiences with digital technology and talking a bit about your everyday family life, and broadly about your attitudes, the things you value and how you tend to make decisions as a family

I will then spend about 30 mins introducing you to some activities that I will ask you to complete over the next 10-14 days.

Can I just confirm you are still free for the next hour?

Questions.

Do you have any questions before I start?

Your + Your Family (10 mins)

Who lives in your house with you? *

Could you tell me a little about your work?

And what is your favourite thing to do on the weekend or during free time?

With and without your family?

How would you describe a typical day in your families' life?

How about a typical week? Any particular routines? Most important parts of the week/rituals?

What parts of the week/time/activities do you value most? Would not like to miss, or stick to even if you are away/have visitors?

Other Values

You, Your Family + Digital Technology (10 mins)

Could you tell me about the way you tend to use digital technology in everyday life?

Could you tell me about the way your family tends to use digital technology in everyday life?

Would you mind showing me the devices you have been talking about?

Would you mind showing me where in the home you tend to use them?

Digital Technology: Attitudes + Expectations (10 mins)

How would you describe your attitude towards digital technology?

Changed since becoming parents?

What are you most excited/optimistic about when it comes to incorporating technology in your family life?

Any challenges that you experience?

Anything you'd like to change/improve when it comes to your family's use of digital tech?

How?

Any rules?

Sharing

Trust

Rules

Time

Appendix 3.8 Study Two: Closing Interview Guide

FAMILY EXPERIENCES OF DIGITAL TECHNOLOGY USE

CLOSING INTERVIEW GUIDE

PH.D. Research

Researcher: Eleanor Chin Derix

Interaction Design + Human Practice Lab, School of Software, University of Technology Sydney

DISCUSSION (60 minutes)

Overall impressions/thoughts/reflections from completing the probe activities

+ compared to first interview

Review – Family Experience Jar

Overall number of positive, negative and mixed experiences
Positive experiences – which ones? Why?
Negative experiences? Reasons?
Mixed experiences? Reasons?

Review – Digital Family Tree

Compare each parents' individual digital family tree with each other
Compare each parents' individual digital family tree with joint family tree

Review – Device Journal

How are device's described
Relationship between people and devices
Relationship between devices within family
Relationship between family members
Perceptions about other family member's device use

When reviewing all probes, consider:

Complex experiences
Children's use of tech
Parents' use of tech
Technology rules/limits
Expectations about tech use
Parents' perceptions of each other's tech use
Parents' perceptions of children's tech use
Children's perceptions of parents' tech use
Appropriateness of tech use in various contexts
Differences in attitudes/practices/approaches between parents? Reasons?
Conversations/collaboration between parents about managing family tech use?
Tension/conflict between parents?
Shared experiences
Togetherness
Could differently designed technologies help to improve any issues? How?

Interesting learnings/surprises from participating?

Implications of participating? Changes attitudes/plans to change practices/rules?

Final thoughts/comments?

Appendix 3.9 Transcript from Study Two: Opening Interview (S2P7 & S2P8)

Date: November 2018

Duration: 84mins

SPEAKERS

S2P7, S2P8, Eleanor Derix

ED

OK, I'll start please by taking some basic information. So I know who lives in your house – S2P7, S2P8, and your oldest daughter is how old?

S2P7

She's 15, turning 16 in December

ED

And your youngest daughter?

S2P7

Two years old

ED 0:49

And you're both originally from Iraq?

S2P7

Yeah. And then we lived in Dubai. We have all our family overseas.

ED

And how long have you lived in Sydney for?

S2P7

13 years.

ED

And can you both tell me a little bit about what you do for work?

S2P7

Okay, so I'll start. I do engineering drafting, eight hours a day I sit in front of the computer using software called AutoCAD, drawing detailed sections from a building that it's been designed architecturally and we are doing the structural side of it.

ED

And have you always done that sort of work?

S2P7

Yes, since I came here in 2007 until now.

ED

And before that?

S2P7

Before then I did sales engineering. I worked as a sales engineer for aluminium company selling doors and windows.

ED

And do you have a preference of what you prefer doing?

S2P7

I think selling, if I have a choice maybe being a sales engineer is better than sitting there in the office. Its more interacting with people and its more diverse there's lots of different things. It's not like doing the same thing, like building a house, or building a high rise building, and starting from scratch and doing the same system. The repetition is killing me.

ED

What do you find is a positive thing about what you're currently doing?

S2P7

This is a hard question at the moment because I'm sick of it. What's the positive, there are lots of positives like it's good income, very stable. I have work, its flexible. The people I work with, they are so nice. And they respect me and they love me. Knowledge, yeah, in every job there is a little bit of knowledge I can add to my, to my experience about the things we do because every site is different than the one before. But not to the point that it satisfies me. I want more at this stage of my life.

ED

Do you have ideas about what would be more satisfying?

S2P7

I think interacting with people. I want to get my English to the level that I will be satisfied with. I think just to deal with people. Because what I deal with is just the drawing and the monitor. We have interactions between us in the office but we are a company of 6 so it's just limited, but maybe I'm seeking something more.

ED

And S2P8,

S2P8

I manage a small IT consulting company. Our company is small, there is now 16 of us. I set it up about 10 years ago. My role is from idea strategy of the business to sales and marketing, to finance, to managing delivery, clients, account management, to hiring.

ED

Do you have a typical day?

S2P8

It varies. I travel a lot. But if I'm in the office, there will be almost a tradition of for the first at least couple of hours, it's going through emails. Then working on whatever is on the day, it could be meetings, internal or external. Could be working on a document, or preparing a demo or a piece of code or not, it depends on what's required so, you know, no kind of standard day.

ED

And what do you enjoy about it?

S2P8

I do enjoy the variety of activities and I do enjoy being my own boss.

ED

Okay, can you tell me a bit about that about?

S2P8

I guess I have the freedom to do stuff the way I want. I guess its pros and cons at the same time, you don't have a structure that you just follow and be a cog in a wheel and give you that kind of safety. So there's a bit of risk slash anxiety with all you do, because there is no one to tell you what to do, really. But also, at the same time, the challenge of the freedom to explore whatever I want to explore. So if we want to go left then we go left, if I want to go right then let's go right. I mean, obviously not dictatorship, but I can set the strategy into a direction.

ED

And can I ask, what you did before this?

S2P8

Well, my career changed, like I started life as a site engineer, which is completely different to what I do now, then I became a trainer. Then I became a consultant. And I work as a consultant for four years. And then from consulting, I started the business, basically.

ED

And, so S2P7, you work four days a week?

S2P7

Yeah

ED

And can you switch off at the end of the day or do you find yourself getting emails after hours?

S2P7

No, I can switch off.

ED

But you (S2P8) work you working five days a week, and do you stick to fixed hours?

S2P8

I try to yeah, I try to. So, no, in a typical week, it's never nine to five. Could be 7 to 6, it could be 10 to 4, but it's typically within that, I mean I don't do, I don't work up to 12 every day its not that. But yeah, it's not 9 to 5 work.

ED

And you have business travel?

S2P8

It's usually domestic travelling. Mostly Melbourne, I go to Canberra and Brisbane sometimes. Sometimes for a couple of nights, sometimes a single night, sometimes the same day going back and forth. Usually I plan the trips a week before. So my next week trip is already organised and I try to keep it to that.

ED

Do you think that if you have a work trip the routine of the family changes much?

S2P8

When I travel?

S2P7

Yeah. Like normally when he's in Sydney, he will come home and we sit together and have dinner and this is the plan. But when he's away, this doesn't happen. So I have to get the girls and try to eat together as a family when S2P8 is not there.

S2P8

Putting (Daughter 2) to sleep.

S2P7

Yes putting (Daughter 2) to sleep. So we have we have alternate nights, so one night me putting her to sleep at night late and we just started this recently. It used to be only me, but we saw it's better for life and for her to say that it's not only me because she just got really attached to me. So we tried, you know, we are trying that, so when he travels, yeah, it has to be me to put her to sleep.

S2P8

And the mornings

S2P7

Mornings? How? If you are traveling you will wake up early.

S2P8

So, I don't see the kids.

S2P7

You don't see the kids. OK, so if you are home you will see the girls.

ED

And is there any difference in how you would then use technology?

S2P7

No, so with the technology with the girls or with (D2), we don't let her use iPad at home. So the iPad is only in the car. For like when we go from point A to B? We use the iPad. Once we finish the iPad stays in the car. When we give her a shower, because she cries so much, to calm her down while I do her hair, I give her my phone, so she goes on YouTube, or S2P8's phone. She goes on YouTube. At that time, yes, we give her a device.

ED

Are those things that you would both discuss or is it something that just ends up happening?

S2P7

It varies, it depends, like with the iPad.

S2P8

(Whispers) Come on, it's always been like that.

S2P7

Because she gave us grief every time we go out, and the only thing to distract her in the car is the iPad. I think we discussed that. We said okay, let's give her the iPad. Let's start and you (S2P8) even downloaded some of the shows that...

S2P8

(Whispers something)

S2P7 14:26

No, no, no I'm just trying to get you to remember. Yeah, so I think that we discussed, but the phone thing in the shower, in the bathroom - no, I think I just gave it to her and it worked.

ED

What do you do with your free time? Outside of work, what are the things that you enjoy doing?

S2P8

I watch a lot of Netflix (guiltily)

(Everyone laughs)

S2P8

During the week that's what I do. It is my way to switch off.

S2P7

Before bed, after dinner

ED

When you answered just now it sounded a bit like an admission.

S2P8

Yeah

ED

What do you think makes you say it like that?

S2P8

I could do other things that are healthier not just watching, although I try to sometimes choose to watch documentaries and stuff, but I feel it's a bit of a, not wasted time, but...yeah there is a bit of a guilt, there's definitely a bit of guilt, that it becomes some kind of addiction and that the only way to switch off is just to put my headphones on and basically isolate myself from everything happening. This other reality, this show, and that makes me forget what's happening around me. And that give me a reset. So it's not only just watching it, it's the whole headphones with this, you know the...

S2P7

Cancellation.

S2P8

Noise cancellation, so that experience...

ED

But that is actually the thing that allows you think to...

S2P8

To switch off. I think so. I think I'm addicted to it... I confess! I'm addicted to it!

ED

Why do you say addicted to it? What would you say is making you feel guilty?

S2P8

Because I think it could be time spent with the girls. It could be time I can read or develop my knowledge about things, whether it's career related or not. And I do have a lack of intellectual satisfaction in my life. I don't think that I'm satisfied intellectually. But I'm too lazy to go pick a book or attend a course or whatever because I feel I'm too tired from working 10 hours a day. And I just want to switch off.

ED

Would you say that the guilt comes at all from society, say, because of what you're told through the media?

S2P8

I don't think it's the media, I think it comes from me.

ED

And do the girls or S2P7 ever pick you up on it?

S2P8

No. But I know it annoys (S2P7) that I do it every night. She doesn't say anything. The other part of the guilt is because (D1) is becoming like this. She watches a lot of Netflix. So, it's as if I'm giving her this habit that I know might be not the healthiest habit, but I'm giving it to my daughter.

ED

As a role model?

S2P8

Yeah as a role model. And that's a good part of the guilt as well. I know S2P7 doesn't like it...

ED

And is this something that you might discuss?

S2P7

So, before, what we used to do, like years ago, we used to...we started with DVDs and it was our own time together - me and him. We watched something, even after we had (Daughter 1), she was at primary school, she would go to bed at 8 o'clock and that would be our time. So we used to watch up to three hours, actually two hours, I don't want to exaggerate, one or two Episodes of a show we both love. Season after season after season. So it was our own time, our *us* time. And then slowly, I think after (Daughter 2) came to life, I didn't have time, I will be just tired, we would start the episode and I would pass out. Because I was tired the whole day. And then gradually it became only (S2P8) who does that. So there was a positive thing out of it, before, it was positive as a couple. It was something together. If it's intimate, or if it's just social drama, or anything, it was something we talked about. Now, I don't think it's positive from a couple or a relationship point of view.

S2P8

I mean, the inventor of the product invents a tool. I think it's up to the person to be responsible to use or not use that tool. So I think Netflix as a technology, I don't think technically you can enhance it in a way to make it an only positive tool. It can be abused in a way that makes it negative. Like anything else.

ED

I think there's some indications that some companies are trying to, let's say with kids, for example, there's a different version of YouTube for kids to acknowledge that there's some ways of using it which are more negative or more positive.

S2P8

I don't know if there is a YouTube for kids.

ED

I think there might be. So, going back to your free time, apart from apart from Netflix, what would be other things that you enjoy doing?

S2P8

I'd definitely like to read a book.

ED

And if you have time together, say during weekends?

S2P8

Yeah so I don't watch during the weekend. It's mostly like put away your time together with the family. We go out, we have people over. So Netflix is mostly I think at the end of the week day it's just become that habit.

ED

And your weeknight, (S2P7), then if you're not doing that in your free time?

S2P7

To be honest? No, there's no free time for me. I try to create free time. So my free time will be, I have a stack of books. I will have fallen asleep after starting so they're all half-finished. Yeah, I would read one page or two page. I try maybe I will be successful one night or two nights a week, but not consistently. I would like to do more. Or watch something, because S2P8 is next to me watching something so I will feel jealous, I also want to watch something and I will start two minutes and I will be passing out and I'm asleep. So in general, most nights I would rather sleep. If I have to sleep, because I wake up at 5.30 in the morning so I need to sleep.

ED

So when you wake up?

S2P7

Yeah, that's it grab my stuff then go to the gym, come back take a shower, have breakfast, get the girls breakfast, take her to day-care then go to work.

ED

Okay, so you wake up at 5:30am and go to the gym. Everybody else is sleeping?

S2P7

Yeah

ED

And then when you come back they're up?

S2P7

S2P8 will be up, (D1) will wake up at seven and (D2) will sometimes be awake, sometimes asleep.

ED

And then how would you describe your typical week for your family?

S2P8

Not living, really, the 5 days are just running,

S2P7

Just running. Running. We are so in need of free time, that we don't have. I feel as a mom here, I have established things in my head I need to do. And I feel I'm so poor, so time poor. I can't do them. Our only, leisure time is Saturday and Sunday. That will be lucky if there wasn't a fight between us. If it passes smoothly and we'll have a happy ending of the week. Otherwise. Everyone's tense, we don't talk and we just start again on Monday. To be frank.

ED

And do you think that feeling of running and being a bit exhausted means you're more prone to having misunderstanding?

S2P7

I think so because when we go away

S2P8

Yeah,

S2P7

Just when you switch and go away, like we did a few weekends ago, we were so tired, both of us and just needed the holiday. So we went and it was just magical that we didn't have an argument we didn't fight we didn't we didn't feel upset with anybody, even when the girls were grumpy and complaining we were more what you call it accepting of the negativity, but I think I feel during the week, we're on edge. With the small things, or with the big things we're on edge.

ED

Because of that feeling of their not being that you've got to get things done?

S2P7

Yeah, I think

ED

Thinking about the use of digital technology in everyday family life and how that is that affecting experiences? But what is different about your when you're on holiday? If you were to break it down, what is not what is different to everyday life?

S2P8

Technology is a big part of it. Like, we went to New Zealand last Christmas, and I made a decision that I will not take my phone or my laptop with me. Only took books and took a notebook where I put my thoughts and so on.

ED

So, you didn't take your laptop or your phone?

S2P8

No, so I left my devices here. I couldn't have been happier during that period and I came so recharged back to work. And one of the best things that I've worked on this year was when I came back and came up with this idea, and that was a direct result of the weeks of being completely switched off. So I think that connectivity anywhere, anytime, is creating a bit of stress because, I know it's silly, I know that, you know, you can turn it off, but I think mentally, at least me, I don't know if I have a bit of OCD or whatever, but I know that is two meters away, so my mind is not at rest. Because maybe I left it at home, completely out of reach, I think that put my mind at ease.

ED

So you said when you came back, it led you to behave differently?

S2P8

Yeah. The first couple of weeks at work I was so organised, my mind was so sharp and clear. And to me it was quite obvious. Well, now I wish I can go back. I'm trying to do, like in the morning, like have 10 minutes of meditation in silence and be cognizant of my thoughts. But it's never as good as what it was when I came back from NZ. It was so good, it was clear, it was calm, full control of mind. The other thing, I think, about technology, is it creates, I don't know if the term noise is the right one, but not in terms of actual noise, but noise in the mind. There's so many emotions that are conflicting, and ideas and thoughts, and it's just too much data basically. Our minds, in terms of processing, I guess we don't have storage devices in our mind that is like a cloud archiving system. (Laughs)
So, I think we've been swamped by this data all the time. And I think we're struggling to turn it from data to information to insights, and then, because it's so conflicting, so many of them, like even when you hear the news, so many conflicting things. Trumps bad, Trumps not bad there's just data, data, data, data data, I feel angry because Trump won the election, but then I got empathetic to the people who didn't have jobs, and so that access to data I guess...the market, housing is going up and now its going down. S2P7's sister got divorced and (D1)'s friend's send us a picture about something, and we're talking about this is in a one or two hours in the morning when I get access to all this information. I don't call it information because its pieces of data, but it's actually not put together to give you the full picture of what's happening. And I think that creates a complex set of emotions.

ED

How would you describe your generally your attitude to technology (S2P7) ?

S2P7

Me? My relationship with technology? I feel I can control it. I can. If I feel I'm going too much, I can take a step back and stop it. I use technology I use my phone. So my technology is my phone. I have everything in my phone, even my password, passwords for so many different things in my head in my phone. If I have a thought in my head, I put it down in my notes in my phone. When I try to find a new recipe for chocolate cake, then I go online and I get one. About conflict with (D1), how to treat (D1) and certain subjects that we've talked about with her, I'll go and seek information from the phone. Yes, so I think my relationship with technology and the way I use it, I can just, I'm not a slave. But S2P8, I think he's a slave. He's so consumed with technology and he loves it so much, and it's I think it's his wife. The technology.

ED

So your attitude towards technology (S2P8)?

S2P8

Yeah, I love technology, but not in the sense that, I'm not a gadget guy, I wouldn't go and buy the latest PlayStation and don't get excited because iPhone has produced a new model. Not that. Not in that sense. But, yeah, you know, technology, AI and data analytics is something that is really at the top of my mind most days, how it is getting so close to be like a network of basically pieces of AI connected together, created almost as a neural system in our minds and how the, you know, it could actually get into a form of AI then can start predicting things that we couldn't do. So, yeah, I'm quite fascinated by technology and how it's actually evolving in a way that the last probably 20, 30 years we evolved so much in technology. Yes, and I'm so interested in curious about what that means.

S2P7

For example, we always do our budget. Every month, we have a budget yearly and we do the budget. So he taught me, he said, well we sat together and we did it together, and then he came up with another idea that there is an app...

S2P8

Not an app...

S2P7

Oh, actually a website. It just came out last week, was it called Xero? I don't know, and now you can do all that using *that* website. And now we discover there is an app, so we are not allowed to do it through the computer until we have the code using the phone, the app on the phone to have a code so we can access it. And to track our spending. How much we spend, like for example, going out, entertainment, something like that. So, this is an example of how we use technology to manage ourselves.

ED

Do you find it useful?

S2P7

I think yeah, it's easier, much easier. So S2P8 came with that Xero and we put it down on our computer. He was the one who found out about it. So, another example, I didn't know how to connect the, what do you call the cable, HDMI? So, we connect our PlayStation to the TV so we can watch Netflix, YouTube, we can play them. So, I would never do that, it's not in me, I don't know, I don't understand the system, but S2P8 does, he did that for us, so sometimes three of us, we try to have a movie night. It's happened once or twice, and we put a nice movie for us all to watch on Netflix. So, this is another example of our good use of technology as a family.

ED

So, S2P8 would tend to be the discoverer of a new technology or a new way of using technology

S2P7

Yes, and now I'll say (D1). She is beginning to use it in different ways. With (D1) its more and on so many different levels, or so many different categories, like fashion, concerts, technology. Like lots of different aspects of life with (D1), she's a teenager she's now learning a lot of stuff about life and then people are on top of that, life around her. With S2P8, its not the same thing, how can I say it? With S2P8, its not academic, the devices that you (S2P8) use and the new things you introduce are more functional more functional with S2P8.

ED

OK, S2P8, how do you find out about a new technology, like with the budgeting one?

S2P8

Well, that one specifically I came across at work. Mostly I'll come across things at work or through LinkedIn, Facebook or my Twitter feed. So, whenever I look at something in LinkedIn I go to read it. Like even before Xero, when I was trying to find a budgeting system for was not Excel, I would just research it. But I know that these things can be possible because I work in technology. Is there an App in Australia that can take the feed from the bank directly to your budgeting system and you just tag it? And so on, and there wasn't then so when Xero came out, I though, oh great!

ED

A certain element of S2P8's technology use, seems to be that he depends on it for his work. So when you describe that he is a slave to technology, do you think he's a slave to technology or a slave to his work?

S2P7

Its two different things. I feel that (S2P8) loves to try new things, as a person. I find it hard and I don't have the mindset for it, but for him it comes naturally to him.

ED 41:09

(Kids enter and S2P8 has to leave room)

Let me think of something I can ask you but just with you on your own...

Did your attitude to technology change at all say since you became parent?

S2P7

I'm more involved now, yes. Like, before, I used to be saying "no technology with kids", "no TV", "one hour more, no more than that". When (D1) came, I felt "no, she needs to watch TV and it's free time for me when I put on the TV or the iPad". Actually, not the iPad at that time, but the DS, the little Nintendo DS. She used to spend long hours just playing. And yeah, I think it changed me. I used to feel "no, this is so wrong. Kids, they shouldn't" but when (D1) came and I felt like she was bored and I can't be entertaining her 24 hours, or when I'm at home after work, so she needed the time, I mean I needed her to be occupied with something while I do something else. So the technology came in handy.

ED

So you've actually become in a way more lenient..

S2P7

More lenient with technology yes. Because of its kind of functional for me.

ED

I've just asked (S2P7) if her attitude to technology has changed since having kids. Would you say that your attitudes have changed at all since having kids?

S2P8

I don't think so to be honest, except I guess back to the guilt, I guess it's more the guilt. When the kids are around I feel more guilty being immersed in technology, when they're not around, I can do whatever I want. I can binge Netflix for eight hours. (Laughs)

S2P7

He has the capacity to do that! I don't!

ED

How about how the kids' use technology?

S2P8

Almost related to a negative impact more than positive, any technology that they use. Even (D1) is like in an extent, even research or when she does her homework. Sometimes I feel, because there's so many sources on the net, that you can't actually check whether it's valid or not, and in many cases she does not. They teach them at school that you need to check the source, and make sure it's a legit source, but I know that she doesn't do it all the time. So, I don't associate with, like, I don't associate any of their usage of technology to something positive to be honest. I just don't.

*(S2P7 looks skeptically at S2P8)

S2P8

Like what? TV? phone? iPad?

S2P7

Yeah, but...

S2P8

It's useful...

S2P7

It is useful...

S2P8

I'm not saying it's not useful. It's a necessary evil. Like in the car...

S2P7

Yeah?

S2P8

Like I probably would like it, if we could...

S2P7

Yeah?

S2P8

Without an iPad, her singing or talking, whatever, I would say it's better than her watching Peppa Pig

S2P7

Yeah, but when we give her a shower and she's screaming...

S2P8

Yeah, I know that's what I'm saying, is it useful? It is useful. I'm not arguing. I'm saying yes, it's useful, but it is not, like if there are other ways and tools that would deliver the same outcome. (I mean what's technology though, are we talking about technology as screens because technology even, we have technology, our chair is a technology so what do we mean by it.) So, I call it the screen time, and I can't see screen time being useful to kids.

S2P7
For kids (seems despondent)

ED
Or for adults?

S2P8
For adults? No, I do my job, I look at the screen most of the time, and I think it's useful. AutoCAD, for example, you're designing something, you know, it'd be stupid not use technology and go with pen and paper again. I think if it's black and white, and it's technology for the purpose of science or business applications, then I think it's absolutely all right. The rest, I think I'll sound harsh, but I think it's rubbish it's entertainment. It's not bad but I'd rather them having...something else.

(Kids enter and talk to parents)

S2P7
(D1) has something like an amplifier, it's a small one and it has really great sound. A small sound system. Very expensive. Very high tech. And now she uses it all the time to run her music through Spotify. And I think it's good. Before, she used to have headphones on all the time. Now, when she's at home she doesn't wear headphones, she uses that to listen to music, and when she has people over and even when they go out they take it out as a party item. And we use it sometimes when we are cooking to listen to music.

ED
Why do you prefer it to the headphones?

S2P7
I think the headphones have isolation, she would be isolated from us. She's not engaging with us. She has the headphones on and she's in her own world. I think if you want to watch something, come and check with us.

ED
So, in your house you use your iPhone.

S2P7
Yeah. And laptop,

ED
Which is your laptop or a work laptop?

S2P7
My laptop

ED
And is it your speaker?

S2P7
No, it's not it's (D1)'s, but we bought it for her.

ED
And the desktop (computer)?

S2P8

It's supposed to be a shared desktop but it's mainly me and S2P7.

ED

And what would you tend to use that for because you've got your own laptop (S2P7)?

S2P7

Yeah.

ED

And you have a laptop?

S2P7

He has three!

ED

Do you have one phone?

S2P8

Yes one phone

ED

An iPhone?

S2P8

A Samsung

ED

And is that both a work and personal phone?

S2P8

Yeah.

ED

And then you've got three laptops, do you use all three?

S2P8

I use more.

ED

Personal ones?

S2P8

Well again it's mixed.

ED

When would you go between them?

S2P8

So, there is one that I keep next to me, by my bedside. And that is my bedtime Netflix. But then one that I travel with all the time in my bag. And there is one at work, that I keep at work, well there's 2 at work.

ED
And do you sync them?

S2P8
Yeah, they're all synced.

S2P7
Even the one by the bed?

S2P8
No, no sorry not the one beside my bed, so that one is completely out of sync. That one is supposed I don't check emails on...

ED
So that is a complete personal laptop. There's no work on there?

S2P8
No, although I do I catch myself sometimes going, because I can still go on, though I made it hard on purpose.

ED
So then you have a TV, it's a regular TV?

S2P8
Yeah a regular TV.

ED
And any other shared family devices?

S2P7
PlayStation.

S2P8
Yes PlayStation.

S2P7
We used to have...

S2P8
An Xbox and PlayStation...

S2P7
...Xbox and PlayStation, we threw the Xbox.

ED
Why was that?

S2P7
Because, I think it needed some updates and it was so complicated and then...

S2P8
No, it just stopped working. We could have fixed it but we said "it's too much technology".

S2P7

Too much technology.

ED

And, the PlayStation is for gaming?

S2P8

Well, mostly to be honest these days for Netflix and YouTube, so...

ED

So, making it into a Smart TV effectively?

S2P8

Correct, I mean we do, we haven't played the PlayStation in ages.

ED

And (D1) has got a phone?

S2P7

Yeah.

ED

She has an iPhone?

S2P7

Yes.

ED

OK – I'm going to move on now.

What part of your week, or your routine, or any part of your family life, would you say you value most?

S2P7

Cooking together.

S2P8

We're so food-centric

S2P7

Yeah, we are.

(They laugh)

ED

And why? For the food or for the experience?

S2P7

For both, I guess. We love food. We love trying different kinds.

S2P8

I think it's a shared passion, that's why.

ED

And, how would you describe your family if you had to sort of summarise?

S2P7

Oh, I will let S2P8 answer this first.

S2P8

Erm...Serious, a serious family, who love food.

S2P7

I think we are organised.

S2P8

Yeah organised. Not much fun!

S2P7

Not much fun. No.

(Laughs)

We are organised. We are loud. When we laugh, we laugh loud and when we fight, we fight loud. And we are an emotional family. And we love food.

S2P8

It's your typical Mediterranean family.

S2P7

We are really that serious? We are not fun? No, I guess we are not fun.

ED

What does your family value?

S2P8

Achievement, I would say.

S2P7

Yeah, that's right. I think that's why we say serious because we want to achieve and...

S2P8

Coming from where we come from, you have to work hard.

ED

So, you'd say that your values maybe come from where and how you grew up?

S2P7

Yeah, and how we were brought up. Courage. We would like to be courageous and...

S2P8

Yeah, take risks, not sit in an empty kind of safety. We would like to push yourself to take more risks. And life without risks is dull.

ED

And do you both discuss your values?

S2P8

Our values weren't aligned with our culture but they were aligned with each other. And this probably was one of the main attractions, I guess, was our disagreement with the values of our culture. But the thing is, I think values also change.

S2P7

Yes.

S2P8

I don't think they've been consistent since the beginning. They do change.

ED

Can you tell me what you mean by that?

S2P8

One of the examples that I went through my moral beliefs or understanding in the whole thing about religion and so on, so, you that changed dramatically.

ED

When would that have changed for you, do you think?

S2P8

Roughly 30. I always had a doubt about religion and I read a book and I came and said that answered all my questions on. Richard Dawkins. That moved me away from belief and made me rethink. I always had doubts I guess.

ED

Would you both have been raised with a particular religion?

S2P8

We were both raised as Muslims, but then at a certain we sort of made a decision that we would be agnostic. I guess both of us were agnostic in a way, well S2P7 doesn't think about it much anyway. She doesn't care whether there's a God or not.

S2P7

So, from the beginning when I grew up, my family wasn't religious. So, I always thinking, they want me at school to read this book, but I don't understand a single word in it and who said this is right? I always had questions about it. And when we got married, S2P8 became more into religion. And I still remember a few times, he would drag me "Let's go, let's go and pray, it's good." I would do it, but I didn't think it was going to change anything. I think most people who do it are afraid of God, afraid of the unknown. I think. So, for me I think I've always been in between. I used to be maybe more afraid, so thinking I would have to do whatever God says I have to do. But when we came here, I saw the freedom and thought "Hang on, I don't need to pray, since I don't believe it's going to change anything and no, I don't want to do that." But he's more courageous, to admit it and say it out loud. I'm still not out loud yet.

ED

When it comes to working out your different individual values and then translating them into a family value. How do you approach that in?

S2P8

I think we are in agreement that (D1) can choose whatever religion...

S2P7

Yeah, from the beginning we said we can't enforce anything on her.

ED

Do expose her to the religions you've come from?

S2P7

When she has a question, we tell her we tell her whatever we...

S2P8

We don't practice any religion.

S2P7

No, we don't practice...

S2P8

Just recently, we have the new situation of sex, and she wanting to have sex, and when this came up.

So, I think we will have to take our time and talk about it, discuss it.

ED

So, you both discuss about your individual feelings and then communicate a united front to her?

S2P7

Yeah, so we'll discuss what the right thing to do for her is, for this specific subject of having sex at this age. Yeah, and I think we made a decision me and S2P8, like about how much religion for (D1) at that time we said no we are not going to influence anything we're not gonna say, yeah, this is what Muslims do this is what Christians do this is what we do. No, we are not gonna talk about it but if she has a question, I am happy to answer but we are not going to raise our girls in any kind of religion. So we discussed before we we...

S2P8

...She knows I don't believe. But I don't say she can't...

S2P7

Yes, not that she has to be like us.

ED

So, talking about taking joint decisions...can you think of the last time that you brought some technology into the home?

S2P7

Yeah, we discussed about the phone with (D1). We...

S2P8

She said I want the iPhone X, or whatever...

S2P7

No - remember when she wanted a phone at primary school? We weren't sure if we should give her that freedom, should we not? We didn't know. Is it good for her age to have a phone? And we even discussed that with other families, like Gracie's mom. And when we talked about a phone that they can use only to call us, and that is not free, the card in it, I can't remember what it's called and what kind of technical kind of phone it was, but it had a card that had a number and she could call us in emergencies, if she was away from us. This isn't when she was in primary school.

I think she started having the phone in Year Five. But we said we were gonna be very strict, we were gonna check on it, but we never did. So we gave her the full freedom. We talked about the risks. We talked about Facebook when she wanted to join, and she came to me and said, "Mom, I can't have an account because I'm under age, I have to put my age on". And I said to her (D1)...no, actually, she did it, and then she came to me to tell me, and I wasn't happy. And she said, "Mom, it's not a regulation". And I said, "you shouldn't lie about your age. If that means you can't have Facebook, you can't have Facebook". And nothing's changed. She still had her Facebook. But...

S2P8

...oh yes, on her first ever phone.

She really respects her parents! (sarcastically) (Laughs)

S2P7

Yeah, but we are both friends with her on Facebook. And the same with Instagram. But not with Snapchat. So yes, we discuss before we agree.

ED

Compared to both your daughter's technology use compares to that of their peers?

S2P8

It really varies with other kids. I don't think there are any other kids her age who are not on some kind of social media. But there are a few who are over the top. There are a few who, I don't know, how can you tell? Apart from we hear it from (D1).

S2P7

I know from friends and people I know, that I think we give our girls more freedom. We are more lenient. I hear from other moms, when they come from work to seven o'clock actually, even less like, one hour a day of TV, one night, a week to watch a movie when they're both mom and dad want to cook or do something. Like Georgie. They don't let their kids watch TV a lot. It's against their rules.

S2P8

But, teenagers...

S2P7

Yeah. Teenagers. I know. A guy works with me the he has twin teenagers. He doesn't give them any freedom. He told them not to use Facebook. My friend from work he went and searched their names and both of them they have account on Facebook. The dad doesn't know. And he talked about...
...that's too much restriction. And he said to John, "what do you what would you do if your kids will ask you about Facebook?" and he said a specific word "how dare they come and ask me this question". Like this is so out of reach he can't think about Facebook and they are both of them already on Facebook, without their parents knowledge.

ED

Whereas, would you say you prize freedom and honesty money?

S2P7

Yes, this is what we try to build in (D1). Have the freedom, but tell us if she wants to have sex. I said, if you want to let's talk about it and I want you to tell me everything. I want you to tell me the guy, I want you to tell me every single bit.

ED

Do you have any idea where those values come from?

S2P7

The opposite of our upbringing. Yes I think from our own experience, we were raised differently, we know how strict and how hard...

S2P8

We know the results of not having the freedom and not having the maturity and not having the conversation, and how that affected us.

ED

Okay, so you learned from your experience?

S2P7

Yeah. We don't know is it's right or wrong to be honest.

(Laughing)

Sometimes I think too much freedom is not good. Specifically with (D1). The way she talks and the way she retaliates and she argues. It would be easier for us to say "no, that's it end of story and no more" but with her, no, because we raised her to talk we raised her to speak up. And she's with me more than with S2P8. She's more free with me and talks and uses different language that she uses with S2P8.

ED

And, would you say that one of you is more strict than the other?

S2P7

I think S2P8 is more strict.

S2P8

I don't think I'm more strict. I think I am less forgiving. S2P7 is more forgiving. So I'll probably give more freedom but when my expectation is not met I'm harsher. While you (S2P7) maybe give more restrictions but are more forgiving if they don't follow the restrictions.

ED

And by harsher, is that in terms of a particular punishment or being visibly cross?

S2P8

Both.

ED

Have you ever had instances to take the technology away as a punishment?

S2P8

I did.

S2P7

I don't believe in that, taking the technology away as a punishment, but S2P8 does. I believe this won't teach the child. They won't think, the technology's not there, I will be I will act better, I will behave better because I miss something. I feel when she misses something, she will be attached to it more.

S2P8

I would take it away if I didn't appreciate it.

ED

With those two strategies, how does that work?

S2P8

That's why we fight at the weekends.

S2P7

Most of the time I won't let S2P8 lead with that. Now, he will say "give me a phone, you're not allowed to use your phone for one week or two weeks". And then I will say to myself, "Oh, this is not good. I don't think this will work." And after one week or less, two or three days, she comes back and she asks for it and S2P8 will reduce it to "there you go, have it." So, I feel there is no use of the punishment. Cos it's not followed through, and she knows that about S2P8, he's harsh, he gives the maximum punishment and then after two or three hours or maybe one day, it's totally gone.

Transcribed by <https://otter.ai>

Appendix 3.10 Transcript from Study Two: Closing Interview (S2P10)

Date: November 2018

Duration: 58mins

SPEAKERS

S2P10, Eleanor Derix (ED)

ED

Thank you so much for taking the time to complete the probes. I'd like it we could start by discussing your responses.

S2P10

Yep, OK.

ED

If you'd like to choose, where would you like to start?

S2P10

OK, this is the family tree.

ED

And, could you please talk me through what you've drawn?

S2P10

Yep, so, this is me and (S2P9). I don't know why I've drawn the female symbols upside down (laughs). She (S2P9) is very much umbilically connected to the TV. (Our daughter) is connected to (S2P9)'s iPhone. (Our son) is connected to my iPad, my iPhone and the TV. And I am connected to the iPhone and the iPad. But not the TV, I never watch TV.

ED

And, can you tell me about the connections you've drawn between the kids and different devices?

S2P10

I think (our son) just finds mine, he gets mine. (Our son) is actually also connected to (S2P9)'s phone. So I should do another line. Because she has games. (S2P9) has some games on her phone.

ED

And, would you say that any of those connection between the kids and particular devices are stronger?

S2P10

Not really. It's just whichever is available. And because (S2P9) has some games on her iPhone, which we actually recently had a discussion about. Where, we are going to delete all those kind of mindless games. And get some *Reading Eggs* and *Maths Eggs* (educational programs) instead, I think.

ED

OK, and over the course of completing this and taking part in this research, did you notice any differences in how you were thinking about or using technology in your family?

S2P10

No, I don't think so. It was just the same old arguments, the same old issues.

ED

So, nothing that seemed too unexpected or surprising to you?

S2P10

No, just the same, it's just an ongoing struggle, really. A parenting challenge.

It's about controlling it, limiting it all the time, for me anyway.

It's about limiting it and trying to keep our rules going.

No screens at the table, but then they're out when we have a meal together, breakfast, and again at dinner.

So, it's more, for me, the struggle is keeping it under control.

So, that everyone is not just sitting around looking at different devices, and that's our family time!

ED

Would you say that controlling and limiting technology is just feels like part of parenting in general.

Or does control over technology seem like a separate focus?

S2P10

I guess it's part of life.

When I was a kid it was just TV, but my mum did the same.

A lot of the rules she had we are basically replicating, well I am trying so hard to.

With (our son) it's very hard in the mornings, to limit his TV.

But we might be getting there now he's getting a bit older.

ED

So you think it might be something that changes with age?

S2P10

Who knows? We only have two kids.

With (our son) I actually think it might be easier to control when they are younger.

As soon as he got to an age where he could get up and sneak in, he literally crawls down the hallway and crawls around our bed...literally like a dog, sniffs around until he can find a phone or an iPad and then he scurries off to his bed and goes under the covers and plays his games or watches whatever he's found.

Or he comes down here and puts the TV on as a last resort.

So, that's been a big challenge for about 6 months.

ED

Why do you think he hunts for the iPad or phone if he can just come down here and watch TV?

S2P10

He can access different things (on the devices)

On (S2P9)'s phone he's got games.

On the phones he can watch ABC kids TV.

And one of the reasons is that he can do it in the comfort of his own bed.

I think he finds it slightly scary being down here alone, but he still does it if he has to because he wants the TV so badly.

ED

OK, so going back to the probe activities that you completed...

S2P10

Yep, the Experience Jar, with all the (notes about my) feelings.

I have been mentally keeping track of them too.

Every morning I get up and have a fight with (our son).

About whether he's watching an iPad or a phone or the TV.

So, every morning starts with a fight with (our son) about technology.

Which (S2P9) never engages in.
That's a negative experience.

ED

Can you talk a bit more about that experience?

S2P10

So, it feels like, 'here we go again!'

I'm always up first (before (S2P9) and I try and catch (our son).

I try to get ahead of him before he gets a device but if he's got one it's an argument about putting it away, which sometimes ends in a deal, that if he gets up, gets dressed, has his breakfast and packs his bag, does all that, then he can watch one episode of a TV show.

I would prefer it if it was just nothing, the rule I have tried to establish is no TV at all except on weekends.

No TV at all. Just go and do something, not so passive.

ED

OK, and something more active might be...

S2P10

Drawing, writing, playing with toys, going outside or whatever.

There's just a realization when I wake up (that he's on a device).
Every single day. Every single day.

ED

And does that worry you? What's at the heart of your reaction to that do you think?

S2P10

Well the reason for the rule is that when he watches TV in the morning, he's in a bad mood all day.

So it's just a bad start to the day for him, in my experience it affects his mood

ED

And how does the fight about it seem to affect his mood?

S2P10

He usually gets over it pretty quickly, quicker than he gets over the mood he gets in after watching TV.

Although I think the mood thing is lessening as he gets older.

When he was younger, after only watching 10 minutes of screen time, he would just be in a foul mood all day. Not because of being made to stop. I don't know why.

It's some sort of reaction to that activity. To me it was very distinctive.

(S2P9) said she didn't notice it too much.

ED

She didn't?

S2P10

Eventually she did say that it did happen, that it wasn't all in my mind.

I noticed it very distinctly - his whole day would be affected by that beginning, so that was the source of having that rule, where it came from.

ED

And have there any other experiences that you feel leave him in that type of negative mood?

S2P10

No. I don't think so.

He enjoys watching TV, and he enjoys exploring different shows. He likes movies. We all like watching movies together. There's other stuff that we do enjoy and he doesn't have that (reaction). So, for instance, I find that TV in the afternoon is better than TV in the morning. TV in the afternoon – that's all right - but TV in the morning, it just seems to set everything off to a really bad beginning for him. He's impatient, he doesn't listen, he's not engaged, whereas if he doesn't watch TV and he does some other activity, he's much calmer, he's more engaged, he doesn't find every conversation some kind of huge imposition on his autonomy, you know? To me it's very strongly noticeable, all those things. But in particular, his engagement with other people. When he starts with his screen, it's just impossible to get through to him and that has actually gotten worse as he's gotten older, that particular feature. When he was younger it was just grumpiness. Grumpy, tired, irritated.

ED

Can you talk about the experience, within your family, as a parent perceiving that effect that you think technology use is having on your child, where the other parent seemingly not noticing the same thing?

S2P10

Oh yes, I did doubt (my perception). It took me a long time to start saying that, even despite (S2P9) (not agreeing), that this (implementing the rules) is just what we're going to do, because I am now convinced over a long enough time and have done enough of my own experiments, in the sense of making a mental note - like, here's a day when there's been no TV, and just observing how the day then unfolds and his mood, and his levels of engagement and that kind of thing.

ED

So, it would feel better if the other parent would be in agreement or also acknowledge that sort of issue?

S2P10

Oh absolutely! It's so much better to not sole parent on particular issues. Yeah, it's really hard. It's a real issue between (S2P9) and I, in that I have been the only one to do that whole morning TV monitoring. But on the other hand I haven't, for example, bought an alarm clock, which is necessary before we lock all the devices into a box overnight so we can't get them. I need to find an alternative way.

ED

Have you tried using pass codes or anything like that?

S2P10

Oh yeah, well I could just change the PIN, that's the other thing.

ED

Because (your son) knows the PIN?

S2P10

Yeah, and it took him ages to figure it out. Well there we go! Here I am thinking of locking (the phone) in a box and it's really (there's an easier alternative). But then I would have to do that on every device and (S2P9) would have to do that on every device (keep them locked with a code). And I just don't think I've got the buy in frankly.

ED

Can you tell me what do you mean by that?

S2P10

I don't think (S2P9) would do it (lock it).

ED

Can you tell me a bit more about that?

S2P10

It's frustrating and isolating.

ED

OK, and if you and (S2P9) would both be implementing the same rules, taking the same approach, ?

S2P10

It would feel like a positive experience. It would feel like something we were united on. And I think the children would prefer it too. They like to say "where are the boundaries?" And otherwise they play you off against each other. Which is what (our son) is now doing a lot. Or they would think, you know, time to change direction. And that's most observable with (our son). Because he's at an age where he is going through that thought process.

ED

Are there any other aspects of parenting that you would like to be more aligned?

S2P10

Yes. It's almost all one-sided, with everything. We don't usually match up on parenting. I try to read stuff about or align on parenting issues. I do. I read stuff in the newspaper, or on websites, or online if I'm having a particular issue that I'm struggling with, or approaches to that problem.

Though actually I think controlling technology use is quite a unique part of parenting.

Other behavioural issues, there's quite a different technique.

It's about saying, "how would you feel if someone did that to you?" And so on.

But because devices are such an individualized experience, you can't use those other relational parenting techniques or emotional intelligence type things to get through. Because it's just them (and the device).

You know, with all of us, we're on a device, it's just us and a device, there's no relating with other people. The device is almost like a mirror. It's just you and the device and its reflecting back whatever your input is. And I guess that's one reason why we don't have it at mealtimes.

That's one thing we are more united on. We're both strict about no devices and no screens, and for me no newspapers - that's (S2P9)'s requirement - that I don't read at the table.

And if you did translate that into relational things, I guess if you are sitting at the table and looking at a screen, you're ignoring us and that's not very social, that's not very engaged.

ED

And are there any examples of technology use that do support the aspirations you have for your family?

S2P10

Skype and Facetime – that helps people to connect I think. We do Facetime a bit, (S2P9) will FaceTime me with the kids when I'm still at work "Don't we?" (To daughter) "You see Mummy on the phone?" And we Skype with relatives in Melbourne sometimes.

ED

And you speaking with (S2P9) and the kids from work on FaceTime, is that a regular thing?

S2P10

Yeah, probably about weekly. I'll be having to work late and (S2P9) will FaceTime with the kids. So I can say goodnight, or say I'm on my way. That's the opposite of devices being 'individual' That's the function they can have to bring people together. That, and watching movies

ED

Can you describe the experience of watching movies together?

S2P10

We watched a movie recently – something about meatballs, some animation. During the week we watched the *Wizard of Oz*, in installments, and (our son) noted last night as we went to bed that I had actually watched the movie, and I normally don't. I usually sit, but I don't usually engage with the movie. And immediately afterwards, as we were heading up to brush teeth, he mentioned it. I remember thinking "oh, he noticed whether I was watching". I thought he was just watching and didn't really care if I was watching or not. For the first time it became apparent to me that it matters to him if I'm watching the movie with him or not.

ED

So, it seems like it was a positive experience for him that you were also watching?

S2P10

Yeah, and because you all laugh together and get the jokes and react together at the same time, so you are actually doing something together, in the sense that you are consuming this film, but I just didn't think it really mattered to him whether I was engaged with it. So that was a learning experience for me just last night.

ED

Would that maybe encourage you to watch more with him?

S2P10

Yeah, definitely. The challenge though is getting things that I can even bear to watch. I've actually sat down with him with some movies and then said to him "this is just too stupid to watch, this is too idiotic". We have to start again and choose another movie, because it's too moronic, basically, some of those Disney animations, they're just awful, or they're sexist. You just get into them and think oh, are serious? How this even get made?

ED

So, sometimes the content is not being aligned with your values.

S2P10

Yeah, not only would I not watch it, I'm like, "you're not watching this!" Now that I think about it, when he was little I used to watch TV with him. So, he would have a set 2 or 3 shows in the evening that he would watch and I would watch with him and in those days I was very particular about "what is he watching? And what's in it and what's in the content" So, *Peppa Pig* for instance, it's so heteronormative and sexist that we just said "no" (laughs) You're not watching that. And there's a few other ones that you can see, its directed for the adults and it's kind of funny but for little kids, its sending them the wrong message. As I'm thinking about it, maybe he can remember me watching with him and he really enjoyed it.

ED

And how about the content that he watches now. Do you think that tends to be aligned with your values?

S2P10

Oh, a lot of the motivation for me limiting TV is (because of wanting) him (to be) engaged with his family and with other people and knowing how to engage with other people apart from through screens.

So (S2P9)'s approach to that is have him doing team sport, but I also think you should engage with people in a conversational way and in creative ways, rather than – here are set rules, let's play this game.

I value, and valued in my own childhood, the ability to play with children in a creative way and in an imaginative way.

ED

And do you feel that video games allow that type of creative engagement?

S2P10

I've no idea. I've never played a video game, apart from Tetris. So I've just never ever been interested.

(Our son) is, (S2P9) is, and (our son) is very interested in 'the arcade', so he likes Pinball, pinball machines, *Space Invaders* and all that kind of stuff. There's some arcade around here that (S2P9) takes him to. I'm just not interested, even as a little kid. It just never held any attraction.

And I actually find as times gone on a lot of the video games, they're so violent.

You know the graphic splatter effect, I guess the more attractive to gamers they are the more repulsive I find them.

And I just think, "Why? When we are fortunate enough to live in a peaceful society, where we are fortunate enough not to be being traumatised by war and random and organised violence.

Why are we subjecting ourselves to this?"

I just don't understand it. It's like fake trauma. It's completely incomprehensible to me

ED

Taking those questions you have about why people engage with games, do you find yourself making any judgements or assumptions, maybe linking how people use technology in their families, to their values?

S2P10

I don't know, I don't talk to people about it. I don't draw conclusions myself.

I appreciate that it's contentious. I don't really talk to people much about it.

And in the few conversations that I've had I kind of get the impression that everyone struggles in the same way with trying to figure out.

What do we do with this stuff and how do we do it?

I think there's probably one family that I've had those conversations with, one of (our son)'s close friends, his mum, I've spoken to about it. And she's really keen on film, so she and her son watch heaps of movies. And I think movies are great, but trying to find quality kids' films is really hard. So probably as a result of that, (our son)'s friend watches a lot of movies, including movies that I think the concepts are a bit too advanced, I would have thought for (our son).

(Our son) has kind of self-disciplined himself into watching stuff that I don't disapprove of. When he first started getting up in the morning and putting on the TV, he would watch stuff and I would come down and be horrified.

I would come down and say "What are you doing? What are you watching? It's too scary, it's too old, you can't..."

And he would say "Yeah, it is pretty scary, I won't watch that"

And I feel like those few interactions I feel like he's said "Yeah, OK, there is only so much I'm ready for."

Yeah, there was one horrible morning I can down and he was looking on Stan (streaming service) or something on the (smart TV) and there were all these kids shows but then peppered throughout it was porn. And I was like “what the f**k”. And I did lose my s**t a bit that time. He was just looking at me going “what? What?” He wasn’t even looking at that, he was just looking for the stuff he was looking for and I walked in and was like “why are there tits and arses on the TV at 6 o’clock in the morning when you’re looking up *Mutant Ninja Turtles*?” Which is what he was looking for.

I don’t know, maybe that’s a demographic, for *Mutant Ninja Turtles* is people who also watch porn, I don’t know?! I just kind of freaked out and turned everything off and said “Look away! Look away! Let’s go and do something else.” I remember his face, he looked up at me and was like ‘What’s going on with her? I don’t understand’. And I did explain to him. I think I probably said ‘what the hell is that?’ and I might have said the word porn. I said I don’t want you to do that. Whatever you were searching for don’t do that again. I said you can go on the TV and look at ABC for Kids, but that’s it.

ED

And do you remember if you described that experience to (S2P9)?

S2P10

Yeah, I would have communicated that to (S2P9)

But she just doesn’t engage. She doesn’t seem, I don’t know, I mean she’s the technical – I don’t know how to put the filters on and all of that – but I have spoken to (S2P9) about it but nothing has happened.

(Our son) fortunately has self-filtered in my observation, because I do sneak up on him when I know he’s down here watching TV or the iPad. And I always do sneak up and try and surprise him to see what it is he’s actually doing, and luckily since those couple of incidents it’s all been fine.

But I am very conscious that we are rapidly approaching that point where we are going to have to put on some quite tight controls. But then on the other hand with those sorts of controls I just know that a kid like (our son) is just going to find a way around them.

I think there’s a sort of false sense of security. You do this and you do that.

We do know one family who say, they put this filter on and that filter on, and they feel very safe.

But I know that (our son) will just go online, if he wants it, he’d find a way to find it.

Now I don’t think he’s interested in porn, or splatter, or anything like that, but that’s partly a consequence of being aware of that and how it affects you. How exposure to that sort of stuff can affect your brain.

I don’t know, you just make it up as you go along really and hope for the best (with parenting technology)

ED

And you mentioned that parenting technology, it’s a contentious issue?

S2P10

The use of tech in families (especially kids use of tech) is both a contentious issue within families and it’s a contentious issue to discuss between families. Both.

Its contentious within our family because (S2P9) has quite different views from me.

And she’s also very happy as a parent to use TV and screens as a way of buying time and as a bribe and to achieve other things. Whereas I’m much stricter in terms of , not only do we not have screens when we’re eating together, but no-one ever has a screen when they’re eating full stop. And so (S2P9) on the other hand is very happy to set the kids up in front of a screen to have a snack or something while she does the dishes. Whereas I’m like “No, you just don’t watch TV and eat”. It’s a demonstrably bad association, associated with obesity and all sorts of stuff. There are certain connections that I think just should not be forged.

ED

Within your family, I understand that you are out at work more than (S2P9). So, given that you both have different approaches to technology use, I wondered if you ever consider or discuss how technology is used at times when you are not here?

S2P10

No, we haven't agreed to anything
And I think we just do completely different things.

ED

So you just imagine what might be happening?

S2P10

I know what she does. It's happening when I walk in and the children tell me.
(S2P9) doesn't want to talk about it.
So that's an indication to me that she disagrees and just wants to avoid conflict

ED

And the experience of coming home and seeing that technology was being used in a different way to how you would like? How do you tend to respond?

S2P10

It doesn't always change when I come in. I will either leave it alone.
But if I think there's any chance of success I will intervene and try to change it

ED

And could you imagine that devices might be smarter – say, responding to different people being home?

S2P10

They could all turn off when I get home! (Laughs)

ED

Have you got any thoughts on VUI devices, smart speakers? Are you familiar with them?

S2P10

I would never have devices like that in my phone (because of) the amount of eavesdropping and privacy.

I would like to move to a Blackberry (again) to reduce that completely uncontrolled access to my personal conversations.

Conversations that I have with my clients come up in adverts in my Instagram and I am actually quite concerned about that. I would also take action in my home. I know people who I work with who have it all (devices) and are constantly updating to the latest phone. And I wonder "don't you notice?"

The concept of privacy is just completely fallen...I think the concept has changed. It's clear to me that some people they never really had privacy as a value perhaps. Or for whom it never really mattered

So, for gay and lesbian people privacy was the refuge within which you could be who you were and that was the only way to survive. But now there is no such thing, there is nowhere to hide. There's no way of hiding and that's it. Privacy is a place you can hide, a place of seclusion and refuge

and it's not possible with those devices, with even my mobile phone.

ED

So, maybe again, it comes back to technology being aligned with family values?

S2P10

We're not one of those "TV families" We're a lesbian family. It's completely different. Privacy is really highly valued and if technology compromises my values, I will not have it.

ED

And, are there any technology decisions, aside from content and privacy, that have come up while raising kids within a same-sex family that you think highlight your particular values?

S2P10

Content is a big one for me. I've scoped out what's out there in terms of TV, what can I cope with and what I can't. And even that was really compromised. There was stuff he really loved, like Paw Patrol, that I just found disgusting. And for (our daughter) there's just nothing. Being a girl, there's just nothing for girls. And so it's not just being a lesbian, or a same-sex family, for me it's very much about being a feminist as well. And knowing how those, all of that, people say 'it's just TV, its only make-belief', but as a child you learn from stories. Story-telling is a huge part of society. All that stuff tells you who you are.

Every story you watch on TV tells you a bit about who you are or who you could be. One of the things I've seen as (our son) has been growing up, one of the things I've found devastating is that there's just nothing for girls. Even the movies that are meant to be inspirational for girls are not. There's very little in the way of inspiration.

In *Frozen* – I think the Guardian (newspaper) did a discourse analysis on the dialogue - and even though the 2 main characters were women, men had like 78% of the dialogue and the women hardly spoke by comparison. And I just thought "well that's it really, there's not much there!"

ED

So, that goes back to the content not being aligned with your values.

S2P10

It does play a role in (my efforts of) limiting tech. If there was more content suitable I wouldn't have such a problem with it (tech). But I find so much of it doesn't just not enforce the values that I want them to be seeing, and the sense that women are equal and equality is possible and achievable and what that would look like in the world because we clearly don't have it now. There's no representations of that. There's little tiny adjustments for how the status quo could be different, but there's no...there's a couple of weird American cartoons that (our son) has stumbled across that are more palatable. But not great modeling on other levels. Ideally the content should provide good role modeling for kids.

The ones (S2P9) and I do approve of, they demonstrate good ways of being with other people. Being kind, helping people. Not being idiotic and American, being a hero and killing someone.

ED

And, when it comes to role modeling to kids, how about the way you use technology, as a parent?

S2P10

I do as much as I can, but I am not a perfect role model.

ED

When it comes to your use of technology?

S2P10

I don't know if the way that I use tech will or won't impact the way they use it.

Because I don't really use it...well I read the 'paper' (online news).

Well, and I guess I use the device to check emails.

I try consciously not to do that when I'm around the kids, but, there are times when I'm around them where I'll be listening out for an email.

I will tell them 'I'm just going to check my emails' and then I'll check it.

Or I'll make a phone call. So it's not like a quarantine it absolutely, but I try to be aware

Even at swimming. (Our son) is swimming and if I'm looking at my phone all the time or if I take the iPad and I read the paper (online news), he'll look up and he'll be looking at me to look if I'm watching him practice his swimming. You know, its half an hour and half the time they just stand there waiting their turn, right? So there's not (always something to be watching) but it still, it just seems to matter that you're engaged and paying attention to them. So, I'm trying to show them that while I am with them, they are the priority. Because I do spend a lot of time at work and not a lot with them. So I just feel like when I am there, I *am* there.

ED

So, with (S2P9) spending more time with them than you, do you think there might be a correlation, that she might feel more able to spend time on devices when kids are around, whereas for you, your time with them feels more limited?

S2P10

Yeah, that's a good point to make. I hadn't really thought of it that way.

Possibly, I will find out at Christmas when I spend 4 weeks with the children!

Yes, at long-weekends when I have a break from work and can just focus, then yes, I guess I tend to be a bit more lenient (with tech). Probably there is a correlation there.

ED

And, going back a bit to what you were saying about it being contentious to discuss technology use with other families?

S2P10

People seem to have strong views and I guess it's a topic I try to avoid because I know I have pretty strong views about TV and particularly violence on TV.

Amongst our extended family, years ago I expressed surprise that my nephew was doing shoot'em up type video games, and that comment engendered a bit of defensiveness and I thought 'OK, this is something people feel...' well, my sister-in-law felt criticised.

And I thought 'Oh well I wasn't criticising you, I was making a general comment', so I guess some of those experiences with Max, the nephew, made me realise that people make decisions that I find surprising but I think that's entirely a matter for them.

I didn't feel like there was really much room for discussion, by then he had obviously been doing it for years. It wasn't like she was at the point where she could do anything, it wasn't like a situation where maybe with a parent of a same age children, where you could say 'what do we do about this?' 'Is your child doing this?' and discuss it. She'd made those decisions years before, so revisiting that would have been a criticism of the decisions she'd made I suppose.

ED

So, discussions about a child's use of technology...

S2P10

There's judgements about parents and parenting. It's like most issues around kids. People personalise it and can get upset about it

ED

Would you say it's like that with all aspects of parenting?

S2P10

I really think parenting is hard and I deliberately don't judge. I think that's what they do in their house and that's up to them, we all have to figure it out as we go along.

But I am often surprised when, with friends, how judgmental they are about other friends' parenting.

ED

OK, great, I'm going to move on to your journal, and here you've started by using the voice of your iPhone and desktop...but there are a few captions missing, maybe we can talk through how they would describe life, if those devices were brought to life? How would they describe you? Maybe we can start by thinking about what would they call you?

S2P10

It would be a Disney nightmare! What would I be to the iPhone? God I just can't, my imagination is struggling. I just can't think of anything except user. Because I just never thought, I've never used Siri,

I don't have that relationship with my phone. I do with my bike, I can tell you what my bike would think of me, but not my iPhone. I think of my bike as being like my horse, my trusty steed that takes me where I need to, and I don't necessary look after it as much as I should. So yes, a hard task master is what my bike would say. And I guess my phone would say the same thing, to the extent that we – well 'we' (catches herself). I have this, the phone and I are together all the time. So, to some extent, I spend more time with my phone, connected and touching my phone, than probably anything else in my life, including people. And certainly I'm physically in contact more with devices.

I'm always, because of my work I spend a lot of time on the phone and increasingly people contact me directly through my mobile phone. I've got one client who only contacts me through my mobile. I don't know why, I think it's because he works a lot on his mobile. Thank goodness he respects working hours. So I spend a lot of time on my phone, increasingly.

ED

And can you try to describe what does that feel like?

S2P10

Not really, I'm conscious that it's not really a good thing.

Because I have become, well, I've been through a very intense period at work and it's to the point that my phone is there and I almost reach for it compulsively. "Is it there?" (laughs)

Have I got like...? If I miss that email, or I don't respond to it in time then that's going to be a problem, that will create all these problems, so rapid response to the extent that my work and other professional obligations at the moment are requiring very quick turnaround.

I feel very dependent on it. I feel physically anxious if the battery power gets low, at a time when I need it to keep going, I have a round of backup power options to deal with that anxiety, but I have never personified it.

ED

So, might it feel like a personal assistant?

S2P10

No, it's very much a character. Though I've never personified it or given it a novelty character, it's very much a functional thing.

Well, it's a bit more of a boss in the sense that I must respond to it, it requires a response from me and if I stuff up something that's in it, I feel very apologetic. Like this morning I missed an appointment and in my mind I thought it was 8:30, I got a reminder text message but I thought I knew what was going on so I didn't open the text message. And I didn't check my diary, but it was actually (scheduled) at 7:30 and so I missed it.

Put it this way. I am very looking forward to the 15th of December, to switch off my notifications and my alerts and making my phone go silent for 4-6 weeks.

I feel anxious and the phone adds to that. Because of time zone differences, because there's stuff going on all the time.

I turn it on and off depending on what I'm doing and I need to be aware, I'm really connected to it and I don't like being quite so connected to it.

Occasionally I daydream about what would happen if all electronic devices suddenly stopped working one day. How would we function?

For the family it wouldn't be a problem, but professionally, things would slow down to such an extent, things would change completely. Initially it would be a panic. Long term it probably wouldn't be a bad things. Things would slow down. Because of my work, there's a lot of history in law, you'll often read decisions from 150 years ago and you can tell from reading them how different litigation was conducted.

People would run a case on very limited evidence and now, almost any case would run on 100s of pages of evidence. Have you got proof of that? Don't you have phone records? So you gather everything together but no one ever reads it. So it's all a bit wasteful I feel.

ED

But you don't think it would have much effect on your family's experiences, if there was suddenly no digital technology?

S2P10

Well, I guess it would affect us in one of two ways. Or a combination of them, I think we would spend more time playing together. Card games, all the old things that one used to do, when there wasn't children's TV on tap at any hour of the day or night.

The children would fight more, but I think they would also play together more. And (S2P9) and I would have to find ways of dealing with that.

We would have to spend more time playing with the children, we would have to spend more time teaching them how to not fight, how to resolve fights. And we would have to ignore more fights, letting them sort it out themselves as my mum would say.

ED

So, do you see that technology use might actually be minimizing the amount of conflict in the family? Say between the kids?

S2P10

It (technology) is a distraction. Absolutely. As a last ditch. I do, everyone uses the iPad or whatever as a distraction. Particularly in public places, where it's just so hard, with modern approaches to parenting.

It's like that Victorian, 'children should be seen and not heard' and where that was that stern, disciplinarian approach to raising kids. Back then, all that conflict happened at home and was controlled through corporal punishment. That is an approach that is very effective at having well behaved children.

But we don't have that. So our kids run around and shout and fight and express themselves and they are very much seen and heard. And so, devices are a good way of, I find, in public, you can set them up to watch an episode of *Hey Duggee* together and you've got 15 minutes you can have a coffee in.

ED

(Joking) So devices might have replaced corporal punishment? (Laugh)

S2P10

Yeah, in a sense I suppose, devices have replaced corporal punishment.

It's the way to get them to sit down and shut up, is to neutralise them. By distracting them with a screen because it so effective at absorbing their attention and pacifying them. It's also a bit scary because you think "What is the effect of that in large amounts and for long periods?"

I don't know, it's different from, you know, when I was a kid there was playschool at 9:30, there were Saturday morning cartoons and there was an hour of children's programming on the ABC for kids. And I remember turning the TV on in the holidays and turning away in disgust because there was nothing but sport, or news.

ED

Thank you, now moving on to a device that would be able to describe your family.

S2P10

Oh, the TV. That's about the only one (device) that we kind of use together.

It's a much more recreational character, like a fun family friend.
It's a fun thing, it's something that we do together

ED

Can you tell me a bit about the difference between the TV and, say, the iPad?

S2P10

I prefer the kids to watch on the TV as much as possible because it's easier to supervise.

So, I can walk through the room and see what they are watching.

I can hear what's going on and what language is being used.

Whereas on the iPad they could be anywhere, and I can't see them and I can't hear it, and I don't know what they're doing.

The iPad is more private than TV. (Our son) in particular will run off with it and watch it by himself when he's being naughty.

ED

OK, thank you so much (S2P10), that was fantastic and I think that's all we have time for today. (Kids are ready and waiting to go on an outing).

Transcribed by <https://otter.ai>

Appendix 3.11 Codebook Examples: Sources of Conflict between Parents

| Code & description | Examples of in vivo description |
|--|---|
| <p>1. Monitoring each other's technology use</p> <p>Parents keeping track of aspects of each other's technology use. (What devices are being used for, for how long, how often & in what contexts.)</p> <p>Related early codes:</p> <ul style="list-style-type: none"> • Keeping track • Comparing • Comments • Judgements • Time • Attention • Uncertainty/Awareness • Change of behavior | <p>Closing Interview P1: He (P2) doesn't use the phone as much as before, so I don't really need to tell him. Before, I needed to nudge him and ask, "can you?" I hated it. Constantly. Not just for me, but for the kids.</p> |
| | <p>Closing Interview P2: My daughter would comment that I am always on my phone. But I pointed out that if she observed correctly, her mum is on her phone longer than I am when she spends time with them.</p> |
| | <p>Closing Interview P9: I am surprised at P10's self-opinion on her devices because she's actually on the phone a lot and she doesn't think that she is. So I was surprised by that, and I guess doing this activity gave me a legitimate lens to have a look at that.</p> |
| | <p>Closing Interview P10: So this is the Family Tree I drew. This is P9 and this is me. She is very much umbilically connected to her phone and the TV. Vita is connected to P9's iPhone. Idris is connected to my iPad, my iPhone and the TV. And I am connected to my iPhone and my iPad but not the TV, I never watch TV.</p> |
| | <p>Closing Interview P15: Each of the adults have a phone. The children all steal them and use them. Mine is the least likely (to be taken) because I have a number lock on it that they don't know. So it's only if I unlock it and they have my permission that they can use it. P16's is just unfettered access and P17's is hard to get out of her hot little hands. I have a password because I'm smart, to stop the kids using it. I've even got face ID on it, they can't go round it.</p> |
| | <p>Closing Interview P16: Yes, there is a change in my behaviour I tend to only use my computer when P15 is not here because if I am using my computer when she's in, if she's in the room she feels excluded. So no, I don't use the phone, I don't use the computer. Occasionally if she's busy doing other things, yes, but she has to be... I almost have to be 'off the hook' if you like, before I can use them.</p> |
| | <p>Closing Interview P17: I've no idea if P15's on work or FB or LinkedIn or scrolling the news. I would prefer her to put (her phone) down and either be working or be with the family. Like, if she's got to go and deal with work emails, go and deal with them and come back. But I find this one leg in each a bit I can't imagine there's anything so desperately important that it can't wait half an hour while we all have dinner and bathe the children.</p> |
| | <p>Closing Interview P17: And if I mention (her phone use) to her she will just say "it doesn't happen". She'll go, "I am not on my phone!" It's been in her hand before when she goes "I am not looking at my phone", and I go, "It's in your hand!" And she goes "yes but I'm not looking at it" and I'm like, "but you were!" It's so unconscious.</p> |

| | |
|--|---|
| <p>2. Using technology as escapism</p> <p>Parents using tech in ways that mean they do not fully participate in family life, despite being physically present. (Whether a parent intends to use tech in this way, or the other parent perceives them to do so. Can include tech used for work or pleasure.)</p> <p>Related early codes:</p> <ul style="list-style-type: none"> • Distracting • Disengaging • Disconnecting • Switching off | <p>Opening Interview P8: I watch a lot of Netflix...during the week that's what I do. It is my way to switch off...there's definitely a bit of guilt, that it becomes some kind of addiction and that the only way to switch off is just to put my headphones on and basically isolate myself from everything happening ...(getting lost in) this other reality, this show, and that makes me forget what's happening around me. And that gives me a reset. So it's not only just watching it, it's the whole headphones with this, you know the...noise cancellation, so that experience...I confess I'm addicted to it..., but I know it annoys her that I do it every night. The other part of the guilt is because Aya is becoming like this. She watches a lot of Netflix. So, it's as if I'm giving her this habit that I know might be not the healthiest habit, but I'm giving it to my daughter.</p> <p>Closing Interview P9: I guess I had never really tied in these automatic habits, like picking up your phone, I'd never really tied that to an emotional motivation. And I've (put in the Device Journal Probe) that I realise that being with the kids so much, I do lack connection with my friends. So, I do rely on the devices these days now, to sort of get that connection. And I guess what surprised me was really thinking about the emotions around those experiences rather than just going through the motions without really thinking about it... emotions like feeling lonely, a bit disconnected. You know what it's like when you're staying at home with young children and you're sort of missing out on everything else. Especially for us where we had a big social life before. So those emotions are about being lonely, needing that reassurance, familiarity. Yeah, it's just a bit boring being at home. Kids are awesome, but doing all the chores... I don't feel judged about my own use of technology use by anyone apart from P10...which she sees as distracting away from her, whereas I just see it as that I'm really tired because it's been a long day, the kids were a nightmare and I (use technology) to disengage, not deliberately from anyone, but I definitely like a bit of escapism. An hour or two of a movie or something to totally escape, P10 hates it... That's what I was talking about earlier with me using my phone, that drive to feel connected but then feeling disconnected when nothings there and it is a mixed experience. For me that was the escapism of the TV, (the kids) are down and the hard hours are over, it's just about being free from anything else and getting lost in it I guess, free of that role and that responsibility.</p> <p>Closing Interview P11: I think its resulted in some structure in the day Generally (my husband) knows, that his job is to not (to be on a device) between 7 and 8 o'clock. Because that's when he gets home from work and he spends time with (our daughter). And he's not always good at doing that, because other things happen and it does frustrate me, if (remote work) meetings come up... but, I think it's sort of mediated by the fact that I know it's not his choice that's driving that decision and there have been discussions on the longevity of continuing like this, so there are sometimes when it's very explicit, even (our daughter) will say "I don't want you to go and do that meeting, I want you to play with me". So she's aware that his job is taking her away from him, and that he can do it at home because of technology...So I've heard her say to me, in the past before I became really conscious of using (my phone) in front of her "Mummy I am speaking to you can you put the phone down? I want you to look at this". So she's aware that is a distracter which means we are not giving attention to her. And she would say that to (my husband) as well.</p> |
| <p>3. Using technology to placate children</p> | <p>Opening Interview P3: I started to have these shows on iView in the evening for Alex because I needed this half an hour to 45 minutes to really get the dinner ready. It was convenient for me - its functional so I can get things done .</p> |

| | |
|--|--|
| <p>Parents using tech to distract, entertain or reward children for desired behaviour.</p> | <p>That was only the benefit maybe for me. He was two years and I also had another baby. So the baby or the toddler, and things had to be done, so it was quite challenging for me.</p> |
| <p>Includes situations in which parents are seeking to occupy children while they are busy working, doing domestic chores (e.g. cooking, cleaning), sleeping, relaxing or engaged in their own tech use.</p> <p>Related early codes:</p> <ul style="list-style-type: none"> • Reward kids • Pacify kids • Distract kids | <p>Opening Interview P3 & P4:</p> <p>P4: I don't know if it's always happening, the discussions around the decisions.</p> <p>P3: No, its not always happening. Some stuff we maybe make a decision together. Some stuff, we have very different ways and then maybe we don't maybe agree with each other. For the technologies I have kind of respect that, you know, he would know more than me. So you know photo technology things so I will ask for example when I buy the phone and I will ask him for advice but for the TVs and things that was, I found it a little bit different because I don't know if you could watch all the time but um, or games? Was that the game that you were quite upset that I gave him...yeah because of this phone I had another phone that was working and then (my son) asked about playing games. And I thought it was OK for him to play a game sometimes. Let's say because he's so ready fast in the morning and he wanted to play a game while he was waiting for everybody else to get ready. Then I felt it wasn't a problem so I started to give it to him, but then (my husband) wasn't very happy about it.</p> <p>P4: That there was no discussion. That it was just decided.</p> <p>P3: But then I thought it's okay, and it's also mainly me, when the I have to cook or when I have to do this or when he asks after school during his spare time (my husband) is not here, so it's more about me with the three kids and what I have to do to finish up and it was convenient for me to say that "yeah, okay" so that (my son) is busy with something. So he started do it, but then I started to have this thing that when it's time to finish, when I needed to finish cooking or something, or we had to go somewhere in 20 minutes and then he asked what can I do this game for whatever the time? I said yes. But when we have to finish it's finished. Yeah? But he when we had to do something else when he had to stop and do something else, he started to make a big fuss about it and started to get quite aggressive. And then I think that's when (my husband) started to comment about this, technology or the games again.</p> <p>P4 A: I started to comment but she didn't realize. She didn't believe that there was an issue.</p> |
| | <p>Closing Interview P9: Because she thinks I am very generous with screens, and I do use screens a lot as a free babysitter. Because (my wife) works a lot, and it's quite typical at the weekend for her to be away for a whole day. So, when I'm cooking dinner and having to get things ready, I do let them watch TV. And that is quite a bug bear of (her's). She is better at getting them to do their own things and she can ignore screaming children climbing up your legs. I can't. She's a bit tougher than me!</p> |
| | <p>Closing Interview P10: The use of tech in families (especially kids use of tech) is both a contentious issue within families and it's a contentious issue to discuss between families. It's a contentious issue within our family because (my wife) has quite different views from me. And</p> |

| | |
|--|--|
| | <p>she's also very happy as a parent to use TV and screens as a way of buying time and as a bribe and to achieve other things, whereas I'm much stricter in terms of , not only do we not have screens when we're eating together. But no-one ever has a screen when they're eating, full stop.</p> |
| | <p>Closing Interview P11: I always limited her TV before, and I would have used it as a babysitter – for want of a better word - to enable me to cook the dinner, get the washing hung out or do a task that needed to be done. Sometimes, if I had a work meeting that needed to be done from home and I needed half an hour or an hour, I'd say this is your hour of TV that you are allowed tonight, and I need to do my meeting. In that case I would have used technology while she was watching the TV.</p> |
| | <p>Closing Interview P15: Mum knows about passwords, she does have a password on it but the kids all know the password. Except for me, who forgets the password. I'm the only one who doesn't know the password She has told them the password. Well, no, (my son) saw her entering it, learnt it and told the other two! She hasn't got round to changing it She talks about it. I would have, absolutely, but she uses it as a bit of a babysitting device. And it kinds of means that she can turn a blind eye. She doesn't approve of them using it but they will use it and be quiet. So she can get on with cooking dinner or whatever she's doing at times when I'm not there and sometimes when I'm there. Yes, I imagine it's a free for all when I'm not there! Whatever keeps the kids quiet.</p> |
| | <p>Closing Interview P17: Yes, I guess I look at how families use tech and at times I see that if it's not kept in balance it can be damaging. I'm aware that not everyone else thinks that way and you know, they think that keeping their children quiet and well behaved in public, or even all of the time seems to be desirable. And to me, I think children are being cheated! It's a pacifier and its prevented them from doing something that might have enabled them to have more valuable experiences - everything from just learning to read or learning to have an activity that they want to do that is important to them. In other words its prevented them from finding out about themselves, as I said I think the children have been cheated. I think the parents have different values and I struggle with some of it.</p> |
| <p>4. Regulating children's technology use</p> <p>Parents attempt to monitor and restrict children's technology use. (Efforts to keep track and control the amount of time being spent on particular devices & what devices are being used for.)</p> | <p>Closing Interviews P2: The probe activities helped me do that, and I've come up with (the idea of) a device free day. I wouldn't just go to my wife and say it, I would table it with the whole family. And the real motive for me would be to get us out of the house. To do something...and while we might have devices with us...we should just be using it for emergencies only. So, even if it's just going to a movie, or for lunch, then our phones should be on silent until the kids have gone to bed. We should set rules and experiment, to decide, should we do it again? I know we wouldn't get it right first time, and the kids would have to see a benefit to it. I want to encourage a bit more physical activity. I am already seeing that one of my kids is having to watch her health. She is active, but she's not being monitored and we have some concerns...even though laptops and tablets are mobile, you generally do it at home...and because of the work/life balance, we only usually get one day a week where all of us are together. And this is part of the issue, even though we are together, we are not really together, all four of us are doing four different things. We can do that six days of the week but we shouldn't be doing (device based activities) on that one day of the week...we should be doing something together, outside.</p> <p>Closing Interview P5: (My husband) will check with me and discuss it with me briefly, but he is pretty much the initiator and effector of all technology. And I might sometimes end up being a resistor, well a</p> |

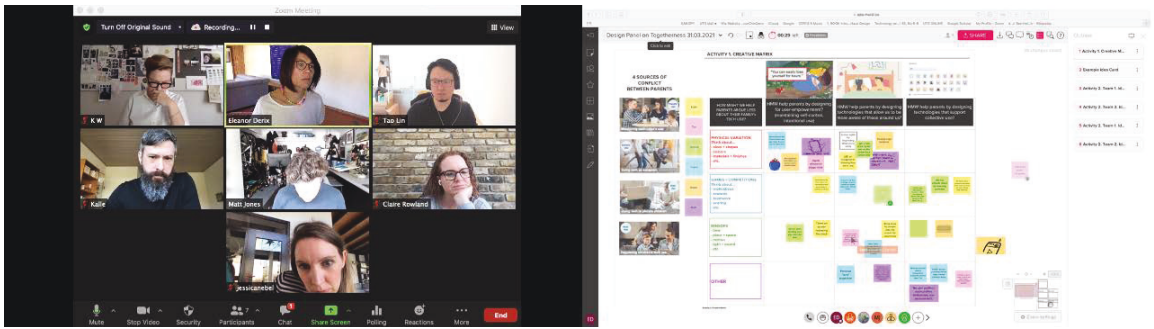
| | |
|--|--|
| | regulator...it's the iPads again...and I think I've seen myself more as a regulator because he'd always be happy to turn to it whenever provided. I regulate through this "no technology use including TV watching before noon" (rule) for instance. |
| | Closing Interview P10: It's just an ongoing struggle really, a parenting challenge. It's about controlling it, limiting it all the time, for me anyway. It's about limiting it and trying to keep our rules going; no screens at the table and we're having a meal together, breakfast and dinner together. So it's more...for me the struggle is keeping it under control so that everyone is not just sitting around looking at different devices and that's our family time. |

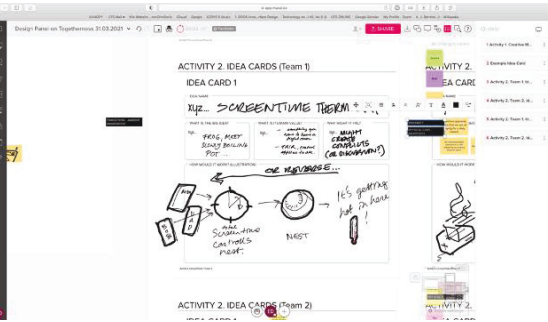
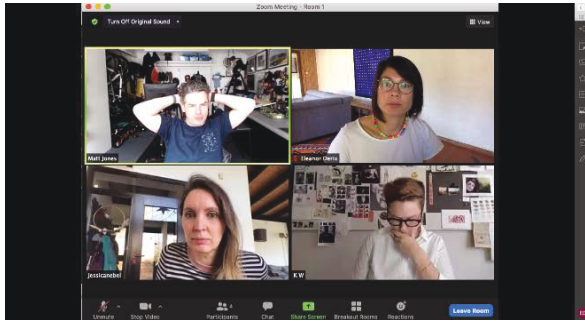
Appendix 4 Study Three | Design Proposals & Interviews

Appendix 4.1 Screenshots of Designers Participating the Two Workshops



Appendix 4.2 Screenshots of the Workshop Activities





ACTIVITY 2. IDEA CARDS (Team 1)

IDEA CARD 1

IDEA NAME
XYZ... **SCREEN TIME THERM**

WHAT IS THE BIG IDEA?
FROG, MEET SLOWLY BOILING POT....

WHAT IS ITS MAIN VALUE?
... something you have to focus on right down...
- F.A.I.R., cannot afford to die.

WHY MIGHT IT FAIL?
MIGHT CHANGE COMPLETS (OR DISOCCUR?)

HOW WOULD IT WORK? (ILLUSTRATION)
OR REVERSE...
It's getting hot in here!
Screen-time controls nest.

ACTIVITY 2. IDEA CARDS (Team 1)

IDEA CARD 2

IDEA NAME
XYZ... **COLLECTIVE GAME** (LARG, CALM)

WHAT IS THE BIG IDEA?
Collective puzzle game for a group of people to solve together.

WHAT IS ITS MAIN VALUE?
... something you have to focus on right down...
- F.A.I.R., cannot afford to die.

WHY MIGHT IT FAIL?
MIGHT CHANGE COMPLETS (OR DISOCCUR?)

HOW WOULD IT WORK? (ILLUSTRATION)
It's getting hot in here!
Screen-time controls nest.

Handwritten notes:
- last causes to be removed/stop
- solve the clues to learn
- forwarding
- box, to be hot
- not a game
- extra
- raise local environment
- level into the game robot skills.

ACTIVITY 2. IDEA CARDS (Team 2)

IDEA CARD 1

IDEA NAME
Proximity indicator

WHAT IS THE BIG IDEA?
Physical presence of smart user digital screen - get people to step up and get the attention

WHAT IS ITS MAIN VALUE?
Creative awareness getting people out of the blue/ technology right use

WHY MIGHT IT FAIL?
Takes up screen space. But can get in.

HOW WOULD IT WORK? (ILLUSTRATION)

ACTIVITY 2. IDEA CARDS (Team 2)

IDEA CARD 2

IDEA NAME
Earn credits for digital chores

WHAT IS THE BIG IDEA?
Promote good digital behaviour and create visibility for how people in the household are contributing to good behaviour

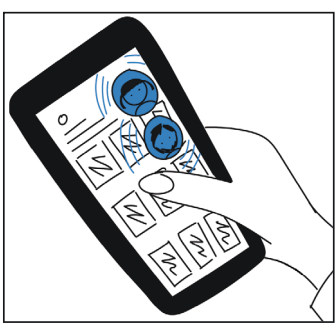
WHAT IS ITS MAIN VALUE?
Creating a conversation between people in the household about good digital behaviour and responsibility of users people do in their device

WHY MIGHT IT FAIL?
Admin overhead?

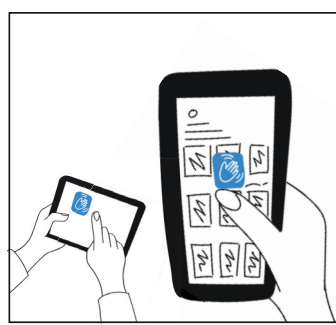
HOW WOULD IT WORK? (ILLUSTRATION)

Appendix 4.3 Storyboards illustrating Concept 1: Wave

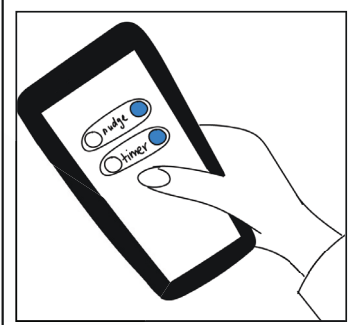




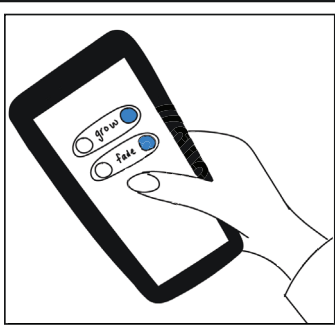
...the icons 'jiggle',
as if waving for attention



Wave can be installed
on multiple devices, and on
multiple profiles of shared devices...



...and a variety of options are available
to easily determine when, and how, icons
appear...

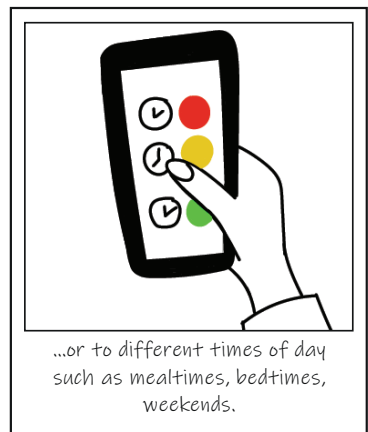
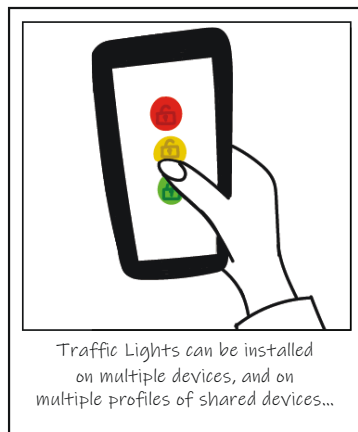
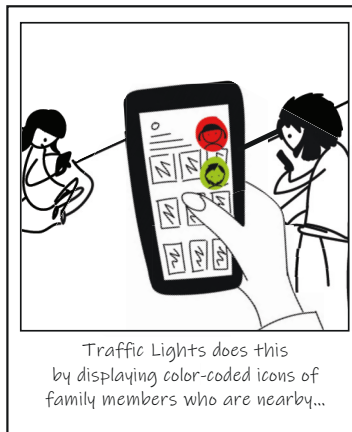
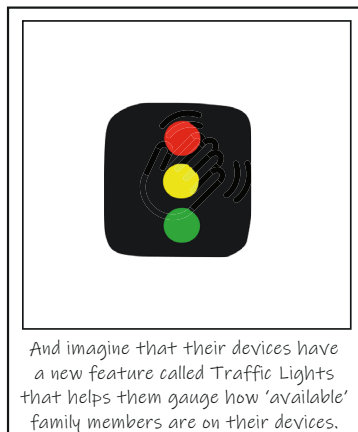
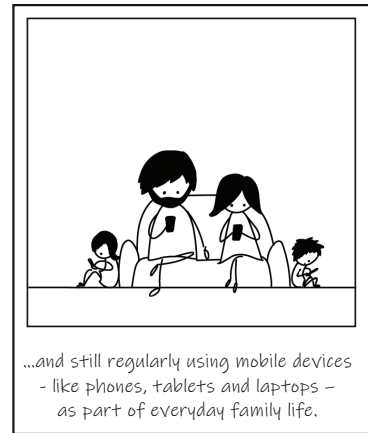
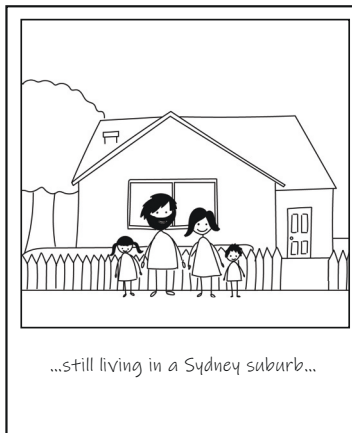
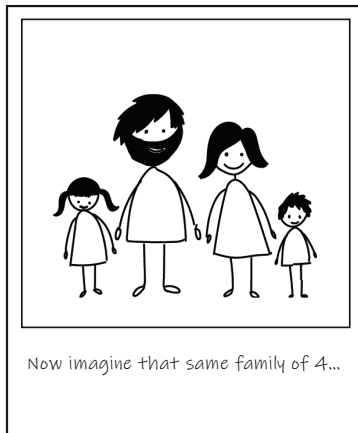


...and a variety of options are available
to easily determine when, and how, icons
appear...



...as well as to determine if and how
family members can respond to
(or ignore) each other's Wave

Appendix 4.4 Storyboards illustrating Concept 2: Traffic Lights

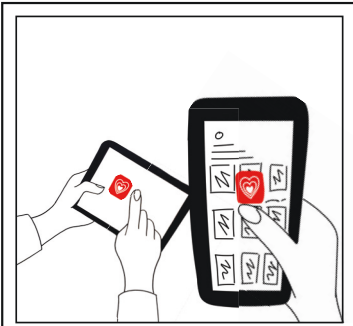


Appendix 4.5 Storyboards illustrating Concept 3: Shared Space

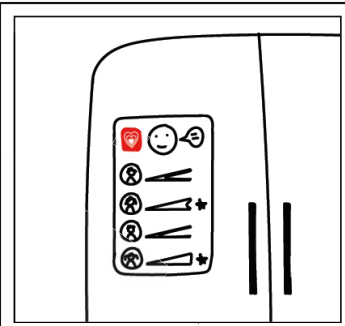


Appendix 4.6 Storyboards illustrating Concept 4: Family Goal Setter





Progress can be viewed on any device at any time...



...and a shared display to foster a sense of teamwork and act as a daily reminder (like sticker charts and notice boards often used for scheduling chores).

Appendix 4.7 Design Workshop Participant Information and Consent Form



DESIGN WORKSHOP ON TOGETHERNESS Participant Consent Sheet

I _____ agree to participate in the research project "Design Workshop on Togetherness" being conducted by Eleanor Chin Derix, PhD Student in the School of Computer Science at UTS

I have read the Participant Information (below) and understand the purposes, procedures & risks of the research as described in it.

I have had an opportunity to ask questions and am satisfied with the answers I have received.

I freely agree to participate in this research project as described and understand that I am free to withdraw at any time without affecting my relationship with the researchers or the University of Technology Sydney.

I understand that I will be given a signed copy of this document to keep.

I agree to be audio recorded, video recorded and photographed (still frames from video recording)

I agree that the research data gathered from this project may be published in a form that:

- Does not identify me in any way
- Identifies me, but not my current professional position (e.g. Sam Smith)
- Identifies my professional position (e.g. UX Designer at Apple)
- Identifies me **and** my current professional position (e.g. Sam Smith, UX Designer at Apple)

I am aware that I can contact Eleanor Chin Derix if I have any concerns about the research.

Name and Signature [participant]

____/____/____
Date

Eleanor Chin Derix
Name and Signature [researcher]

17/03/21
Date

DESIGN WORKSHOP ON TOGETHERNESS Participant Information

WHO IS DOING THE RESEARCH?

My name is Eleanor Derix and I am a PhD Student at UTS. My supervisor is Dr Tuck Leong, also at UTS.

WHAT IS THIS RESEARCH ABOUT?

This research explores the role that digital technology plays within today's families. Specifically, how the use of digital technologies such as smartphones, tablets and other internet-connected devices shape the experiences, interactions and relationships between parents.

This particular study (Design Workshop on Togetherness) seeks to understand designer's thoughts on some of the insights that have emerged from the research so far, specifically around the way in which family technology use can contribute towards conflict between parents. The primary aim of this session is to generate UX concepts that attempt to address some of this conflict.

WHY HAVE I BEEN ASKED?

You have been invited to participate in this study since you are a Design Professional with experience/interest in researching/designing digital technologies for use in domestic settings.

IF I SAY YES, WHAT WILL IT INVOLVE?

If you decide to participate, I will invite you to participate in a 1.5 hour online ideation session:

- I will email you a brief explainer (PDF) and ask you to look through it before the session.
- I will present you with a background of the research so far.
- I will ask you to briefly introduce yourself to the other participants in the session.
- I will ask you to complete short ideation activities with the other participants.
- The session will take place via Zoom and activities will be conducted using Mural.
- The session will be audio/video recorded and transcribed.
- I will ask you for (brief) feedback at the end, or shortly after, the session.

ARE THERE ANY RISKS/INCONVENIENCE?

I have designed this study to minimise any risk or inconvenience that you might experience.

I will attempt to be as flexible as possible with scheduling the session and aim to keep the time required to complete activities to a minimum.

If at any time you feel uncomfortable with any of the questions or activities, please don't hesitate to communicate that to me.

DO I HAVE TO SAY YES?

Participation in this study is voluntary. It is completely up to you whether or not you decide to take part.

WHAT WILL HAPPEN IF I SAY NO?

If you decide not to participate, it will not affect your relationship with the researchers or the University of Technology Sydney. If you wish to withdraw from the study once it has started, you can do so at any time without having to give a reason, by contacting Eleanor Derix.

If you withdraw from the study, any transcripts or information collected from you will be deleted or destroyed. However, it may not be possible to withdraw your data from the study results if these have already had your identifying details removed.

CONFIDENTIALITY

By signing the consent form (above) you consent to the research team collecting and using personal information about you for the research project. You can determine how confidentially this information will be treated in the consent form. Your information will only be used for the purpose of this research project. In all instances your information will be treated as confidentially as you determine.

I plan to discuss/publish the results in academic forums such as academic conferences and journals. In any publication, information will be provided in such a way as you determine (above).

WHAT IF I HAVE CONCERNS OR A COMPLAINT?

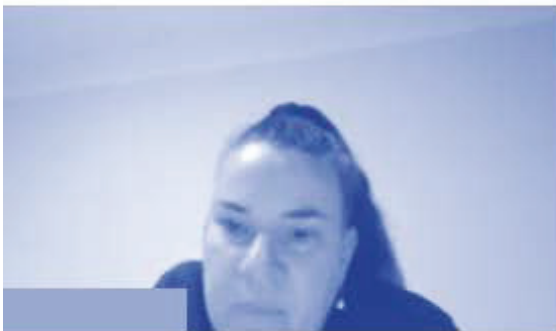
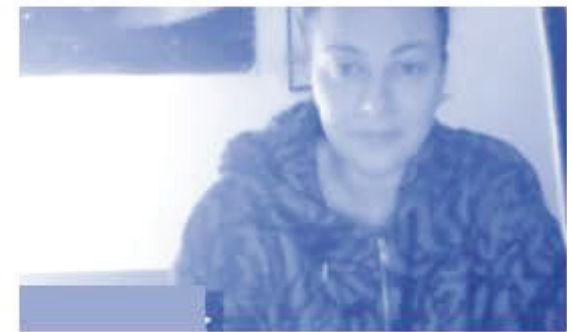
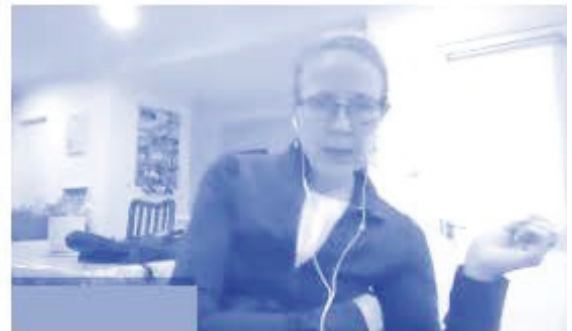
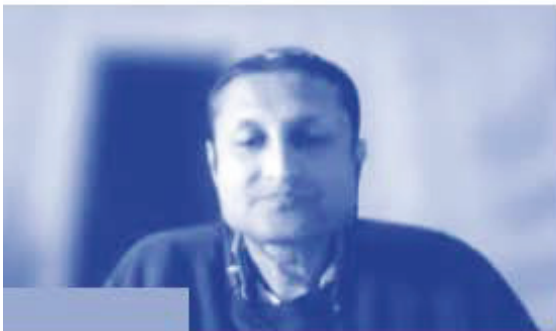
If you have concerns about the research that you think I can help you with, please feel free to contact me. (eleanor.c.derix@student.uts.edu.au)

You will be given a copy of this form to keep.

NOTE:

This study has been approved by the University of Technology Sydney Human Research Ethics Committee (ETH17-1811). If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on: +61 2 9514 2478 or email: Research.Ethics@uts.edu.au. Any matter raised will be treated confidentially, investigated and you will be informed of the outcome.

Appendix 4.8 Screenshots from the 14 Interviews with Parents





PARTICIPANT INFORMATION SHEET
DESIGN CONCEPTS TO IMPROVE FAMILY EXPERIENCES OF DIGITAL TECHNOLOGY

WHO IS DOING THE RESEARCH?

My name is Eleanor Derix and I am a PhD Student at UTS. My supervisor is Dr Tuck Leong, also at UTS.

WHAT IS THIS RESEARCH ABOUT?

This research explores the role that digital technology plays within today's families. Specifically, how the use of digital technologies such as smartphones, tablets and other internet-connected devices shape the experiences, interactions and relationships within families.

At this stage of my research, I have created several Digital Design Concepts' for domestic technology use and I am interested in capturing feedback on these Concepts.

WHY HAVE I BEEN ASKED?

You have been invited to participate in this study since you are a parent/caregiver living in a household with your child/children under the age of 12 years of age.

IF I SAY YES, WHAT WILL IT INVOLVE?

If you decide to participate, I will invite you to participate in a two-week study:

- I will ask you to complete an initial "General Participant Details" form which enables me to build a demographic overview of the people participating in this study.
- I will ask you to participate in an online Semi-Structured Interview that will take approximately 30-45 minutes, in which: I will introduce you to the findings of my research so far and ask introductory questions about your experiences of digital technology use in your family. I will introduce you to a set of Digital Design Concepts and describe how they might be used in family life. I will then ask you to reflect and provide your feedback on, these Digital Design Concepts through several questions.
- This interview will take place remotely (via video call), at a time that is convenient to you.
- The interview will be audio/ video recorded and transcribed.

ARE THERE ANY RISKS/INCONVENIENCE?

I have designed this study to minimise any risk or inconvenience that you might experience. If at any time you feel uncomfortable with any questions, please don't hesitate to communicate that to me.

DO I HAVE TO SAY YES?

Participation in this study is voluntary. It is completely up to you whether or not you decide to take part.

WHAT WILL HAPPEN IF I SAY NO?

If you decide not to participate, it will not affect your relationship with the researchers or the University of Technology Sydney. If you wish to withdraw from the study once it has started, you can do so at any time without having to give a reason, by contacting Eleanor Derix. If you withdraw from the study, any transcripts or information collected from you will be deleted or destroyed. However, it may not be possible to withdraw your data from the study results if these have already had your identifying details removed.

CONFIDENTIALITY

By signing the consent form you consent to the research team collecting and using personal information about you for the research project. All this information will be treated confidentially. Your information will only be used for the purpose of this research project. In all instances your information will be treated confidentially. I plan to discuss/publish the results in academic forums such as academic conferences and journals. In any publication, information will be provided in such a way that you cannot be identified.

WHAT IF I HAVE CONCERNS OR A COMPLAINT?

If you have concerns about the research that you think I can help you with, please feel free to contact me. (eleanor.c.derix@student.uts.edu.au, [REDACTED])

You will be given a copy of this form to keep.

NOTE:

This study has been approved by the University of Technology Sydney Human Research Ethics Committee [UTS HREC ETH17-1811]. If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on ph.: +61 2 9514 2478 or email: Research.Ethics@uts.edu.au, and quote the UTS HREC reference number. Any matter raised will be treated confidentially, investigated and you will be informed of the outcome.

Appendix 4.10 Study Three Interviews: Participant Details

Table 1. Study Three: Interviews - participant details

| Participant | Age | Current Occupation, (Part-Time/Full-Time) | Cultural Background | No. of Kids (Age) |
|----------------|-----|--|---------------------|----------------------|
| S3P1 (Father) | 41 | Lawyer (FT) | Australian | 4 (10, 8, 5, 1) |
| S3P2 (Mother) | 46 | Sales Advisor (PT) | Malay | 2 (11, 9) |
| S3P3 (Father) | 55 | Marketing Manager (FT) | British Indian | 2 (11, 9) |
| S3P4 (Mother) | 50 | Physiotherapist (PT) | Australian | 1 (8) |
| S3P5 (Mother) | 38 | Transport Planner (FT) | Australian | 3 (11, 9, 7) |
| S3P6 (Mother) | 42 | Graphic Designer (PT) | Australian | 2 (10, 7) |
| S3P7 (Mother) | 48 | School Councillor (FT) | Italian-Australian | 2 (9, 6) |
| S3P8 (Mother) | 42 | Pharmacist (PT) | Chinese-Indonesian | 3 (10, 7, 2) |
| S3P9 (Father) | 50 | Software Engineer (FT) | Australian | 3 (10, 7, 2) |
| S3P10 (Mother) | 36 | Student (PT) | British | 2 (8, 5) |
| S3P11 (Father) | 38 | Veterinarian (FT) | Spanish | 2 (8, 5) |
| S3P12 (Mother) | 41 | Engineering Draftsperson (PT) | Iraqi | 2 (17, 6) |
| S3P13 (Father) | 52 | IT Consultant (FT) | Iraqi | 2 (17, 6) |
| S3P14 (Mother) | 36 | Teacher (FT) | Chinese-Australian | 2 (5, 2) |

Appendix 4.11 Transcript from Study Three Interview (S3P6)

Date: May 2021

Duration: 51:01

SPEAKERS

S3P6, Eleanor Derix (ED)

ED

I'd like you think about the statement "I associate digital technology use in my family with positive experiences." Would you say that you agree or disagree with that statement, or feel that you're somewhere in between? And could you tell me a bit about why you feel that way?

S3P6

I would say probably disagree. If I think of a unified experience, I reckon it would be, I guess, feeling like everyone's distracted, they're on devices and it's like it's...it's like a battle. So I feel like there is a constant feeling of, everyone using the technology as single users. So, it's not an experience for the family or the children, it's usually an individual experience. So, it's not a nice family experience. Yeah, I don't think we have a single thing that brings us together - unless we are watching a movie, which I don't really think of as using digital technology. So no, I don't think digital technology use unifies our family in any way.

ED

Thanks, and now I'd like you think about the statement "I associate digital technology use in my family with conflict between parents." Would you say that you agree or disagree with that statement, or feel that you're somewhere in between? And could you tell me a bit about why you feel that way?

S3P6

Yeah, I guess we don't have an alignment on the kids' use. So that's where we do have sort of well - I don't know if I would say its conflict, but we've had a few instances where some games have been approved and the other parent doesn't think that's something the kids should be using. I guess we haven't aligned, so it's not smooth, if that makes sense. It's not that there's lots of conflict, it's more the stress of trying to manage it as a whole; to manage the children with it and manage our own usage, probably as well. And, again, it's not something we do together. If we do, we do it parallel. Yeah, I wouldn't say there's conflict because I think we feel aligned because we have the same battle. Although, I will say that I agree with it because, I'm often wondering if (my husband) will hear me when he's sitting down to look at his phone at his morning coffee or pulling out his phone at the table where it's like, we're not aligned.

ED

Okay. So then there tends to be more conflict around your (the parents') individual use?

S3P6

Yes. So let's say "Agree". It's common, and it's more when you're amped up and you're stressed and then (he's) sitting there watching, something, and I'm like, "*There's stuff happening!*" So maybe it is even with the "Do you associate digital technologies in my family with positive experiences" that I could even say "strongly disagree", because I don't believe it unifies us at all. And I don't think of it as a bonding experience. I find it stressful. Then with the technology, the conflict, it's kind of one of those things, right? When things are just, like, making breakfast or getting ready for school, it's just that when someone else is escaping on the thing (device), it's frustrating. But I think we have, I wouldn't say it creates conflict, but you'll just hear one of us say, you know, directing each other what to do next, "*if you've got time then, can you do this?*". But yeah, we have certain things like 'strictly no phones at the table' and stuff. So, that's a big pain point of mine when it (husband's phone) comes out. And that's when I get that "*it's work*". It's not common, because it's not allowed. There is definitely conflict at times with it. Yes. And I

feel like when times are a bit tricky at home, that's what cops it - it's the technology use, because it's like, it's not the most important thing to be doing.

ED

So technology use on its own is not causing loads of stress in family life, but if things are stressful, the technology use might amplify feelings of stress given everything that is going on?

S3P6

Yes, it is unhelpful. It's kind of like, you can only be using your device after the hours of like, 8:30 when the kids are in bed. Any time before that, it's just, it's absolutely annoying and useless, because you should be with the children. But then, I can't talk - I'm on it quite often, because I do my whole, all my emails on my phone, which is probably wrong, because I realized my kids talk at me while I'm typing an email, and I'm multitasking, probably blatantly ignoring them.

ED

OK, now I'm going to present you with the first Storyboard describing a Design Proposal called Wave.

[Present Storyboard 1: Wave]

Now I'd like you to think about the statement: "this concept could improve parents' experiences of technology use in everyday family life". Would you please tell me why you agree or disagree with that statement, or if you sit somewhere in the middle?

S3P6

Yeah, it could improve my experience - yeah, I guess it would. I like this concept. Because it's something that I feel would probably work, but you wouldn't want to admit that you needed it. Does that make sense? Like "*Oh, you know, our family are always on our devices so I've got to nudge them, I've got to show that I'm here*" and, it would actually be quite, it would feel like it was like, you know, it's like, they don't respond to me verbally saying, get off the device. If I can get into their device and yell at them. I could get them off. But it's something that you'd be like, "*Oh, no, no, no, no, no, I don't need this.*" And then you're like, "*No, actually, I probably do need this.*" But it's more of a like, maybe is it more like, "*That's how sad this whole environment is that we need to, like, pop up inside their device?*"

ED

So, just the idea of admitting that you want or need to use Wave might be a little bit of a barrier?

S3P6

Yeah, kind of - it's almost like we're trying to fix something that's broken, by just like, I don't know. Yeah, first I was like, "*I don't want to admit that we need this*". But you know, I would probably end up with it, because it'd be great way to help manage the situation. And I know, I reckon Ollie (son) would feel really guilty if he saw my little face on the screen trying to tell him to get off the, you know, get off. Where he can't, you know, now when they're on (the device) they're kind of blocking out everything else that's in in real life. So I feel like it's just another, I don't know if it's unifying, but in the way that they'd go, "*Oh, look, mum's on my screen!*" or if it'd be more like, "*Get off that you've got five minutes - I'm in the room, or my face has been sitting on a screen for 40 minutes, and you still on there!*" Ha-ha. So, whatever you actually think people might think, I need this anyway. It's not about other people. But we would probably use it as a last resort to feel like we are connected in some way. Or even I would be probably using it more as empty threats about screen time usage. And I don't know if I would feel like it's connecting and unifying us. Maybe I would, or maybe I'd just be really depressed that I'm seeing my whole family while I'm in a 'scroll hole', while they're all sitting next to me, and we're all scrolling together. So, as much as there's that, another part of me is saying yes, you know what? I probably secretly really need this because it will help me manage and all of that, but right, it's a sad problem I already have and I'm trying to fix it.

ED

OK, thanks. And how about the difference that you mentioned between using it to limit screen time for kids compared to How about using Wave between parents' phones?

S3P6

Yeah, OK. Maybe it could be used intimately, like, "*Oh, hey, I'm sitting right in front of you, giving you a dirty wave!*" Ha-ha. Maybe like that? Or, you know, like, "*Oh hey, what are you doing? You watching those silly videos again?*" Yeah, it'd be interacting, but it would feel like it's a little bit...and it's cheeky, it is a bit like, "*Oh, hey, I'm poking you*", like Facebook could years ago. But maybe it is just as, you know, oh, we never communicate - the sad reality, we're attached to our phones. And maybe it would be fun, but yeah, maybe because first I was like, "*I could actually see us using that!*" because no one responds to each other in person sometimes.

ED

So does that aspect make you feel a bit unsure or negative about it?

S3P6

Yeah, because when you were showing it, I loved the idea of being able to show the faces creep up over it - it still made you feel like it was friendly, and like, you know, "*I'm not going to be screaming at you from the kitchen. I'm just going to like, slowly take over your screen!*" Ha-ha. So, yeah, I feel like we would probably need it and use it, but yeah, I feel like maybe it's not helping us feel connected. I'd still be using it as a control thing, I think. But could it improve my experience? Erm, yes, I feel it could improve it, by dealing with that feeling that I was talking about, where, I don't feel like (family technology use) is a unified experience. I feel like at least if we got into their device, we could communicate with them, and, you know, get them from inside instead of trying on the outside. So I would say it would probably improve my experience of how my family uses technology, but it would still be in a, like a haunting kind of threatening. But that just might be me, though! So, I will agree it may improve my experience.

ED

Now I'd like you to think about the statement: "This concept could improve parents' experiences of technology use in everyday family life". Would you please tell me why you agree or disagree with that statement, or if you sit somewhere in the middle?

S3P6

I guess it would, because you would have the plain hard data that if something had come up after 30 minutes being on it, obviously, it would be that "*I told you so*" (Interview briefly interrupted by child). Again, I think it would be something that we want in our current use of technology. I guess it'd be good for the kids to have it and for me as well, so they know when I'm working or not working. Like, I've always got to be on duty for them. But then again, I think my kids would always put their lives at the highest importance. But I think it would still be good to have the timing (control), and you could set profiles to different types of apps and times, and all that kind of stuff would be good for regulating the usage of the family. So I would say it would improve our experience. Again, it's kind of a little bit like, where it's kind of used as just a regulatory thing, that I'm using it as a way to say, "*Get off your phone!*" or "*Oh, you're doing something that is a bit more worthwhile, so you can stay on it longer!*", so it would be more of a remote monitoring kind of thing - and still probably in ways of trying to control - maybe I try and control screen time too often - it's a drag!

ED

OK, now I'm going to present the second Storyboard describing a Design Proposal called Traffic Lights. [**Present Storyboard 2: Traffic Lights**]

Now I'd like you to think again about the statement: "this concept could improve parents' experiences of technology use in everyday family life" and please tell me why you agree or disagree with that statement, or if you sit somewhere in the middle?

S3P6

Yeah, it would, I guess, because it would set a standard, in that obviously, you'd know for sure instead of always asking, "do you know how long we've been on for?" So, yeah I reckon it would, so I'll say agree.

ED

Because, in a similar way to Wave, you've got that almost like an evidence kind of base thing?

S3P6

Exactly that - and it's kind of like a little contract, pre-organised. And so it's all pre-set, and we may even be able to have it between the kids. So it's all set.

ED

Could you just tell me a little bit more about that?

S3P6

So, we do have something at the moment, where (my husband) can track (my son's) game use across all the devices. And I have to rely on (my husband) to find it. But it kind of always like, we say "Ollie, you've got 40 minutes, you've got to put a timer on - do it", he'll somehow forget the timer. (Me:) "How long were you on?" (Son:) "Oh 30 minutes", (Me:) "(My husband) can you check that?" So this is kind of what we would want. And also, I would love to know how involved people are in things, it'd be nice to know, when someone's just not doing much and you can say "get off" or if it's work, same with me, I could also put on what I'm doing. So a contract where I'm saying, it's just visual proof that it's there - that you have this much and that and it's been used.

ED

And that might help misunderstandings and disagreements?

S3P6

Yeah, I guess, because it's visual. Visual is the best - it's better than just verbal agreements. Like, you know, we have a two hour a day screen policy for only on the weekends, but it somehow is like every weekend, we're confused about how much time it actually is. (Son:) "Does that also include watching the iPad?" (Me:) "Yes, it also includes watching the iPad" sort of thing. You know, it's never clear, even though we give them that clear instruction - so something that could be clear and visual, so there's less negotiating around it. Because there's multiple devices. So it's not like he has one iPad, and everything's on the one iPad. There's like, two gaming consoles, there's a computer, iPad and now a little phone.

ED

And when it comes to managing the kids- say that setup where you were trying to keep track of the kids and you're having to go through (your husband) in order to get that information - do you feel like that's driven by what's available in the technology? Or is that a choice based on something else?

S3P6

Yeah, it's about what's available. So, (my husband)'s got all that - and you know what? He can't even do all of our tech. He's connected to the Switch and the Xbox, so that's our two gaming consoles that we have. But I haven't got - I should have and I don't - I don't have the setups on the Mac computers and the iPad. I took them off ages ago and I probably should have them on there too. But it's not unified. So that's separate devices and two Mac products, which we can't unify. Who's going to calculate all three of those together? (Our son) won't! Ha-ha. So if there was one thing that charted everything - that would be amazing. But then again, it's a regulatory thing again, it's trying to monitor and it's not...it will save disagreements for the whole family and it would improve my experience in technology with my family, but it's not creating like, unified, you know, like that feeling of unification. It's just feeling that we're on the right track, and that there are no more ifs and buts - "just get off. It's done." So it's just making the battle a bit easier. I liked the Traffic Lights where you could put what you're doing. I thought that was good.

ED

That when you unlock it you have to input how busy you are?

S3P6

Yeah. I liked that.

ED

OK, so with Storyboard 2, would you agree with the statement about misunderstandings and disagreements?

S3P6

Yeah, well, this really could help alleviate massive misunderstandings, so I would strongly agree. And it would improve my experience of how my family uses technology in everyday life, it would also do that too. It would be making life a little bit - probably a lot - easier, because everyone's battle is screens. And managing multiple devices is the biggest battle, I think. So, I'd say, strongly agree about both statements.

ED

OK, now I'm going to present the third Storyboard, describing a design proposal called Shared Space.

[Present Storyboard 3: Shared Space]

Now I'd like you to think again about the statement: "This concept could improve parents' experiences of technology use in everyday family life".

S3P6

Yeah, I agree, it would improve the experience definitely. And I like how it is that kind of unified thing - I'd probably be like, "*I don't want to watch this anymore*", when someone shares something. But it would be nice to have it in the background, maybe even for knowing what the kids are watching, and understanding what they like. I do like that aspect. I don't know how long we could stand it for some things, but yeah, I kind of do like how you can share things. So, if everyone had a screen and everyone's stuff was up on the screen, maybe also as the kids are getting older, that would be really important so that we could be like, "*well if you're doing stuff above board (share it)*". You know, again it's a bit like a regulatory kind of thing. But it's like, it's something you can share. I know (my son) always loves to show me things but I'm always busy. It's like, "*oh, show me later*", but he's out of the mood then. So it would kind of be cool to have it for that I guess.

ED

And between parents, would it be useful to see what each other is doing at all?

S3P6

Yeah. Again, see maybe I'd be using it as a thing for the kids - to see what they're doing - as a regulatory thing as well, but also interesting. (My husband)? I don't know, sometimes we like sharing videos, but then sometimes I have really no interest. I don't think he would have any interest in most things that I'm scrolling through either. I mean, sometimes it just be like, "*Oh, I don't need to see that stuff*", you know, it'd be boring or like, you know articles or silly videos on things. So I don't know, maybe it could be a bit of fluff, but then, it's got a nice bit of transparency to it. But I guess it would feel weird, in a way, when it comes to privacy -that maybe there isn't privacy or trust? Because, maybe someone doesn't want to show or someone wants to read a trashy article about something, but then I guess that's OK. Yeah, it's nice to talk about and being able to share those things. But yeah, whether it would work with us when someone's deep in, say (our son) is gaming, would he really care what anyone else is watching? I do see the kids unite over peering at each other's screens sometimes. It's like "*Oh, look at them. They're bonding over watching the same screen at the same time*". It does feel like it has this kind of thing to unify the family. Whether or not it would last with us, or would work, or if we'd get bored of watching, like all these video game things, but then it'd be nice to share things together, and say, "*Hey, look at this*". And maybe, yeah, you could nudge them

with, "Hey, check this out", because that's kind of cool. I kind of would like that because I guess it's happening in the moment and that's when it's like, when you really want to share it. So, yeah, I do like that kind idea.

ED

So, thinking about the first statement when it comes to Storyboard 3?

S3P6

I'd agree - could it improve my family experience? Yes. And the concept would alleviate misunderstanding/conflict? I'm not sure. It's interesting because I feel like it actually has that feeling of sharing, unifying and being in each other's space - in a non-threatening way. Maybe I'll say strongly agree, because I like how it has that - it's got a positive feel to it. Well, how I would use it positively to share and do that kind of stuff.

ED

OK, now I'm going to present the fourth and final Storyboard describing a design proposal called Family Goal-Setter.

[Present Storyboard 3: Family Goal-Setter]

Now I'd like you to think again about the statement: "This concept could improve parents' experiences of technology use in everyday family life".

S3P6

I really liked the idea of this. I would be interested to see how long it would actually work in our family setting. Would we get bored of it? Or would it fail if one of us, say if (my daughter) got (bored with) it within a couple of weeks, and then would it all just fall apart? But I like the idea of having something that helps everyone, because first you'd have to discuss your goals and then experience things, and then probably help each other set out to get them done. So it could be like, the ultimate reward chart, which I think could...again, I like the idea of it. I don't know how it would help my experience of using technology, I can't see that - unless there was some kind of, depending on what kind of app it was, I guess how the app would work on each individual iPad or device.

ED

How about the overall dynamic of the family when it comes to how device use is managed?

S3P6

Yeah, I think it would be positive, I definitely think it would, because (my husband) and I could be honest, and say, "*we should only use (devices for) two hours a day*". But then also having the kids see our goals, even the goals that aren't like technology (related) goals, and then seeing us, either do them or not do them, you know, being involved in that. And even the kids setting their own goals and having to think about, like, how achievable are they? Did they achieve them? And we can just have those chats and discussions - I think goal setting is probably one thing that families don't do much together, because the parents are always telling the kids, "blah, blah, blah, do this, don't do this" and then the kids kind of have to just, you know... so I think it would open up a lot. And it would maybe help kids feel like they're empowered to make their own (goals), and to want to achieve goals or even to make their own goals and help them think about what is it they want to achieve - that's outside (unrelated to) screen use as well. So I liked how it could be screen related and not as well. The 'outside of screen' (aspect) is kind of giving it that 'outside of tech' feel which ideally, you know, we're all trying to get away from (technology) now that we're so involved in it and using it so heavily, I think. So, I expect that it would, yes, I will say strongly agree, I think this concept could improve...it could because we can become more aware of what we're doing and how we're doing and sort of take control of those things.

ED

Okay. So, improving your experiences by helping you all feel more empowered?

S3P6

Yes, and aware.

ED

And how about between you and (your husband) in terms of misunderstandings, uncertainties or disagreements that you have about each other's use or managing your kid's use.

S3P6

Yeah, it could (help). It could, because I guess, simple things like, say the kids decided to make a goal that they only did this much a week, and they did or didn't do it, and again it's there (visible). Same with myself. I think everyone would love to do less scrolling. Yeah, it will. I'll just say agree, though.

ED

So, you mentioned the novelty factor. Any other potential difficulties with this concept?

S3P6

I think that would be the only thing really, as a family, because, I wonder, you know, if (my daughter) did drop off, or say even (my son), or one of us did, then it could affect us as a family. But the idea, I like - the whole concept and hoping that we would get driven by, "OK, *what's on next week?*" or "*What's today's goal?*" Or maybe it will change the way we...but could it all wear off? We're not really good at routine and stuff. Well, I'm not, (my husband)'s not. (My daughter) might actually stay on it. Ha-ha. So, maybe the negative bit would actually be positive. I like the whole unification and it feels like it could be giving us something more than what we're looking for already really.

ED

And now, thinking about each of the four storyboards you have been shown. Could you please talk me through how you would rank them in order of preference?

S3P6

This is hard, because I feel like Wave and Traffic Lights are really similar, and the other two are quite different. So it's tricky. Okay, I'm going to say Wave is my least favourite, Traffic Lights second (lowest), the Shared Screen third (lowest), and the fourth (lowest), the other one the Goal Setting. Just because I feel like the first two, like Wave and Traffic Light is a way of controlling and muting our chaos from digital technology usage in the family. I feel like it's just one of our biggest battles with everything. And I feel like these could actually - well, it's good, because these could help it. So, maybe I'm doing it (the ordering) all wrong. But yeah, these all help in that way and they will help settle problems, but we're using it as a way to monitor and to control and to relieve our stress and all of that anxiety about it, and our fights, and our feeling that our kids aren't listening or were not listening and all that kind of stuff. So, I feel like those two would fix that. The sharing screen is nice because I feel like it opens up the family, you know, to conversations and maybe to that unifying thing, again, whether it would work long-term, I'm not sure? See, maybe I'm doing it (ordering) around the wrong way because I like the last two and the Goal-Setter (especially) because it's giving me something I think we don't have from technology and it's trying to - I feel like it's something that could possibly give us more than what digital technology is currently giving us in terms of more - you know, the experience

ED

So, in a sense, if I can use an analogy, you feel that Wave and Traffic lights are helping to extinguish a problem, whereas the other two ideas are actually opening up and delivering a new solution, rather than just solving the problem?

S3P6

Yep, exactly.

ED

And are you able to say which of those two approaches you prefer? I get a sense that you're saying in a way, one of them sits better, because you seem to think Shared Space and Family Goal-Setter might help to you manage things in a constructive, positive way. And the other

approach, while they might be helpful tools, you'd have to get over the fact that you're admitting to even needing them.

S3P6

Yeah, and Shared Space and Family Goal-Setter could actually be the absolute answer, do you know what I mean? Because then, screen time, and usage would be not a problem. So (that approach) could, in fact, be the best. But we don't know what we want. We want to feel...like, I'm not happy with screen time, I find it's just we're all getting lost and sucked into it. It's not a positive experience. You know, I don't know how other people are feeling but as a family, it's becoming one of those just heavy-handed, like, "*Oh fine, use the screen*" or "*Oh fine, do that*". And as a parent, I'm just not enjoying it. So in a way, maybe Wave and Traffic Lights could be the ultimate solutions to the problem. But then, I guess here I am feeling like I want something that will change my life (Concept Shared Space and Family Goal-Setter), so it's hard (to choose between them).

ED

How about the last way of looking at it - which would help more to alleviate issues between you both as parents?

S3P6

Yeah, it would definitely be Wave or Traffic Lights, yeah, I think them - to alleviate the parent misalignment or, you know, that kind of stuff, it would definitely have to be Wave, or Traffic Lights. Because that, I guess, is the frustration. Or maybe if those two were (combined into) one, it would be great. So, maybe Wave could be then my favourite going from that.

ED

Because, if you focus more on the niggles that you have between parents...

S3P6

I liked with Traffic Lights, how you could shut it (the device) off. And you could, you know, it was like that, rather than just dragging my face across the screen for (my son) to see and ignore me then. Though I would probably say that Wave would be in a nicer way of you know, like, even with the kids, I guess, like Traffic Lights though, because you're also showing where you are and what state you're in - but maybe Wave could be considered because it's communicative in a way where it's friendly and it can be sort of that kind of friendly tone.

ED

Thank you. It was really good to have that articulated by you in terms of those two different approaches, one being about regulating and monitoring and stopping device use, and the other I think that you said, 'opening things up and creating new experiences'.

S3P6

Yeah, it's that, I guess we all want something else, maybe we've had so much tech, and the same channels that we're not getting anything from anymore. Do you know what I mean, compared to when it was new? But now, it's like, "*Ahhh, I'm staring at the screen and I don't know what's happening*". Or, it's kind of almost like, "*What's next?*" you know? I think you can use Traffic Lights and Waves at the same time - that would be like the ultimate!

Appendix 4.12 Codebook Examples: Design Approaches to Benefit Parents

| Code and description | Example of in vivo description |
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| <p>Awareness</p> <p>Design approach that attempts to foster awareness between collocated family members</p> <p>Related early codes:</p> <ul style="list-style-type: none"> • Curbing tech use <ul style="list-style-type: none"> - Reminders - Nudging - Nagging • Reducing uncertainties <ul style="list-style-type: none"> - Realize • Connected presence <ul style="list-style-type: none"> - Connection - Unified - Family time/together • Playful <ul style="list-style-type: none"> - Cheeky - Fun - Subtle | <p>P5: Positive aspect of (Storyboard 1)? It would be really positive for me – and negative for everyone else. Ha ha. No, but it would help as we haven't set up a protocol really around how we should all use tech when we're together. And it would act as a buffer, or a stepping stone, to help stop us all going down rabbit holes. To transition back into the physical world. To nudge you a little. I also like the concept because I feel it provides a sense of connection. That we're "still here". Might reduce conflict between adults because of having those discussions to set it all up – and having that assistance and stepping stone to help kids transition off devices – and each other.</p> <p>P6: (Storyboard 1) would be a great way to help manage the situation. And I know, I reckon (my son) would feel really guilty if he saw my little face on the screen trying to tell him to get off the, you know, get off. Where he can't, you know, when they're on (the device) they're kind of blocking out everything else that's in in real life. So I feel like it's just another, I don't know, if it's unifying, in a way of, they'll go, "Oh, look, mum's on my screen!" and it'd be more like, "Get off that, you've got five minutes - I'm in the room, or my face has been sitting on a screen for 40 minutes, and you still on there!" Ha ha. So whatever you actually think people might be like, I need this anyway. It's not about other people. But I'm like, we would probably use it as a last resort to feel like we are connected in some way. Or even I would be probably using it more as empty threats and you know, screen time usage. And I don't know if I would feel like it's connecting and unifying us. Maybe I would, or maybe I just be really depressed that I'm seeing my whole family, while I'm in a scroll hole, and they're all sitting next to me, we're all scrolling together. So, as much as I'm like, yeah, so there's part of me that's going 'Yes'. You know what, I probably secretly really need this because it will help me manage and that but you're right. It's a sad problem I already have and I'm trying to fix it.</p> <p>P6: In (Storyboard 1) it would be like interacting, but it would feel like it's a little bit cheeky, it is a bit like, "Oh, hey, I'm poking you" like Facebook could, like years ago. But maybe it is just as, you know, it's like, oh, we never communicate - the sad reality, we're attached to our phones. And maybe it would be fun, but yeah, maybe because first I was like, "I could actually see us using that," because no one responds to each other in person sometimes.</p> <p>P7: (Storyboard 1) is a good idea, as long as you can swipe it away, but at least you're aware. Because you do get lost sometimes. And that's when it's sad when the kids go, "Mum, you know, mum, mum, mum, mum, you've been on there for too long get off the phone." It's happened to me, and I'm very aware. So yeah, I think it's good to have that kind of reminder or at least awareness, because you get lost in it -that's the problem.</p> <p>P7: I think (Storyboard 1) is good, for our family anyway, because I think as I get older, I think now is not such a big problem, because they're still little, and we can still control a lot of what they do. But as they get older, they will be more on devices and I think it's because you're still having family time, by being more aware of each other. So, you're still having kind of family time, when you're actually not together, like in your own little world with your devices. And then the awareness, I like it, when as it gets for me, it would be more of a visual, getting bigger and blocking the screen a bit more. Because then it's kind of like, maybe giving you a minute, or a minute or two would be good. Because in case you're in the middle of something, maybe not, I guess when we're doing work, I wouldn't use this for work and things like that. But just for when we're doing our, you know, just sort of chill out time on the devices. And then, um, and then</p> |

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| | <p>you know, kind of, then we can always just stop and, and then have more, you know, like, physical time together, like we can do another activity.</p> |
| | <p>P8: I love (Storyboard 1) as a concept. And as I was saying earlier, I like it because basically it enables what I want to often do with kids, when we're both on our devices, sitting next to each other, I feel in real life, I would just want to nudge them, sort of go, "Hey, what you're up to?", or "Hey, shall we go out, take a break, have a breather?" so it sort of enables or facilitates what I want to do in real life already...often I want their attention because I want them to stop the devices and set the table, but sometimes I am actually just curious what they're doing, whilst let's say, I'm working myself and I just want to take a breather, and I'm wondering what they're up to, whilst they're playing Minecraft, or what have you. I really just do want to nudge them and see how they going, and get them to smile at me or something. And with (my husband) it is probably more the latter, I wouldn't really want to interrupt what he's doing. It would really just be more of a, oh, I don't know, like a drive by "how are you going?" sort of thing.</p> |
| | <p>P8: The kids might get a kick out of, you know, icons that look like them, and that they might appear in the corner of Mum's screen and vice versa. Maybe you're just having an icon there actually, to mimic the physical real life experience. I think (Storyboard 1) is really cute. I don't know how durable it is. But I like the idea.</p> |
| | <p>P8: I immediately see that (Storyboard 2) will be helpful for me. I think the kids would know then, I think, as I said, they can't tell when I'm on my device whether I'm interruptible or not, whereas this signals this really clearly to them. And you know, I imagine when the kids are teenagers, they would probably appreciate this picture for themselves.</p> |
| | <p>P8: (Storyboard 2) clarifies communication. And with (my husband) as well, like if he puts down that it's red, then I will not disturb him, whereas (at the moment) it's not transparent. And it forces him to think about when he might want to be available as well.</p> |
| | <p>P11: I think that's something that a lot of people are unaware of their own use. And, you know, I think sometimes you get a bit of an awakening of "Oh, yeah, probably I do spend a bit too much time doing this, that or, you know, searching Facebook or checking emails" and I think, probably the amount of time that we realize we're doing that is probably very small compared to the amount of time we're not aware of that. So I think, I think it's good to have those kind of reminders. And whichever way it is, I think this is a nice way of keeping everybody in the family aware of their screen time. So yeah, I like the idea that (Storyboard 1) is just highlighting times when, yeah, making sure that you're aware, "OK, yes, I've been on this for half an hour", or whatever your timer is. And I guess also just allowing, if you have the ability to, you know, just do those nudges and things where it would be a subtle way of trying to remind the other person or family member. That maybe you think that they're spending too much, not too much time, but maybe their current time spent on a device, you know, maybe is a bit longer, but rather than I guess doing it in a way that you feel like you're nagging or having a go at somebody, it might be a bit more of a subtle way of doing it.</p> |
| | <p>P11: I think if as a family, you use (Storyboard 1) to then have your limits. So, I think rather than it just being something of a "oh this is more awareness" I think having that then linked to, "OK, so when this comes up, what do we then do about it?" So having an agreement, maybe it's between each other to go "OK, when I send you a nudge, it's because maybe I'm thinking that you could maybe put your phone down or something". So, you're having those discussions beforehand, saying "Right, well, when that happens, could you do this?" and so having those kind of agreements...and things that you could stick to, would I guess take out the whole problem of it becoming a novelty that you then just ignore.</p> |

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| | <p>P12: Yeah, because if (Storyboard 2) is showing Green, "I am approachable" then there is no need to ask the question. Why would you question that? "I'm approachable and I'm available here". Yeah, there will be no need to ask or to wonder, yeah, I agree. It would alleviate misunderstandings (between my husband and I).</p> <p>P13: I like (Storyboard 1) because online presence is merging into physical presence. So you are kind of at home together, but virtually. So when you are at home, physically interacting and talking and even if you're on your device, you are living together digitally, in parallel to living together physically. I'm not sure about the nudging and setting time limits and harassing the other family member into not using the technology. I see it more a collaboration - is that the right term? - of communication. An interactive way that merges the digital and the real world together, I like that idea.</p> <p>P13: On a personal level, (Storyboard 2) is also appealing to me. And I think, if I (daughter) or (wife) is there online, and I can see them online, it should be a layer on top of the first concept. First of all, I can see them around me and their own device online, and they're just wasting, killing time - they're watching something and not working on something or whatever. So, it will help you say 'well they are killing time, I'm killing time, then I'll just go into her room and chat to her there and talk about her day.' While if she's busy working, and so on, I'll stay killing time on whatever. So I think it aligns because when people are on their device, you don't know what they doing. And sometimes they're busy doing work, and you don't want to disturb them all, or they're actually just bored, but they don't know that you're bored too and can do activities together.</p> |
| <p>Proximity</p> <p>Design approach that attempts to encourage proximity between collocated family members</p> <p>Related early codes:</p> <ul style="list-style-type: none"> • Close contact • Sharing • Space • Unifying • Physical interaction | <p>P6: It's nice to talk about and share those things. But yeah, whether it would work with us when someone's deep in, say, (my son) is gaming, whether he'd really care what anyone else is watching. I do see the kids unite over peering at each other's screens though and it's like "Oh, look at them. They're bonding over watching the same screen at the same time." It does feel like it has (Storyboard 3) kind of thing to unify the family. Whether or not it would last with us, or would work or if we'd get bored of watching, like all these video game things, but it would be nice to share things together and say, "<i>Hey, look at this...</i>" and maybe you could nudge them with, "<i>Hey, check this out...</i>" that's kind of cool. I would like that because I guess it's happening in the moment and that's when you really want to share it... I feel like it actually has that feeling of sharing, unifying and being in each other's space - in a non threatening way. Maybe I'll say, strongly agree, because I like how it has that positive feel to it, well, how I would use it positively to share and do that kind of stuff.</p> <p>P6: If everyone had a screen and everyone's stuff was up on the screen, as well, especially as the kids are getting older, that would be really important so that we could be like, "Well if you're doing stuff above board, share it" you know? Again, (Storyboard 3) is a bit like a regulatory kind of thing but it's also something you can share. I know (my son) always loves to show me things but I'm always busy. It's like, "oh, show me later," but he's out of the mood then. So, it would kind of be cool to have it.</p> <p>P7: I can see how (Storyboard 3) could encourage more communication, or at least being more transparent, on what the kids and ourselves are doing. And I think that kids will feel more connected to us in that sense as well. Because sometimes behind the screen feels like there's so much secrecy. So, you know, that way the kids can also we can, all of us can be more transparent in some ways, you know, which I think would be a good thing.</p> <p>P9: This would be convenient, like, to look something up and be able to show it to everyone or if someone has a question, or someone found some cool picture or whatever or here is when a thing happened. But I actually think it's slightly worse than the current workaround of them picking their device up and walking over to the person they want to show and</p> |

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| | <p>that creates communication, because then you're over next to someone showing them and talking to them about it whereas this might be less so. And so, if you look at something and want to show it to more than one person, so <i>"here's an interesting thing, look, I've got the video from the school thing, let's all look at it,"</i> then this would be terrific. And for some of the general <i>"here's what may be what I'm working on. I'm doing something interesting, whatever"</i> those sort of awareness aspects it's also good, but the specific one-on-one stuff I feel works better in the current form because I wouldn't want it to replace that physical interaction.</p> <p>P10: I can see (Storyboard 3) working in the same physical space, with the bigger screen, where everyone can be working on their own thing, but at the same time, everyone is - its a collage - everyone is just seeing what everyone is doing. Whereas the small screen, seeing everything in your phone, it's a little bit, you're not really, it's more, it feels like spying - or like you are checking on someone rather than actually sharing.</p> <p>P10: The main issue with technology is the isolation, and obviously, the lack of transparency, and basically (Storyboard 3) is very honest, you put it on the table, and basically, it brings the family back together. And that would bring proximity, whether we like it or not, and I think it will actually bring other things, like for example, just discussion and talking and things like that. So, I think it is a technology but at the same time, it's a technology, that is, that shoots technology in the foot, and it brings the family into physical contact, and that physical contact could potentially bring other things. So that's the reason why is my favourite.</p> <p>P13: I feel that if I am on my PC or laptop, and my daughter, my wife, or whoever is collaborating with me, is sharing a screen, or doing a zoom session and we can drag and drop stuff, it's not as intimate, or as family-like as when we're around a table, or around a desk, and there are things in front of it that we can see and focus on. We're sharing the same device, rather than the same information, data at the end of the day, ones and zeros. But the actual physical thing that we are both touching at the same time and interacting around. Maybe it's just me, but (Storyboard 3) appeals to me more than a virtual sharing space (between individual devices). That whole idea of a dining table, where people sit together to eat, and chat, and celebrate, and be sad, and comfort each other, and find some time. But it becomes that piece of hardware, where you can then, you know, look at that piece of plywood that's sitting in the middle of the kitchen and it reminds me of the memories again, versus that Zoom session that we had two years ago, which is really hard to relate to or remember. That physical space will be the representation of that interaction and communication.</p> <p>P13: Yeah, (table in Storyboard 3) definitely feels like a centerpiece that represents that we are family, we are one unit, represented by this single unit. That yes, you bring your own stuff, your own device, your own video clips, and articles, and whatever these digital things that you're interacting with, and bring it to that centralized unit that represent our unit as a family and share through that same medium. That's what appeals.</p> <p>P14: I just really like the collaborative nature of (Storyboard 3), the sharing and just being open about it, you know? I'm seeing something that's really cool. I want to share it with you...I'm inviting you into my space.</p> |
| <p>Communication</p> <p>Design approach that attempts to support communication about technology use within families</p> | <p>P2: We do discuss certain things, I wish that we discussed things a little bit more with the kids in terms of technology, the pros and cons and stuff. So (in Storyboard 4) having that conversation would be good. Just to be open with them. And between (my husband and I) – we are aligned, well on practically everything except for the part where he thinks that two hours of screen time shouldn't mean using two hours all in one go. But we're essentially, you know, it's going to be it's either everybody agrees, or we don't do it at all. So, it has to have some sort of consensus, consensus for it to work, basically. So it's going to be a lot of conversation, which is</p> |

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| <p>Related early codes:</p> <ul style="list-style-type: none"> • Communication • Open/transparent • Collaboration • Family goals | <p>a good thing to have conversations in the family. And I'm going to assume that once a goal has been set up, there's always going to be - somebody like (my daughter) will come saying, "<i>Oh, actually, can I change a little bit?</i>" You know, that conversation? Which, if it wasn't there, she's just going to do something else in terms of, or maybe I can cheat my way and, you know, extend my time on certain things. So, to have (Storyboard 4) will probably open up more conversations with each individual child, which is a good thing.</p> <p>P2: Yes, the kids come to me mostly. (My husband) will just say no, and I'll be like, they'll negotiate a little bit more with me. And then I'll be the one talking too (my husband) about it in the background. And then sometimes, there'll be a little bit of disagreement, and then we chat. And then ultimately, it will be me who tells the kids and manages kids' use. With (Storyboard 4) it's not just going to be just me. It has to be, I would say, if it was set up, and we all have to agree on it, then the kids will not just come to me - it the has to be done with both of us. And, yeah, so I don't know how it's going to be set up but ideally, it will be like everybody needs to have some sort of agreement in it or, I don't know, like to unlock or lock the codes. Not just me.</p> <p>P2: With (Storyboard 4), if it was a prior discussion and we agreed on it, and it's like, on that chart and everybody can see the progress, kind of like their health, every weekend, like we share each other's progress, then there's nothing to dispute, because it's all there, digitally. So there probably will not be any disagreement.</p> <p>P4: (Storyboard 4) could help to alleviate misunderstandings (between parents), because you would have to set some expectations...you would have to explain your use...I think positively about it. And I think, if you have to sit down and think about your use and think about what your goals are and how you want the technology to work for you as a family, I think that open communication really helps to alleviate the misunderstandings. And then if you are setting some goals and going well, "<i>for me I want to do this</i>" then you can all help each other with that idea of "<i>well, you said you were going to be on it for two hours a day that you've actually been on three hours a day</i>". You know? There's a mechanism for further discussion on a weekly or a daily basis about "<i>Okay, well how do we reach our goals as a family? Because we're still on the on there too much.</i>" And I'm assuming that whatever gets displayed would be like a breakdown of what you're using. Yeah, no, like, if you could see that, you know, for a particular person, you might go, "<i>Well - he needs to be on that phone for work, emails and work</i>" but then have the metric be for anything outside of a certain number of hours on that type of use or you know - Yeah, I just really see quite a lot of positives for that sort of technology.</p> <p>P4: Yeah, so I think that when there's no structure around it, it can feel like nagging. But if you've all agreed that you're going to have the discussions, and that you're going to check in on your own use and the family is involved, then it provides something external, that is not someone inside the house going, "Oh, you're on the phone again". But also, as we said earlier, in the way that we check our health, and we track other things. Once you have the tool that allows you to do that, it's actually really something that people embrace. And people really like looking at those metrics, and they go, "Oh, I thought I was doing 2000 steps a day. But I'm actually only doing well 10,000 steps a day, but I'm actually only doing 2000 steps a day. Oh, I really need to do something about this." And it's having that objectivity around it that really can make.</p> <p>P5: : (Storyboard 1) would be really positive for me – and negative for everyone else. Haha. No, but it would help as we haven't set up a protocol really around how we should all use tech when we're together. And it would act as a buffer, or a stepping stone, to help stop us all going down rabbit holes. To transition back into the physical world. To nudge you a little. I also like the concept because I feel it provides a sense</p> |
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| | <p>of connection. That we're "still here". It might reduce conflict between adults because of having those discussions to set it all up – and having that assistance and stepping stone to help kids – and each other - transition off devices.</p> |
| | <p>P6: You would have the plain hard data that if something had come up after 30 minutes being on, it would be obvious. It would be that 'I told you so. (interrupted by child). Again, I think it would be something that we want in our current use of technology. I guess it'd be good for the kids to have it for me as well, so they know when I'm working or not working. Like, I've always got to be on duty for them. But then again, I think my kids would always put their lives at the highest importance. But I think it would still be good to have the timing (control), and you could set profiles to different types of apps and times, and all that kind of stuff would be good for regulating the usage of the family. So I would say it would improve our experience. Again, it's kind of a little bit like (Storyboard 1) where it's kind of used as just a regulatory thing, that I'm using it as a way to say, "<i>Get off your phone</i>" or "<i>oh, you're doing something that is a bit more worthwhile, so you can stay on it longer</i>", so it would be more of a remote monitoring kind of thing - and still probably in ways of trying to control - maybe I try and control screen time too often - it's a drag!</p> |
| | <p>P6: we do have something at the moment where (my husband) can track all (my son's) game use across all the devices. And I have to rely on (my husband) to track it. But it's kind of always like, even though we say "<i>Ollie you've got 40 minutes, you've got to put a timer on - do it</i>", he'll somehow forget the timer. (Me:) "<i>How long were you on?</i>" (Son:) "<i>Oh 30 minutes</i>", (Me:) "<i>(Husband), can you check that?</i>" So (Storyboard 2) is kind of what we would want. And also, I would love to know how involved people are in things. It'd be nice to know when someone's just not doing much and you can say "<i>get off</i>" or if its work, same with me, I could also put on what I'm doing. So it's just visual proof that - that you have this much and that and it's been used. Visual is the best - it's better than verbal agreements. Like, you know, we have a two hour a day screen policy for only on the weekends, but it somehow is like every weekend, we're confused about how much time it actually is. (Son:) "<i>Does that also include watching the iPad?</i>" (Me:) "<i>Yes, it also includes watching the iPad</i>" sort of thing. You know? It's never clear, even though we give them that clear instruction – so, something that could be clear and visual and if the alarm goes off, so there's less negotiating around it. Yeah. Because there's multiple devices. So it's not like he has one iPad, and everything's on the one iPad. There's like, two gaming consoles, there's a computer, iPad and now a little phone.</p> |
| | <p>P7: I think that (Storyboard 1) would help (alleviate misunderstandings) kind of by being this middleman for some of the things that you have to do in monitoring each other's use or regulating each other.</p> |
| | <p>P7: (Storyboard 4) will help because then it's all visual, and we can see what our goals are. And that you can actually like as a consequence, you can switch off things a bit, you know, and have those consequences that would actually help (my husband) and I a lot because it would align us in terms of what we want for the kids. In terms of how much use and stuff. And opening up about the goals we have as a family. It's very positive. Because we don't do that enough, even without technology. I guess it's a good way of using technology. If we're going to use it, it's a positive way of using it. Because we'd all have to agree then, you know? And coming up to a family reward at the end. I think that's a wonderful way of aligning us, so it's not the kids versus the parents. It's like we're working together as a family towards a common goal.</p> |
| | <p>P8: Whilst I think (Storyboard 4) will be great from the point of view of parents to kids and actually you asked me that question about whether the kids' technology use would cause disagreements between (my husband) and</p> |

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| | <p>myself, I don't think that happens. But with regards to our (my husband and my) respective tech use though, that has the potential to cause tension. So this is where potentially (Storyboard 4) might actually help us, but I wonder whether (my husband) might not like having to be accountable for his tech use. Currently (my husband) gets a bit of "Dad, you're always on your device" from the kids. And this might just put that into a more concrete form that he might appreciate. He might appreciate being able to have a means to switch off that accountability, but I can't be certain he would. If he did see that the concept requires him to put it on his device and say I'm gonna participate. Maybe, he would join in with this. Like, maybe when it's when the criticism is nebulous and say, "<i>Oh, you're always on your device</i>", then maybe that's the pain-point for him, whereas maybe a situation where there is a way for him to actually show the family that "<i>well, I'm working</i>".</p> <p>P11: We've been able to kind of gauge each other's, not interest, but how important being on a device is at that time but yeah, I think (in Storyboard 2) we'd have to have those discussions about what's deemed important to us as a family rather than to everybody individually. And so I think that's where I would see the benefit of this, being able to open that discussion. '<i>when you think about it, is it that important that you spend half an hour doing this in the morning?</i>' type of thing, that I could see would be a benefit, just to bring awareness of the reality of how important it is to be on the devices at certain times.</p> |
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