Understanding the Role of Technology in Supporting Parent–Child Reunion

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Abstract

Parent–child reunion is one of the most prevalent yet less explored areas of family life. During reunions, parents and children can strengthen their bonds and reaffirm their ties. Earlier works on Human–Computer Interaction (HCI) have highlighted the value of digital technologies in supporting the parent–child relationship during physical separation or collocation, but little work has focused on parent–child reunion. This thesis investigates the role of digital technology in supporting a specific type of parent–child reunion: a reunion following separation for work-related reasons that has a pre-, upon and post-phase. This investigation was conducted with the participation of three types of families: academic, defence and mining.

This thesis presents three studies that examined the role of digital technologies in supporting parent–child reunion. The first study focused on technological shortcomings of current technology use in parent–child reunion. This study found that current technologies lack certain elements of support during the anticipation to reunite in pre-reunion, the initial engagement upon reunion and the sharing of experiences in post-reunion. The second study identified the interactional qualities of digital technologies that aim to support parent–child reunion that led to the design of *Rendezvous*—the first reunion-oriented artefact. The insights from this study emphasised the importance of stimulating co-creation in pre-reunion, motivating co-engagement upon reunion and inspiring co-sharing in post-reunion. The third study evaluated *Rendezvous* through its field deployment with the participation of academic and mining families. The findings demonstrated the significance of *Rendezvous* in supporting parent–child reunion by augmenting the anticipation to reunite in pre-reunion, heightening the initial engagement upon reunion and strengthening the experience of sharing in post-reunion.

The knowledge generated by this thesis has three main contributions. First, it uncovers the necessity for digital technologies to support parent–child reunion by focusing on the anticipation in pre-reunion, the engagement upon reunion and the sharing of experiences in post-reunion. Second, the thesis calls attention to the merit of asynchronous technologies in supporting parent–child reunion. Finally, it expands the current knowledge by highlighting materiality and temporality as key design considerations for reunion-oriented technologies.

Declaration

This thesis constitutes work carried out by the candidate unless otherwise stated. The thesis is less than 100,000 words in length, exclusive of tables, figures, bibliography and appendices, and complies with the stipulations set out for the degree of Doctor of Philosophy by The University of Melbourne.

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Preface

This thesis documents the findings from my PhD research conducted at The University of Melbourne. Some of the findings produced from this research have been documented in other publications. The findings from the first study that relate to the relationship between reunion and technology-mediated separation (Chapter 4) have been published in Kazakos, Howard and Vetere (2013). I also took part in the doctoral consortium of the 2013 conference on computer-supported cooperative work where I presented my thesis' research design and preliminary findings as discussed in Kazakos (2013). Finally, inspired by the second and third study, I organised two workshops in the Computer Human Interaction conference in 2013 and 2015.

The following are the publications arising from my research. These publications, which are peer-reviewed, are provided in Appendix D.

Kazakos, K 2013, 'Understanding the role of technology in parent-child reunion', in *Proceedings of the 2013 conference on computer supported cooperative work companion*, ACM, New York, NY, USA, pp. 61–64, < http://doi.acm.org/10.1145/2441955.2441972>.

Kazakos, K, Howard, S & Vetere, F 2013, 'Revisiting the relationship between reunion and technology-mediated separation in periodically transitioning families', in *Proceedings of the 2013 conference on computer supported cooperative work*, ACM, New York, NY, USA, pp. 1157–1168, < http://doi.acm.org/10.1145/2441776.2441907>.

Kazakos, K, Bales, E, Neustaedter, C, Yarosh, S, Kaye, JJ & Kirk, D 2013, 'Exploring the diversity of families: designing technologies for the contemporary family life', in *CHI'13 Extended Abstracts on Human Factors in Computing Systems*, ACM, New York, NY, USA, pp. 3255–3258, < http://doi.acm.org/10.1145/2468356.2479660>.

Kazakos, K, Kirk, D, Durrant, A, Chatting, D, Yurman, P, Bichard, J-A & Paik, J 2015, 'Design-led inquiry for mobile lives', in P*roceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems*, ACM, New York, NY, USA, pp. 2393–2396, < http://doi.acm.org/10.1145/2702613.2702630>.

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This thesis stemmed from my personal interest in parent–child reunion. As a member of a defence family, I experienced several reunions with my parents during the first 18 years of my life. It would not have been possible to complete this work without the continuous support and encouragement of many individuals.

I am grateful to all the families that took part in this research who not only allowed me to have a glimpse at how they experience reunion, but also enthused me with critical advice at every stage of this investigation. The least I could do was donate *Rendezvous* to all these families upon the completion of this thesis as a token of appreciation.

I would like to thank all members of Open Lab at the University of Newcastle-upon-Tyne (formerly known as Culture Lab) for their hospitality during my visit while I conducted the second study of this thesis. I am thankful to Dr Anja Thieme, Dr Vasilis Vlachokyriakos, Dr Madeline Balaam, Professor Peter Wright and Professor Patrick Olivier.

It would have been extremely difficult to bring this thesis to an end without the help, guidance, advice, mentorship and inspiration of Professor Frank Vetere. I am indebted to him for his presence in this journey and endless thoughtful feedback in every challenge that I faced along the way. I am grateful to Dr Bjorn Nansen for his supervision, meticulous comments and insightful discussions. I am also appreciative of the conversations with Professor Martin Gibbs that helped form Study 1 and 2 of this thesis. Most importantly, I am beholden to Professor Steve Howard who sadly passed away in the middle of my candidature. I am deeply honoured to have been one of Steve's students and will forever cherish his passion for research and calm demeanour that has shaped my approach to life.

Thank you to all the members of the Interaction Design Lab (IDL) at The University of Melbourne for our never-ending discussions on design and user experience as well as Pedro, Chris, Kate, Catherine, Alexis, Katerina and Olia for their support and true friendship. Also, I acknowledge that Capstone Editing provided copyediting and proofreading services, according to the guidelines laid out in the university-endorsed national 'Guidelines for Editing Research Theses'.

I am thankful to Winora for her understanding, love and constant encouragement.

Finally, this thesis is dedicated to my sisters, Nikoleta and Marianna, and my parents, Georgios and Konstantina, who were by my side throughout this journey, even when I was unsure of the destination. They have and will always continue to inspire me with their patience, determination, and unconditional love.

Σας ευχαριστώ πατέρα και μητέρα για ότι έχετε κάνει για εμένα και τις αδερφές μου.
Αυτή η διδακτορική διατριβή αφιερώνεται σε εσάς μέσα απο την καρδιά μου.

As you set out for Ithaka
hope the voyage is a long one,
full of adventure, full of discovery.
Laistrygonians and Cyclops,
angry Poseidon—don't be afraid of them:
you'll never find things like that on your way
as long as you keep your thoughts raised high,
as long as a rare excitement
stirs your spirit and your body.
Laistrygonians and Cyclops,
wild Poseidon—you won't encounter them
unless you bring them along inside your soul,
unless your soul sets them up in front of you.

Hope the voyage is a long one.
May there be many a summer morning when,
with what pleasure, what joy,
you come into harbors seen for the first time;
may you stop at Phoenician trading stations
to buy fine things,
mother of pearl and coral, amber and ebony,
sensual perfume of every kind—
as many sensual perfumes as you can;
and may you visit many Egyptian cities
to gather stores of knowledge from their scholars.

Keep Ithaka always in your mind.
Arriving there is what you are destined for.
But do not hurry the journey at all.
Better if it lasts for years,
so you are old by the time you reach the island,
wealthy with all you have gained on the way,
not expecting Ithaka to make you rich.

Ithaka gave you the marvellous journey.
Without her you would not have set out.
She has nothing left to give you now.

And if you find her poor, Ithaka won't have fooled you.
Wise as you will have become, so full of experience,
you will have understood by then what these Ithakas mean.

'Ithaka' in Constantine P. Cavafy, *Collected Poems (1897–1933)*
Translated by Edmund Keeley and Philip Sherrard

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List of Abbreviations

ADF	Australian Defence Force
CASY	Contextual Asynchronous System
CHI	Computer Human Interaction
CSCW	Computer-Supported Cooperative Work
FIFO	Fly-in Fly-Out
HCI	Human–Computer Interaction
IDL	Interaction Design Lab
ubicomp	ubiquitous computing
UCD	User-Centred Design
VIOs	Virtual Intimate Objects

Chapter 1: Introduction

1.1 Background and Context

This thesis focuses on understanding the role of technology in supporting parent–child reunion. Irrespective of cultural and geographical background, families will inevitably experience some form of separation (e.g., due to work or other family obligations). Reunion is, therefore, a common part of family life.

Early sociological works define reunion as annual assemblies of physically separated family members (Ayoub 1966). These annual gatherings (e.g., a Christmas reunion) usually span a set number of days. Younger and older family members engage in common activities with the aim of strengthening their bonds (Peterson 2006). In certain occasions, confrontations occur and reunions become grounds for negotiations (Ayoub 1966). Through those discussions family members can renew their family ties while being physically together.

Although this definition of reunion is common within the literature on family studies, this thesis uses a different interpretation. This thesis is inspired by the work of Moss and Moss (1988), who construe reunion as a process that follows any physical separation that occurs due to work, personal circumstances or other reasons. It is a highly dynamic family experience that happens periodically—in most circumstances daily, weekly or monthly. Moss and Moss (1988) identify three essential threads of the reunion experience: pre, upon and post. In pre-reunion, which can last a few weeks, parents and children are close to the eventual reunion, but still physically separated. Upon reunion is the first moments of being reunited. During post-reunion, which may last for several weeks, family members are physically together.

In the presence of children, the periodic transitions between reunion and separation affect the health of the family bonds and influence the relationship between parent and child (Wood, Scarville & Gravino 1995; Stafford & Merolla 2007; Diamond & Hicks 2008). Specifically, literature has demonstrated the negative effects of constant separations on the overall wellbeing of younger children—less than 10 years old—as

they are still attached to their parents (Applewhite & Mays 1996). For example, earlier studies on parent–child relationships within families who experience long and frequent separations highlighted not only the impact on the children when in separation, but also the struggle that they face in externalising their emotions and sentiments when in reunion (Clark & Taylor 1988).

When separated, communication technologies offer unique opportunities for parents and children to support and strengthen their ties (Neustaedter, Harrison & Sellen 2012). Family members have access to a range of synchronous and asynchronous communication mediums (e.g., phone, video-based communication, text messaging and social media) that foster their connectedness and closeness regardless of location. When together, there are also technologies that enrich their relationship (e.g., photos and videos) (Patel et al. 2009; Patel & Clawson 2011). However, during the process of reunion the role of technology is uncertain. Even though digital technologies can support physical separation and collocation, it is unclear whether and how they do so in the context of reunion.

1.2 Work of Others

Previous work has explored the role of technology in domestic life. Studies have examined the practices that surround the use of technology inside the home and among family members (e.g., Hindus et al. 2001; Petersen 2004; Judge & Neustaedter 2015). A significant number of research efforts have investigated technologies that support and enrich family ties through in situ studies (Isola & Fails 2012; Neustaedter, Harrison & Sellen 2012). Within this body of research, a range of works have contributed to the design of both synchronous and asynchronous technologies aimed to support parent–child physical separation (Vetere et al. 2005; Dalsgaard et al. 2006; Romero et al. 2007; Brush, Inkpen & Tee 2008; Christensen 2009). Other studies have explored the role of technology in supporting and supplementing parent–child interactions. Research in this area has highlighted the significance of digital content (e.g., photos and videos) in strengthening family members' sense of identity, the nature of their relationship and the uniqueness of being part of a healthy family (Crabtree, Rodden & Mariani 2004; Kim & Zimmerman 2006; Stelmaszewska, Fields & Bladford 2008; Van House 2009).

When examining family and technology studies within HCI and computer-supported cooperative work (CSCW), there exists only a handful of works that explore the role of technology in supporting family relationships within the context of familial separation (including divorce and work-related separation) (Modlitba & Schmandt 2008; Yarosh, Denise Chew & Abowd 2009; Odom, Zimmerman & Forlizzi 2010; Yarosh & Abowd 2011). Even though these works have centred on supporting parent–child interactions within the context of separation, they do not explore the role of technology in parent–child reunion. Throughout the abovementioned body of research, reunion is hardly mentioned, though occasionally described as an experience that is anticipated by children who are longing for the return of their divorced parent.

Communication technologies have supported parents and children while they are physically apart (Neustaedter, Harrison & Sellen 2012; Judge & Neustaedter 2015). However, these communication technologies have also blurred the previously distinct boundaries between being physically together and separate (Baym 2010; Turkle 2011, 2015). When family members live through reunion and separation in a recurring manner (e.g., in the context of specific professions such as defence or fly-in fly-out [FIFO]) they find it challenging to balance the time and effort required to sustain and further grow their relationship (Hetherington 1989; Kaczmarek & Sibbel 2008). Defence families are an example of this continuous struggle; Blasko and Murphy (2016) demonstrated the challenges that reunited defence family members face when a deployed parent returns. In such circumstances, the physically separated parent may not have talked to their child or children as much as they would have desired during the separation. This creates an additional stress to the reunion, as it is the time when the defence family is physically together and when parents feel that they are required to foster and enrich the parent–child bond. However, doing so can be exceptionally difficult. Through a thorough understanding of the role of technology in supporting parents and children to strengthen their bonds while in reunion, the consequences of challenges faced during this time can be addressed and further mitigated.

1.3 Research Gap

Prior research has not focused on the role of technology in supporting family reunion. Although there is substantive knowledge on digital technologies that support parent–child relationships (when physically apart and when physically together), that is not the case for parent–child reunion. Therefore, this thesis aims to address the following gaps:

1) how current technologies are used in parent–child reunion, particularly ways that technology can support it
2) the interactional qualities of technologies that are aimed at supporting parent–child reunion, and
3) the ways that reunion-oriented technology supports parent–child reunion.

1.4 Aim and Approach

This thesis aims to fill these gaps by investigating the role of technology in supporting parent–child reunion. The main question that guides this research is:

> **Main Research Question:** What is the role of technology in supporting parent–child reunion?

Answering this question provides the first understanding of the relationship between digital technologies and parent–child reunion. It provides a thorough comprehension of how technologies can support the reunion experience. In doing so, this research complements previous work on family wellbeing and digital technologies by investigating an overlooked yet common family experience. This thesis follows a user-centred design (UCD) approach. It employs a series of qualitative methods to explore the current limitations of technologies in supporting reunion to design the first reunion-oriented technology and investigate how this technology supports parent–child reunion through a field deployment. Three studies work together to address the main research question.

> Study 1: **Current Practice**—The first study explores how current technologies are used in parent–child reunion with a focus on the technology's shortcomings when supporting that experience. It uses a qualitative lens to

investigate how parents and children use technologies in their reunion experience. It employs direct observations of reunion and interviews with parents and children from academic and defence families.

Study 2: **Intervention**—The second study investigates the interactional qualities of technologies whose purpose is to support parent–child reunion. In the context of this thesis, interactional qualities are defined as attributes of the design aimed to support the interaction between individuals Through a co-design process with parents and children of academic families, this study leads to the design of *Rendezvous*—the first reunion-oriented artefact.

Study 3: **Evaluation**—The third study evaluates *Rendezvous* through an in situ deployment of the artefact with academic and mining families. It uses interviews, observations, and questionnaires to capture the experience of use of *Rendezvous* and its influence on reunion.

Ultimately, this thesis focuses on understanding the role of technology in supporting periodic parent–child reunion. It explores a specific type of periodic reunion caused by work-related reasons. The investigation involves the participation of three types of family cohorts—academic families, defence families and mining families. Further, it employs a series of qualitative design methods to explore, design and evaluate *Rendezvous*—the first reunion-oriented technology.

1.5 Thesis Overview

Chapter 2 provides a critical review of the current literature on the role of digital technologies in supporting both collocated and physically separated family interactions, focusing on parent–child reunion. This chapter highlights the opportunity that exists in further understanding the role of technology in supporting parent–child reunion.

Chapter 3 presents the research design, exploring the research questions that drive each of the three studies and explaining the reasoning behind the choice of the most appropriate data collection and analysis methods.

Chapter 4 describes the first study of this thesis, which aims to understand how current technologies are used to support parent–child reunion. Through a series of interviews and field observations this study explores how parents and children from two different family cohorts—academic and defence—use current technologies to support their reunion experience. These two cohorts have many similarities regarding reunion, yet their access to technologies while separated and in reunion differed due to distinct environmental and professional factors. This study highlights the role of current synchronous and asynchronous technologies in preparing family members for the upcoming reunion, demonstrating family interactions upon reunion and reaffirming family ties in post-reunion. Further, it identifies certain limitations of current technologies in supporting reunion. These limitations relate to anticipation to reunite in pre-reunion, initial engagement upon reunion and sharing of experiences in post-reunion.

Chapter 5 describes the second study of the thesis, which was motivated by the findings of Study 1. The aim of this study was to explore the interactional qualities of technologies that support parent–child reunion. This study generated three findings. First, it highlighted the need for a reunion-oriented artefact to stimulate the co-creation of content by both parents and children while in pre-reunion. Second, it drew attention to the significance of motivating family co-engagement upon reunion when designing technologies aimed to support this experience. Third, it emphasised the necessity for a reunion-oriented artefact to inspire co-sharing in post-reunion. Driven by these insights and the UCD process, Study 2 produced the first reunion-oriented artefact—*Rendezvous*. This is a physical, lockable box with a digital component. The aim of *Rendezvous* is to support the anticipation, engagement and sharing of experiences that families undergo when reuniting.

Chapter 6 describes the third study of this thesis. It explores the deployment of *Rendezvous* with academic and mining families and highlights the effect that use of *Rendezvous* has on reunion by focusing on the shortcomings of current. *Rendezvous* supports parent–child reunion by augmenting the anticipation to reunite through the postponement of viewing shared content, heightening initial engagement upon reunion by promoting gifting of the content that was contributed and strengthening the sharing

of experiences in post-reunion by encouraging collocated storytelling practices around the content and through interaction with the artefact. The outcome of this study highlighted the significance of each of the qualities of *Rendezvous* in supporting parent–child reunion.

Chapter 7 discusses the findings from each of the studies and final conclusions of this thesis. This thesis extends the current body of knowledge by identifying the key limitations of current technologies and highlighting the merit of asynchronous technologies in supporting reunion. Further, it highlights the value of materiality and temporality as key elements of reunion-oriented technologies. This chapter also provides an overall critique of this thesis and offers suggestions for future work.

1.6 Contributions

This research focuses on parent–child reunion. It builds on previous work on domestic technologies and parent–child interactions by extending the current understanding of the role of technology in parent–child reunion in the following ways:

1) The thesis highlights the necessity for digital technologies that support parent–child reunion to support the anticipation in pre-reunion, initial engagement upon reunion and the sharing of experiences in post-reunion.

2) The thesis offers evidence for the merit of asynchronous technologies in supporting reunion. Most of the recent work has denoted the importance of always-on synchronous technologies in supporting parents and children while they are apart. This thesis unveils an area overlooked in previous work by shifting the focus to the design of asynchronous technologies for supporting the different dimensions of reunion.

3) The thesis highlights the value of materiality and temporality as key design considerations for reunion-oriented technologies. Since reunion is a temporal phenomenon that has, in most cases, a short duration, it is important to consider the way that a reunion-oriented artefact can be appropriated as part of the reunion experience. The design of *Rendezvous* incorporates the relationship between materiality and temporality, and in doing so demonstrates importance of these elements in the overall reunion experience.

Chapter 2: Related Work on Technology, Family Interactions and Family Reunion

2.1 Introduction

The previous chapter introduced the aim, research problem and overall structure of this thesis. This chapter presents a critical review of current research that focuses on the role of technology in parent–child collocation, physical separation and reunion. The review of the current literature demonstrates that there is little knowledge on investigating, designing and evaluating the role of technologies aimed at support parenting–child reunion.

This chapter commences by investigating reunion in family settings (Section 2.2). The section discusses family connection (Section 2.2.1) and parent–child reunion (Section 2.2.2), with the aim of contextualising the critical review of the current literature. This is followed by an examination of the role of technology in family settings in collocated and physically separated contexts (Section 2.3). This chapter then introduces the main gaps in the current knowledge (Section 2.4), before concluding the review of the current (Section 2.5).

2.2 Reunion in Family Settings

Reunion is an integral part of the lives of numerous families. Examples of families who go through this experience include those with one or more family members working in specific industries and sectors—as in the case of FIFO, defence, aviation, maritime and academia. The main characteristic of reunion is its dynamic and periodic character that stems from the transition between being physically together and apart. The physical presence of all family members during family reunion gives a unique opportunity to parents and children to further interact to foster a healthy and meaningful relationship.

2.2.1 Family Connection

Early works on family studies defined families as a collection of individuals that together share a collection of common experiences. Through those experiences, family

members strengthen their communication with continuous social interactions (Sroufe & Fleeson 1986; Fitzpatrick & Vangelisti 1995; Vangelisti 2004; Segrin & Flora 2005).

This thesis adopts the definition of family connection proposed by Neustaedter and Greenberg (2012). They defined family connection as 'how families not just communicate with each other but how they share their lives and routines, how they engage in social touch and how they negotiate being together and apart' (Neustaedter, Harrison & Sellen 2012, p. 1). This definition's approach to family connection encompassing the challenges that family members face when they are physically together and when they are apart makes it more suitable for this thesis. In particular, connection between children and their parents is mainly through verbal communication, care or play—all of which is essential to support children's sense of belonging and attachment (Bretherton 1992; Baumeister & Leary 1995).

2.2.2 Parent–Child Reunion

Although underexplored in HCI, parent–child reunion has received extensive attention within sociological and family studies literature. Earlier sociological works defined reunion as a one-time yearly event that has a celebratory nature (e.g., Christmas reunion). Its main characteristic is the meeting of family members that have not seen each other for prolonged periods of time. In that sense, reunion represents the family continuity that is passed from generation to generation through physical interaction and long discussions (Ayoub 1966).

Later sociological work interpreted reunion differently. In their seminal work with elder parents and their adult children, Moss and Moss (1988) described parent–child reunion as a process rather than a one-time event that is part of contemporary family life. Reunion occurs every time a family member is away due to work-related, personal or other reasons. Based on their work, reunion is an 'experience that encompasses the flow of past memories, present reality and the future' (Moss & Moss 1988, p. 655). The fact that parents and children are physically separated and then reunited over regular intervals creates fertile grounds for them to share their experiences, reflect on the importance and value of being a family and ensure the healthy continuity of their family ties and identity. Inspired by Moss and Moss (1988), this thesis defines parent–child

reunion as an experience that occurs after a work-related separation in a periodic manner and whose aim is to ensure the continuity and further strengthening of healthy parent–child bonds.

There are three important facets of the parent–child reunion: stability and change, wanting and fearing, and continuity of parent–child ties. The first facet refers to the autonomy and dependency that a parent or a child might express when they are close to the end of physical separation, just prior to reuniting (pre-reunion). The second facet represents the need of family members to affirm themselves and their relationship to ensure that the bond between all family members is present, strong and coherent upon the first moments of reunion (upon reunion). The third facet is the need to ensure the continuity of the parent–child ties through constant enrichment of their interaction when they are physically together regardless of the challenges they faced while apart. Throughout this thesis, reunion is approached through these three facets and their corresponding reunion phases (pre-, upon and post-reunion, as introduced by Moss and Moss [1988]). Specifically, when focusing on the pre-reunion phase, this thesis considers the autonomy among the physically separated parents and the dependency that children feel. Further, when in upon reunion, this thesis is guided by the commitment of family members to reaffirm their family bonds. Finally, when in post-reunion, this thesis is directed by the family's responsibility to foster their bonds.

Under this definition, one of the fundamental components of reunion is its periodicity. This reunion characteristic is closely tied to the frequency that it occurs within the family realm. On one hand, reunion is interpreted as a one-time experience (Ayoub 1966). In that case, the family members meet once per year in a pre-arranged location. The aim of these annual reunions is to help family members who have not physically seen each other over the course of the year to restore their ties, celebrate their relationship and strengthen their family bond and identity (Peterson 2006). It is normal for extended family members to participate in this type of reunions and for many participants to travel from their current place of residence to the reunion location. Conversely, family reunion is a more frequent occurrence and members of a family reunite numerous times per year. In many circumstances, it is not uncommon for the family to experience reunions twice a month (Clark & Taylor 1988). An example of

such reunion is that experienced by the families of the FIFO Australian workforce, who reunite on average once every three weeks (Taylor & Simmonds 2009). As stated earlier, this thesis is concerned with the latter type of reunion—the one that occurs in a recurrent and periodic manner.

This type of reunion is due to personal or work-related reasons. In most cases, personal reunions arise due to divorces in which separated parents arrange between themselves for regular visits of their children. In that scenario, reunion happens, on average, once per week or per month when parents and children take time to reaffirm their bonds and reflect on their relationship. The underlining commonality in this type of reunion is its emotional character due to the sensitive context in which it occurs. This thesis does not focus on reunions that are a consequence of personal reasons. Rather, it concentrates on work-related reunions that take place periodically within the family context. These reunions are a consequence of the nature of a parent's profession. Examples include FIFO personnel, members of the Department of Defence and the academic or research community (including international students), maritime workers, seamen and aircrew to name a few. The main similarity among all family members who undergo regular work-related reunions is that they all have access to different types of communication technologies that aim to enhance their relationship and sustain healthy family bonds. This thesis' interest is situated precisely within that context—the role and effect of digital technology in work-related periodic reunions.

2.3 Technology in Family Settings

The previous section provided an overview of the approach this thesis is taking towards reunion in family settings. This section focuses on the recent work on technology and family. Section 2.3.1 reflects on the significance of domestic technologies as an area of exploration for recent HCI and CSCW studies. Section 2.3.2 examines current work on the use of technology when parents and children are physically collocated. This is followed by a critical account of current research on technologies for parent–child interactions when physical separation occurs (Section 2.3.3). Finally, Section 2.3.4 investigates current research efforts within the context of technology and parent–child reunion.

2.3.1 The Rise of Research Focus on Domestic Technology

Over the last few decades there has been a shift in focus within the HCI discipline from the work to the domestic domain. Venkatesh (1996) argued for the importance of better understanding of the social and technological space that emerges from the introduction of technology in the home. Following this rationale, Hindus et al. (2001) explored social communication technologies in the home while mapping the opportunities that arise with the design and deployment of domestic technologies. In their ethnographic work on better understanding the use of domestic technology, Blythe and Monk (2002) highlighted the complicated practices that surround the use of technology within not only the home, but among family members. The challenges that relate to designing technologies for the home were also raised in the work of Petersen (2007) and of Brush, Inkpen and Tee (2008), who noted the significance of focusing on the process of technology use as a source of inspiration for designing technologies that better meet the needs of home users.

Within the specific contexts of parent–child interaction, the use of domestic technologies has given unique opportunities to support this interaction. Early work on the lifestyles of working parents by Beech et al. (2003) highlighted the need for technologies to address and support family members who continuously struggle to balance home and work commitments. In their latest book on the influence of communication technologies on domestic life, Neustaedter, Harrison and Sellen (2012) investigated how new types of communication technologies support family connection. They explored the effect of new technologies on supporting the challenges and tensions between family members. They concluded that technology is increasingly affecting the manner in which family interactions are expressed through the digital sphere. However, the presence of new communication technologies does not equate to the replacement of the old ones. As Harper (2010, p. 18) suggests, 'new technologies tend not to replace the old ones, but instead they add to the palette of possibilities'. These possibilities expand from supporting collocated family interactions (discussed in Section 2.3.2) to enriching physically separated ones (discussed in Section 2.3.3).

2.3.2 Technology and Collocated Family Interactions

Collocation refers to the bodily and physical presence between two or more individuals within the same spatial and temporal dimension (Goffman 1963). The main characteristic of collocation is the face-to-face interaction that serves as the basis of communication and is supplemented through physical contact and touch (Cooley 1956). The presence of different communication technologies within the domestic domain that can be used within collocated family interactions has attracted significant interest from recent HCI work. Most of these works have investigated the role of technology in supporting collocated family interactions, focusing on the social practices that surround the uses of these technologies. The current section reviews these studies by centralising on four key elements of the parent–child relationship: closeness, presence, intimacy and sharing of experiences (Beech et al. 2003).

2.3.2.1 Technology for Closeness in Collocated Family Interactions

An essential aspect of family relationships is the closeness that permeates the interactions between family members. Vangelisti (2004, p. 36) defines closeness as 'the degree to which individuals affect and are affected by each other'. In the case of parents and children, closeness is an inherent and fundamental component of the attachment that forms the parent–child relationship (Bretherton 1992). Theorists and sociologists who have explored the practices that surround photography argue that home photography can be used as a medium that secures and strengthens family values and roles by fostering closeness (Sontag 1978; Chalfen 1987).

Early works in HCI and CSCW identified the significance of photos as a medium of deepening togetherness within the home. In a study with computer-owning families, Frohlich et al. (2002) investigated how photos facilitate the communication between the present and the past that enriches the feelings of closeness between family members. This work noted a key difference between practices around reminiscing and storytelling. The former is a single-person attempt to interpret phenomena using certain cues, whereas the latter has a collaborative sense in which many individuals participate and share their experience related to a specific photo. Furthermore, this study unearthed the importance of materiality as a key substance of technologies aiming to support

closeness in collocated family interactions through the shape and form of physical photos that can help family members reminisce and collaborate. Other works have explored the role of mobile technologies as a medium for bringing family members closer. Inspired by sociological studies that depicted the face-to-face disconnect that numerous digital technologies bring to interactions between family members, Jarusriboonchai and Väänänen-Vainio-Mattila (2012) designed FAMEX, a system that is based on supporting individual and collective playful discussions through the creation and collocated digital representation of family events that happened in the past with the use of photos.

Previous research has clearly demonstrated the value of photos in enabling parents and children to come closer together and enrich their feelings of togetherness while they are physically collocated.

2.3.2.2 Technology for Presence in Collocated Family Interactions

Another important facet of family relationships is the presence that entwines the interactions between family members. In particular, social presence that 'describes the set of spatial and temporal conditions in which human individuals interact with one another face to face from body to body' (Zhao & Elesh 2008, p. 24). Similarly, awareness is defined as the 'state of knowing about the environment in which you exist; about your surroundings and the presence and activities of others' (Rowan & Mynatt 2005). Both presence and awareness have been extensively investigated within CSCW and HCI research.

Studies have depicted the role of home displays and situated messaging as a way of fostering awareness when family members are in the same physical space. In their study on person-to-place communication, O'Hara et al. (2005) designed TxTBoard, a display located in the home, where family members can send notifications in the form of text messages. TxTBoard acted as a peripheral awareness display whose material character added a more tangible social domestic touch and led to collocated discussions that were driven by the content of the technology. On a same note, Sellen et al. (2006) depicted the importance of situated messaging as a vehicle for the enrichment of presence and awareness in the home. They designed HomeNote, a technology focused on mundane

communication activities that permeate the daily family life. Family members can use HomeNote to increase their awareness of each other when they are collocated by following their usual life patterns (e.g., leaving a digital note on the fridge).

Other research studies focus on fostering presence and awareness within collocated family members through playfulness. Lindley, Banks et al. (2009) aimed to create richer presence within the domestic setting by enabling family members to engage in a more enjoyable and playful manner through material artefact as in the case of BubbleBoard, a playful answering machine. In their work on family calendars, Neustaedter and Brush (2006) designed LINC, a digital family calendar situated in the kitchen. Their research showed the importance of calendaring systems as a tool of simple awareness that supports family members to coordinate and be more present in each other's lives. The significance of coordination within collocated family interactions was also underlined in the work of Neustaedter, Brush and Greenberg (2009) on defining a typology of calendars as a medium of making family members more present and aware of each other. Through this typology, their study unpacked the value of coordination in fostering presence within collocated family members.

In short, previous studies have demonstrated the ways in which technology can support presence and awareness in collocated family interactions through innovative forms of notification, playfulness, coordination. These research efforts highlighted the role of material artefacts in further fostering the collocated presence between family members.

2.3.2.3 Technology for Intimacy in Collocated Family Interactions

One of the aims of family interactions is to create and enrich the intimacy between all members of a family. Intimacy is the 'process in which one person expresses important self-relevant feelings and information to another and as a result of the other's response comes to feel known, validated and cared for' (Kaye 2011, p. 32). Intimacy has received extensive attention in sociological literature, where studies have depicted the significance of intimate family relationships for sustaining cohesive bonds. Within HCI and CSCW literature, numerous studies have focused on exploring the role of technology in supporting intimacy in collocated family interactions. The overarching

themes of the recent literature on collocated intimacy are built around the concepts of deep interpersonal sharing and mutual reflection.

Thieme et al. (2011) highlighted the importance of reflection between couples as a way of enriching intimacy in romantic relationships. To this end, they designed the Lover's Box, a physical artefact aimed at integrating the daily life of partners who are collocated through personalised video messages as a basis for better understanding their intimate relationship in a meaningful manner. The results of this study depicted the value of materiality and the designed material artefact in allowing family members who are collocated to foster their intimacy and better support their mutual sense of their relationship. Building on this work, Branham, Harrison and Hirsch (2012) further explored the design space for intimacy with local partners (those who reside in the same household). Through interviews with marriage family experts, they identified new opportunities for the enrichment of collocated couples' intimacy. This is based on deep interpersonal sharing—a 'form of communication that allows partners to build and rebuild mutual understanding in ongoing dialogue' (Branham, Harrison & Hirsch 2012, p. 8). It is also mirrored in the design of a Diary Built for Two, a personal journaling system whose aim is to foster intimacy between couples through collaboration. In the context of parents and children, Dalsgaard et al. (2006) highlighted the importance of mutual play activities as core mediums for fostering interpersonal sharing. This particularly important since children spend less than one hour a week participating in household conversation compared to more than 20 hours a week of play, hobbies and studying (Hofferth & Sandberg 2001).

The recent efforts on supporting intimacy in collocated family interactions have focused primarily on fostering reflection and interpersonal sharing among family members—both primarily manifested through play among parents and children.

2.3.2.4 Technology for Sharing of Experiences in Collocated Family Interactions

A basic attribute of collocated family interactions is the sharing of experiences that occurs with the engagement of all family members in dialogue or other meaningful social practices (e.g., play or attending common activities). Shared experiences are a bonding activity by which different threads of the family relationship are further

enriched and strengthened. Research efforts in technology and collocated family interactions have emphasised the significance of technological tools (both material and digital) in fostering the sharing of experiences when family members are collocated.

Photos are one of the most common ways with which family members can share experiences when they are physically together. Studies in HCI and CSCW have investigated the social practices that surround the use of photos in collocated domestic settings (Lindley, Banks et al. 2009). Photos, both in a material and digital form, provide a meaningful medium for family members to tell and re-tell their interpretations of the photos' content in an enjoyable and collaborative way (Chalfen 1987). An important characteristic that relates to the practice of photos is storytelling, a primate mode of communication between individuals that is facilitated through photographs and verbal expression. It is used by parents as a mode of communication and connection with their children either in a structured (e.g., through reading stories) or unstructured manner (e.g., through play) (Landry & Guzdial 2006).

One of the earliest studies on storytelling within the context of HCI was done by Balabanović, Chu and Wolff (2000) and explored the nature of sharing experiences through digital storytelling—storytelling that occurs with the help of digital photos and the use of the web. They designed and deployed the StoryTrack technology, which was aimed at supporting local sharing of digital photos. Their research unearthed two types of storytelling strategies that family members employ: 'photo-driven digital storytelling' and 'story-driven digital storytelling' (Balabanović, Chu & Wolff 2000, p. 3). In the former, the photo guides the progression of the story, whereas in the latter, the individual has a specific story in mind that the photos support. Inspired by this work, other research efforts commenced a thorough exploration of digital storytelling as a way of sharing experiences within the home. In their work on smart digital frames, Kim and Zimmerman (2006) designed Cherish, a system that facilitates the organisation and display of photos in the home. Their research highlighted the value of Cherish in enabling family members to narrate and share their daily experiences among each other while strengthening their bonds. The widespread presence of mobile phones has also attracted research efforts aimed at understanding the use of mobile phones as a collocated photo-sharing medium. Drawing on previous work on user engagement in

sharing experiences through photos, Patel et al. (2009) designed Mobiphos, a system that can be used to synchronously capture and share experiences. Even though they did not deploy the technology within the domestic setting, their work revealed the importance of mobile technology as a collaborative tool that supports experience sharing through photos in settings where individuals are collocated.

Another element of sharing experiences through photos in collocated settings is collaboration. Recent studies have explored the role of collaborative photo-sharing devices in enriching the sharing of experiences between individuals. Bhömer et al. (2010) designed 4Photos, a device located on the dinner table that allowed the sharing of experiences in a more democratic and serendipitous way compared to traditional photo displays in the home. The deployment of 4Photos highlighted the possibilities of a novel technology and distinct forms of materiality that merge the physical with the digital in sparking collaborative sharing of experiences in a non-traditional way. Lucero, Holopainen and Jokela (2011) investigated the role of mobile technology in enriching collaborative interactions among collocated individuals in the home. They deployed Pass-Them-Around, a material prototype that was inspired by the traditional practice of passing printed photos around. Their findings demonstrated the potential of mobile technology in supporting collocated and collaborative interactions through digital photos within the household.

The presence of increasingly ubiquitous computing (ubicomp) has stimulated the interest of HCI researchers considering the use of ubicomp in conjunction with the collocated sharing of experiences. Ah Kun and Marsden (2007) investigated the role of public broadcasting of images among a group of collocated individuals (friends) with a focus on the usability of the mobile devices and the negotiations that occur. Their findings indicated the importance of having 'strict control policies' that control the sharing of the photos (e.g., turn-taking) (Ah Kun and Marsden 2007, p. 5). Other studies have explored the use of physical memorabilia as an opportunity to enrich the collocated sharing of experiences based on photos. Nunes, Greenberg and Neustaedter (2009) designed Souvenirs, a system inspired by the presence of domestic physical mementos and photos within the home. Using RFID technology, family members can associate a digital photo set with specific physical memorabilia which demonstrated an

advanced way of merging materiality with digital information. For example, the family's vacation photo album could be linked, using Souvenirs, to a physical object that the family purchased while on vacation. They can then bring the physical memento close to the television set where the associated photos will be displayed, thus enriching the collocated storytelling experience. The use of Souvenirs highlighted a novel design space for sharing experiences through photos within the domestic domain.

Recent research has also examined the relationship between performance and sharing of experiences through photos within family settings. In her work on collocated photo sharing, Van House (2009), inspired by previous work on the performance of self (Goffman 1956), highlighted the significance of performative interaction in the context of storytelling. Her research found that even though families and individuals live increasingly in the digital sphere, collocated photo storytelling still holds a significant part in their daily life. Her findings indicated that the performer (individual leading the storytelling) and the audience (individuals who are listening) can reconstruct their personal identity and strengthen their relationships. Performative interaction has also been investigated within the context of ubicomp by works that focus on the role of public multi-touch displays in supporting collocated interactions. Jacucci et al. (2010) designed two tangible public displays (CityWall and MapLens) with the aim to further understand the role of ubiquitous media in collocated interaction. Their work unpacked the importance of reminiscing talk (as introduced by Frohlich et al. [2002]) that binds collaboration and performance in the context of collocated interactions.

Apart from photos, researchers have explored other technologies in the context of supporting the collocated sharing of experiences within the family setting that focus on playfulness. Inspired by the theory behind cooperative interaction—whereby users actively coordinate their actions towards a shared object—Petersen (2007) designed Squeeze. The aim of this system was to explore the potential of employing digital technologies (apart from digital photos) that support the collocated sharing of experiences among family members through playfulness. Squeeze consisted of an in-house camera and an interactive 'sack-chair' (Petersen 2007, p. 3). Photos taken of the daily life of the family are displayed to a wall close to the chair. Movements within specified zones around the chair can help further explore each photo. The deployment of

this technology within the home emphasised a more playful way for family members to use an already known technology (photos) and a familiar space (chair) to further enrich their sharing of experiences. It, also, exhibited another way with which materiality, playfulness and digital technology could work together while strengthening the collocated sharing of experiences amongst family members.

In general, previous research has extensively explored the role of digital technologies in supporting the sharing of experiences within collocated family interactions. They highlighted the use of photos, the importance of digital storytelling and play in fostering collaboration and strengthening the family bonds when parents and children are collocated. Finally, earlier work depicted the value of materiality in creating new opportunities for sharing of experiences between parents and children.

2.3.2.5 Summary of Technologies for Collocated Family Interaction

This section has explored previous HCI work on technologies that support collocated interactions among family members. These works demonstrated the value of technologies in enriching the feelings of closeness, presence, intimacy and sharing of experiences when parents and children are in the same physical space. They identified the importance of photos and storytelling in fostering closeness and promoting the sharing of experience between family members. Further, these studies highlighted the role of reflection through digital mediums (e.g., videos) in augmenting the intimacy between collocated parents and children. In the context of intimacy, presence and sharing of experiences, the previous work showed the importance of play and playfulness as an important component of technologies aimed to support collocated family interactions. Finally, the previous work on collocated family interaction noted the significance of materiality and physical artefacts alongside digital technologies in encouraging closeness, intimacy as well as sharing experiences between the older and younger family members when at the same physical space (e.g. through material artefacts that encourage playful engagement).

The next section delves further into the current research efforts that focus on the role of digital technologies in supporting closeness, presence, intimacy and sharing of experiences among physically separated families.

2.3.3 Technology and Physically Separated Interactions

The previous section described the research on the role of technology in supporting collocated family interactions. Another facet of family life is the interactions that occur when family members are separated by distance and time. This can occur due to work-related, personal or other reasons. The importance of distance and its impact on the maintenance of social relationships has received great interest within HCI literature since the prominent work of Olson and Olson (2000). With the widespread use of different communication technologies, family members can mediate their interactions and sustain the strong nature of their relationships regardless of distance. Recent literature has also highlighted the need for researchers to further explore the social and emotional aspects of communication technologies within families (Little et al. 2008; Olivier & Wallace 2009). This section provides a critical review of the current research on the role of technology in mediating physically separated family interaction with a focus on closeness, presence, intimacy and sharing of experiences.

2.3.3.1 Technology for Closeness in Physically Separated Family Interactions

Prior to digital technology, closeness between physically separated family members was mediated primarily through letters and phone conversations. Recently, the increased penetration of web-based technologies into the domestic domain has provided exciting ways for family members to bridge the physical gap and feel closer to each other regardless of location.

Most research has focused on the value of video communication in supporting closeness between physically separated parents and children. In their work on mobile video telephony, O'Hara, Black and Lipson (2009) investigated the effect of ubiquitous video communication on the feelings of closeness among family members. They highlighted the importance of video-based communication in mediating visual cues, which cultivate stronger closeness between parents and children. Inspired by this work, Kirk, Sellen and Cao (2010) studied the current practices that surround the use of video communication across 12 homes. Their findings demonstrated the significant support that video technologies provide when families are faced with the challenges resulting from parents and children being physically separated. Moreover, these insights presented the need to

consider the temporal elements of the video communication use between parents and children when designing technologies for physically separated family interactions.

Other studies have focused on embedding video-based communication with a more common practice that is known to children: reading a book. Follmer et al. (2012) designed People in Books, a flash cam–based technology that playfully extends the experience of reading a book by integrating video chat streams directly into the book illustrations. Twelve families with children between the ages of three and five years old used the artefact and expressed their increased sense of closeness. In a subsequent study, Raffle, Ballagas et al. (2011) explored how playfulness can mediate parent–child closeness through asynchronous video messaging. Their research led to a device called Toaster, which was based on the idea of having a 'jack in the box toy with an embedded mobile phone' (Raffle, Ballagas et al. 2011, p. 2). Through Toaster, children can take and share their own digital media (videos and photos) in a playful way. The deployment of the prototype with 30 children highlighted the necessity of considering children-oriented user interfaces—with a focus on playfulness and immediacy—when designing systems that aim to mediate closeness between family members. Furthermore, the commonality of all these studies was that they embraced the materiality of the artefact and considered it as a key component of the technology aimed to support closeness between parents and children through video-based communication.

Another important facet of the parent–child relationship is storytelling. The collocated practice of storytelling is a source of inspiration for studies that aim to inform the design of technologies that mediate closeness among parents and children. Vutborg et al. (2010) designed StoryTeller, an artefact aimed to better explore the role of storytelling in mediating closeness between grandparents and grandchildren living apart. Their findings, from a deployment of the tool for two weeks with two families, demonstrated the necessity for current communication technologies to consider storytelling activities that focus on the child. Along the same lines, Raffle, Revelle et al. (2011), based on the concept of connected eBook video, examined the deployment of an artefact— StoryVisit—whose aim was to enrich the sense of closeness between adults and children separated by vast distances. The use of StoryVisit by 61 families indicated that adults and children using StoryVisit could mediate their feelings of being together in a

richer manner compared to typical video chats. This was mainly due to the effect that the visual cues had on the overall parent–child interaction.

The advent of video-based technologies has enabled physically separated family members to strengthen their closeness. In regard to children, this new feature in the existing palette of technologies helps augment storytelling and play—two fundamental components of a healthy child development—with their dispersed parents by enabling both visual and auditory cues as well as by blending it with material approaches to technology.

2.3.3.2 Technology for Presence in Physically Separated Family Interactions

Recent developments in communication technologies have also enabled family members to feel more present in the lives of their distant loved ones. Early HCI research identified the need to design technologies that support the feeling of presence for family members who reside in different locations. Rowan and Mynatt (2005) showed the importance of technologies that support peace of mind for senior adults who live apart from their loved ones. Their introduction of the digital family portrait, a prototype that summarises the life of the senior adult through images over a period of 28 days, highlighted the importance of emotional connections between family members when designing technologies that mediate family presence.

Following this research, the interLiving project explored the role of technology in supporting presence among physically separated family members (Hutchinson et al. 2003). This study introduced the concept of technology probes: 'instruments whose aim is to explore the unknown research and design space' (Hutchinson et al. 2003, p. 2). They designed and deployed the messageProbe and the videoProbe with four families over a two-month period. Their study, among others, revealed the importance of family values when designing presence-oriented technologies. Inspired by this work, Ames et al. (2010) conducted a study exploring the benefits of family video chat. Their research identified the value of video chat in fostering parent-child presence through real-time visual and audio cues.

Other HCI studies have focused on exploring the role of technologies in supporting 'affective awareness'—the 'general sense of being in touch with one's friends and family' (Markopoulos et al. 2004, p. 1). That body of literature has highlighted the value of lightweight social communication (e.g., photos, images, short messages and short audio snippets) in supporting family presence in physically separated settings. In their work on supporting awareness between distant family members, Saslis-Lagoudakis et al. (2006) designed Hermes@Home, an always-on system with which family members at home could write messages to be seen by separated loved ones. The deployment of the probe highlighted the importance of lightweight and personal expressivity (through the handwritten messages) and identified issues around trust, reliability and privacy. Moreover, that work demonstrated the importance of considering time and temporality when building technologies for presence in physically separated family members.

Further, Zuckerman and Maes (2005) identified the need to create technologies that support parent–child awareness with a specific focus on the child. They designed the Contextual Asynchronous System (CASY), a system centred on children as the main users. Through CASY, children can capture and send asynchronous video snippets of their routine daily activities to other family members. These types of mundane activities provide another space for the design of awareness technologies. Kanis and Brinkman (2010, p. 6) highlighted the value of mediating 'daily mundane pleasures' through lightweight technology (in their case, mobile internet messages) with the aim of enriching the affective awareness between friends and family members. In the case of long-distance couples, the presence of mobile technologies has complemented the ways that loved ones can be aware of each other. Bales, Li A and Griswold (2011) explored the existence of explicit action between the sender and receiver through mobile technologies with the aim of exploring the communication needs of long-distance couples. The developed coupleVIBE, a mobile system that automatically forwards a user's location information to their partner's mobile through vibrotactile cues at specific times during the day. The use of coupleVIBE by seven couples over four weeks demonstrated the value of this approach in further enriching the relationship between loved ones.

A specific social affordance that emerges from the awareness literature, which is associated with the 'positive emotional appraisal which is characterized by a feeling of staying in touch within ongoing social relationships', is connectedness (Dey & de Guzman 2006, p. 1). HCI-related research has underlined the role of technology in supporting connectedness between distant family members. Early studies focused on the value that at-home displays add in enriching the sense of connectedness between loved ones. Dey and de Guzman (2006) emphasised the possibilities of using physical devices as displays (as opposed to graphical) as these could present information peripherally and be located in distinct and meaningful locations in the house (e.g., the bedroom). Further studying the concept of connectedness, Romero et al. (2007) designed the ASTRA awareness system, which is based on creating a simple to-do list of thoughts that an individual would like to share with their loved ones. The deployment of the system with four families for two weeks indicated the need to revisit the definition of connectedness to also include the 'feelings of being in touch with someone, being aware of what happens in their lives, feeling what they think and care' (Romero et al. 2007, p. 9).

Building on this work, Brush, Inkpen and Tee (2008) investigated the value of enriching family connectedness through the asynchronous sharing of important family information (e.g., photos or planning activities) between distant family members. The deployment of their prototype—SPARCS—with 14 families for five weeks unveiled the benefits that sharing suggestions and asynchronous chat have for supporting the connectedness between family members. Later research has highlighted the need for technology designs that aim to support connectedness without obligation for the users (so that they do not feel guilty about not using the technology), to be as lightweight as possible (to interweave with people's busy lives), to support the privacy concerns that are raised with the introduction of such systems (Brush, Inkpen & Tee 2008) and, in some cases, to consider supporting the connection of remote people 'sensuously' to their home — which invites a turn towards material engagement through sensors (Lynggaard et al. 2010, p. 4).

Recent research has also explored the use of video media spaces in the domestic domain with the aim of supporting family connectedness. Judge, Neustaedter and Kurtz (2010)

inquired into the role of a video connection in the form of a domestic media space in helping dispersed families to feel more connected. They designed the Family Window, an always-on video media space that focused on mediating connectedness in dyadic relationships where the parties lived in different locations. The deployment of this prototype with two families for eight months and another four families for five weeks illustrated the significance of always-on video in increasing the feelings of connectedness in daily family life.

Extending this work, Judge et al. (2011) focused on better understanding the role of domestic media spaces in helping triadic relationships where the parties lived in three locations further enrich their sense of connectedness. The deployment of Family Portals, which provided shared synchronous video link between three locations, with six families prompted new styles of interaction to emerge and new understandings of connectedness between family members in three different locations. Media spaces have also provided opportunities for designers to address the more complicated relationships between parents and children. In the context of parent–child connectedness, Yarosh et al. (2009) explored the role of media spaces and synchronous parent–child interaction in supporting a sense of connectedness through shared engagement in family learning and play activities. The deployment of their prototype, ShareTable, highlighted the complexity and particularity that accompanies the design of a media space for parent–child interaction regarding supporting both synchronous and asynchronous communication (semi-synchronous communication).

A significant challenge in supporting presence between family members, underlined in recent HCI literature, is family members residing in different time zones. Research on better understanding the communication of separated family members across time zones reveals the need for systems to be sensitive to time, and aware of family members' daily routines as well as notes the difficulty in having ad hoc lightweight but timely communication (Cao et al. 2010). The existence of video communication has allowed researchers to devise mechanisms that take the above concerns into account. Tsujita, Yarosh and Abowd (2010) proposed CU-Later, a system that allowed family members to see and hear each other when they were having dinner. CU-Later recorded each of the dinners in different households and then time-shifted the video recording, making it

seem as though family members in the two households had dinner at the same time. A different study, inspired by the materiality of artefacts, used the metaphor of gift-wrapped presents to investigate the potential that a different form of asynchronous video clips had in bypassing the time difference and further enriching the awareness between distant family members (Kim et al. 2013). The design of TimelyPresent aimed to preserve the meaningful aspect of the video that was sent from one household to the other and was visually present in a touch screen device located at home. The field study of this prototype with four families for two months emphasised the value of gifts and materiality as a way of further enriching the interactions between family members in different time zones.

Supporting presence in physically separated families has been the subject of a plethora of previous studies. These works highlighted the importance of synchronous and asynchronous communication technologies in mediating presence (including awareness and connectedness) among parents and children while considering the importance of time and temporality. Specifically, video technologies alongside lightweight social communication tools (e.g., presence displays with images or messages) have been proven to help separated family members cultivate and support their presence and thus further strengthen the family bond.

2.3.3.3 Technology for Intimacy in Physically Separated Family Interactions

Early research in the HCI literature highlighted the significance of designing technologies that support intimacy at a distance between family members. Studies have explored the role of lightweight, synchronous and asynchronous technologies in mediating intimate acts between parents and children (primarily through play) and long-distance partners.

In the context of lightweight technologies, Kaye and Goulding (2004), inspired by the work of Strong and Gaver (1996), conducted a study to better understand the design of intimate objects that can be used to augment intimacy in long-distance couples. Building on this work, Kaye (2006) also underlined the merit of focusing on technologies that require minimal communication between separated loved ones. The design of Virtual Intimate Objects (VIOs)—installed in each of the loved ones'

computers, allowing individuals to pick and send a colour that fades over time to the other—unearthed the importance of supporting the mediation of intimacy through low-bandwidth connection. The deployment of VIOs showed the rich interpretations that loved ones would give to a seemingly minimal communication (the transmission of a colour of the individual's choice). Lottridge, Masson and Mackay (2009) investigated how current communication technologies supported the mediation of intimate acts of 13 couples that lived apart. Their thematic analysis of couple intimacy resulted in the design of MissU, a technology probe that shares music and background sounds and focuses on the couples' 'empty moments'—moments such as waiting, walking, taking a break, waking up and going to sleep which are not well supported by current communication technologies. The deployment of MissU with five couples noted music as a meaningful element in supporting couple intimacy.

The presence of video has afforded unique opportunities for physically separated couples to mediate their intimacy and love (Kaye 2011). Neustaedter and Greenberg (2012) examined the role of video chat as a medium of further complementing couple intimacy. The interviews they conducted with 14 individuals in long-distance relationships showed the unique positive dimension that video chat adds in enriching couple intimacy. They also underlined the contextual, technical and personal challenges that couples face through video chat (e.g., knowing the location of partners and the lack of physicality in the communication).

HCI studies have explored parent–child intimacy not only through lightweight communication, but also through asynchronous technology design. Vetere et al. (2005) used cultural probes and contextual interviews with six families to better understand how technology can support intimacy over a distance. Their work generated a thematic understanding of intimacy that described the conditions for intimacy, the themes and the results of intimate acts. Building on this research, Dalsgaard et al. (2006) mapped the design space for intimate technologies that are constructed around the unique character of parent–child intimacy. Guided by this study, Dalsgaard, Skov and Thomassen (2007) designed eKISS, an asynchronous system that supported the sharing of pictures and text through a weblog. Their aim was to better understand the potential of an asynchronous technology to support parent–child intimacy. Their five-week deployment of eKISS

with four families revealed the opportunity for parents and children to gain more insight into each other's lives over time while they were apart, despite children feeling unmotivated to take pictures and upload them to eKISS.

Further, Davis et al. (2007) used play—a more common parent–child activity compared to taking photos—to explore the role of technology in mediating parent–child intimacy. Their enquiry into a design that could support mediated intimacy through physical and virtual play led to the development of the Virtual Box, a location-aware client-server application that was based on asynchronous data sharing and whose design was inspired by the asymmetric nature of the grandparent–child relationship. The in-lab evaluation of this material artefact with three families with children aged between six and nine showed that play over a distance could further enrich the intimate feelings and expressions between parents (or in this case, grandparents) and children. In a later study, Vetere et al. (2009) designed two technology probes—the Magic Box and the Collage—with the aim of better understanding the concept of intergenerational playfulness as a platform for enriching grandparent–grandchild bonds. Their deployment, similar to Davis et al. (2007), identified the complexity of the different roles that technologies need to support to augment the intimate acts between younger and older family members.

Supporting intimacy in physically separated families has received extensive interest from the HCI community. The works discussed in this section highlighted the importance of lightweight and synchronous and asynchronous technologies in strengthening family members' intimacy regardless of any physical boundaries.

2.3.3.4 Technology for Sharing Experiences in Physically Separated Family Interactions

One of the most important aspects of family interactions that can be mediated with the presence of different technologies within the domestic domain is the experience that each family member has while being apart from their loved one.

Throughout the HCI literature, video technologies have given unique opportunities for distant family members to share their everyday life activities and experiences (Judge &

Neustaedter 2010) and opportunities to younger family members to augment their friendships (Inkpen et al. 2012). In the context of parent–child and child–child interactions, recent research has explored the role of technology (virtual or physical) for sharing experiences through play. Yarosh, Inkpen and Brush (2010) investigated the use of video channels to mediate free play between pairs of friends (aged seven and eight years old) and to map the type of experiences shared with this technology in a common child activity. Their study showed the need to reconsider the design of video technologies to support richer sharing of experiences through play among younger children. Expanding on this work, Yarosh and Kwikkers (2011) further examined the role of video chat in supporting pretend and narrative play. They invited 10 pairs of children to play by using phone-to-phone, phone-to-laptop or laptop-to-laptop interaction. They found that laptop-to-laptop interaction is far better for supporting the sharing of experiences through narrative play between children.

Other studies have examined the way that materiality and physicality of artefacts can support the sharing of experiences between distant family members through play. Raffle, Revelle et al. (2011) designed Pokaboo, a networked toy that supports low–frame rate video and photo sharing and is focused on remote physical play between children aged two to five years old. The use of Pokaboo by children highlighted the engaging connections that such a physical device can offer younger children. Other studies have delineated the value that media spaces add in sharing experiences between distant family members. Neustaedter and Judge (2010) inquired into the use of a mobile family media space in supporting the sharing of experiences. They designed Peek-A-Boo, a bidirectional live video streaming system between a mobile phone and an at-home physical display that permitted distant family members to record and share their daily activities and experiences. The evaluation of this prototype highlighted the importance of sharing experiences in the moment (as they happen) and augmenting voice calls through shared video.

Another way that family members can share their experiences when physically apart is with the help of photos. Early research has emphasised the merit of sharing experiences through photos to enrich the collaboration between distant family members (Crabtree, Rodden & Mariani 2004). Another aspect that has attracted the attention of recent

research on mediating experiences through photos is the practices that surround their use, namely the narrative that surrounds the view of photos over a distance. In their work on social storytelling, Jomhari, Gonzalez and Kurniawan (2009) described the expressive nature of narratives that encircle the sharing of baby stories over the internet between young mothers and their distant loved ones. In the context of intergenerational communication, researchers have also explored the role of storytelling in supporting the sharing of experiences between distant grandparents and grandchildren. Raffle et al. (2010) introduced Family Story Play, a video-based system that enriched the reading of stories over a distance, to further investigate how this common practice could support the literacy development of young children. The shared activity of reading together gave the opportunity to both grandparents and grandchildren to share their experiences and feel closer despite being physically apart. Moreover, Bentley, Basapur and Chowdhury (2011) designed and deployed the Serendipitous Family Stories system that aimed to explore how the serendipitous sharing of daily experiences between distant family members can further enrich the family bonds across generations. Their findings revealed the need to further understand the notion of storytelling as a way of sharing experiences between parents, grandparents and children.

Previous work has highlighted the role of digital technologies in enabling the family members to share their experiences while apart. These technologies span from the use of video and media spaces to those that embrace materiality as in the case of physical photos. Even though parents and children are separated by time and space, the use of the presented technologies mediate activities that are essential for the strengthening of parent–child bonds and the healthy upbringing of children, including play and reading.

2.3.3.5 Summary of Technology for Physically Separated Families

This section investigates the previous work within HCI studies on technologies aimed to support physically separated families with a focus on closeness, presence, intimacy and sharing of experiences. The literature demonstrated the significance of both synchronous and asynchronous technologies in strengthening the bonds between family members, particularly parents and children, when they are physically separated. Specifically, video-based technologies have received increased attention, with studies highlighting the role of video in supporting closeness and presence among parents and

children through mediating storytelling and play activities. Further, video-based technologies, including media spaces, have been shown to further foster the sharing of experiences and strengthen intimacy among family members over time. Recent research efforts have unearthed the role of asynchronous and lightweight technologies in supporting the interactions between physically separated family members. The use of photos, images and text in an asynchronous manner gives the opportunity to parents and children to mediate their presence, closeness and intimacy while they are separated not only by distance, but also by time. The asynchronous and synchronous technologies complement each other and can be used by parents and children interchangeably while physically apart with the aim to support and further solidify their bonds. Finally, recent research efforts have emphasized the importance of embracing materiality by blending physical and digital artefacts in mediating closeness, intimacy and sharing of experiences amongst physically separated family members (e.g. through playful interactions between parents and children).

The next section shifts the focus of this literature review to technology and family reunion, which is the core of this thesis. The section visits and critically reviews the current work on the role of digital technologies in supporting parent–child reunion, with a focus on closeness, presence, intimacy and sharing of experiences.

2.3.4 Technology and Family Reunion

The previous sections explored current research efforts that focus on further understanding the role of technology in supporting interactions between physically collocated and physically separated family members. Given that the core of this thesis is family reunion, it is essential to visit and critically examine previous HCI-related works on this complex yet common family experience. Family reunion is an experience that occurs periodically due to work-related, personal or other reasons. It is related to and influenced by both the collocated and mediated interactions of physically separated family members (Moss & Moss 1988).

The research landscape has revealed a lack of studies that focus on technology and family reunion. In fact, most recent studies that mention family reunion did not explicitly aim to explore this experience. Rather, they were focused on better

understanding different dimensions of physical separation, with their findings suggesting the existence and significance of family reunion as an area requiring further study (Wood, Scarville & Gravino 1995; Ramirez, Skrbiš & Emmison 2007; Stafford & Merolla 2007). The next sections unpack this scarce yet significant literature on technologies supporting family reunion.

2.3.4.1 Technology for Closeness in Family Reunion

Sociological research has identified closeness as one of the most important dimensions of reunion (Moss & Moss 1988). Within this family experience, previous work has highlighted the importance of synchronous and mobile-based technologies in supporting closeness. In their work on distributed family interactions, Evjemo et al. (2004) examined the differences between face-to-face and phone conversation in supporting the bond between grandparents and grandchildren. They found that communication among grandparents and grandchildren when they are physically together after their separation is extremely important regardless of the use of synchronous technologies while apart. The authors demonstrated the significance of common conversational contexts that are aimed to facilitate the discussions between grandparents and grandchildren. They noted that current technologies aimed at assisting family members while apart lacked the ability to identify a context for conversation that could help separated family members communicate more intimately when they are physically together. This in turn influences the design of technologies that are aimed at supporting family members' closeness within reunion, given that it follows the separation.

Christensen (2009) underlined the value of the mobile communication in mediating closeness among physically separated family members. His study demonstrated that the ways that family members communicate have not altered significantly since the introduction of the mobile phone. He highlighted that even though mobile-based communication is omnipresent in family life, physical-based interactions remain the 'bedrock on which close relationships are built' (Christensen 2009, p. 445). For Christensen, the digital sphere is an extension of the physical one and should be embraced and further extended.

Ultimately, despite the scarcity of works investigating technologies aimed to support closeness in family reunion, the literature describes the significance of mobile and synchronous technologies in helping family members foster their family bonds and strengthen their interactions when they are physically together.

2.3.4.2 Technology for Presence in Family Reunion

Presence is another important characteristic of family reunion. Even though recent studies are extremely scarce, they demonstrate the value of in-person interaction and the role of photos in strengthening family presence when parents and children are physically together after haven been physically separate.

In their study on work-related separation, Modlitba and Schmandt (2008) explored the challenges that parents and children face when they go through this experience. Their research efforts led to the design of Globetoddler, a system aimed to enrich co-presence and communication between parents and children while they are physically apart. However, one of the key insights that this study unearthed was the anticipation that children have of the upcoming reunion when they are 'seeing the face of and the photos that the parent brings' (Modlitba & Schmandt 2008, p. 3). The preference of children for the physical presence of their parent and the role of photos in bridging the gap of physical separation by facilitating the narration of experiences was clearly demonstrated in the use of the Globetoddler system (Modlitba & Schmandt 2008). The study aligned with the work of Fortunati (2005), who noted that despite the complexity of the boundaries between physical separation and collocation (due to the presence of information and communication technology in daily life), the human to human interaction fosters the presence amongst individuals. This is supported using photos that can help both parents and children be present together after being apart (Modlitba & Schmandt 2008).

Building on this work, Yarosh and Abowd (2011) focused on the strategies that parents and children develop to manage their work-related separation and unveiled a similar understanding of the value that children place on the reunion with their loved one. The researchers conducted interviews with 14 pairs of parents and children (aged between seven and 13 years old) that highlighted the anticipation of children towards the

physical presence of their parent upon their return. That insight was not unexpected given the large body of previous literature highlighting the importance of presence in children's lives (Baumeister & Leary 1995). Although the use of technology while physically apart does help parents and children to mediate their awareness and co-presence, Yarosh and Abowd (2011) stated that for the children who participated in the study technology, the use while apart had an additional surprising finding: it reminded them of the absence of their parent and demonstrated the need for their parent's presence in their life. It also increased their awareness of the importance of reunion and enabled children to count down the days until the eventual return of their parent. Thus, it demonstrated the ways in which reunion is experienced by children in the context of physical presence.

Therefore, despite the scarcity of the work on technology aiding presence in family reunion, previous studies demonstrated the role of photos in reminding and strengthening the physical bond between parents and children. Further, they turned the attention towards children as key actors in technology use while apart and that such use of technology reminded children of the absence of their loved ones and of the importance of physical presence.

2.3.4.3 Technology for Intimacy in Family Reunion

In the context of family reunion, it is important for family members to put effort into further enriching the intimacy that may be lessened by the physical absence of the loved one. The closest work within the HCI field to intimacy and family reunion is situated inside the literature on divorced families.

In their work on better understanding the role of technology in supporting parent–child interaction in divorced family cohorts, Yarosh (2008) and Yarosh, Denise Chew and Abowd (2009) identified the difficulty that children and divorced parents have in sustaining and mediating their intimacy due to the sensitive context. Even though parents and children would use synchronous technologies (e.g., telephone and video conferencing) as a primary means of staying in touch, they would also try to reunite as often as possible to ensure actual physical contact and presence. Consequently, this research demonstrated the value of asynchronous communication in supporting

intimacy between physically separated parents and the children. However, this resulted in tensions between divorced households that in turn imposed limits on the duration of the reunion and thus on the intimacy expressed during the reunion. On that note, this research showed the need to design for a child's autonomy and considering the specificities of each divorce.

Odom, Zimmerman and Forlizzi (2010) conducted a similar study on divorced families that showed the importance of identity and place for children. Interviews with parents and children from 13 divorced families revealed that numerous tensions existed between the divorced households which influence intimacy between children and divorced parents and had an effect on the identity of the children. Even though this work does not explicitly mention reunion, it implicitly states the effort that children went through in capturing and sharing digital content of virtual possessions (objects that were not present in the other household) with the aim to further enrich the intimacy between themselves and their parent and negotiate the tension between the households.

Despite the scarcity of studies on technologies for reunion, previous research has indicated the role of both synchronous and asynchronous technologies to support intimacy for reunion. Further, they have signified the need for designing systems that support a child's autonomy and enable them to manage their virtual possessions in the context of a divorce.

2.3.4.4 Technology for Sharing of Experiences in Family Reunion

As aforementioned, little HCI research has explored the role of technology in family reunion. In the context of sharing of experiences, there is no previous research that explores, explicitly or implicitly, digital technologies aimed at supporting family reunion with a focus on the sharing of experiences.

The work that most closely touches on the importance of technologies in supporting the sharing of experiences in family reunion is the recent study on the concept of relatedness conducted by Hassenzahl et al. (2012). Their literature review on the current strategies used to mediate relationships through technology revealed the existence of three approaches that guide the design of artefacts in that context. These have

similaristics to key observed characteristics of reunion: gift-giving, joint action and memories. Guided by gift-giving, artefacts are designed to support reflection, effort, appreciation and communication. Inspired by joint action, artefacts are required to activate communication as the individuals are physically collocated. Within the memories approach, artefacts sustain records of past activities and unique moments in the close relationship between individuals. Even though these approaches do not explicitly refer to reunion, the similarity is that they require the sharing of experiences to strengthen the relationships between individuals who care for each other (as in the case of families).

Previous work has unearthed the importance of three strategies (gift-giving, joint actions and memories) that guide the design of technologies that aim to mediate key aspects of close relationships between individuals. Despite the absence of a direct link between those approaches and reunion, they are all part of this experience. Most importantly, they all require the sharing of experiences within reunion.

2.3.4.5 Summary of Technologies for Family Reunion

This section has investigated the current research efforts that focus on technology and family reunion. Even though there is a scarcity of HCI-related work on reunion per se, previous research has demonstrated the value that technology can bring to supporting that experience in terms of closeness, presence, intimacy and sharing of experiences.

In the context of closeness, the literature has highlighted the significance of mobile and synchronous technologies in supporting older and younger family members to prepare for their time together after being apart (Evjemo et al. 2004; Christensen 2009). Similarly, regarding presence, previous studies identified the importance of photos in reminding family members of their physical bond. In doing so, these works shifted the attention to children as key participants in the use of technology aimed to support presence among family members (Modlitba & Schmandt 2008; Yarosh & Abowd 2011).

Earlier research indicated the importance of both synchronous and asynchronous technologies to support intimacy for reunion. These efforts signified the need for

designing systems that support a child's autonomy and enable them to manage their virtual possessions in the context of a divorce (Yarosh, Denise Chew & Abowd 2009; Odom, Zimmerman & Forlizzi 2010). Finally, in the context of technologies aimed to support the sharing of experiences within reunion, research efforts have signified the existence of three strategies—gift-giving, joint actions and memories—that can inform technology design since these strategies are inherent components of the reunion experience (Hassenzahl et al. 2012). Very little work has been done on reunion and technology in recent HCI literature. Consequently, the next section explicitly identifies the research gaps and introduces the research questions that guide this thesis.

2.4 Identified Gaps and Research Questions

The previous section provided a review of the current HCI literature on the role of technology in supporting collocated family interactions, physically separated family interactions and family reunion. This review centred on four key components of the parent–child interaction that also exist in reunion: closeness, presence, intimacy and sharing of experiences. Table 2-1 provides a summary of the current understanding of the role of technology in supporting family relationships when parents and children are collocated, physically separated and in reunion.

Table 2-1: Current Understanding of Technology and Parent–Child Relationship

	Technology and Collocation	Technology and Physical Separation	Technology and Reunion
Closeness	Storytelling through photos	Storytelling and play through synchronous video	Fostering discussion through synchronous technologies while apart
Presence	Asynchronous messaging and play	Synchronous and asynchronous images, photos, video, messages	Supporting children's autonomy through photos while apart
Intimacy	Asynchronous video	Synchronous video	Management of virtual possessions for children while apart
Sharing of Experiences	Storytelling and play through photos	Synchronous and asynchronous video	Strategies including gift-giving, joint actions and memories

As showed in Table 2-1, most of the recent work has been focused on supporting collocation and physical separation with the use of synchronous and asynchronous technologies (e.g., video). There is little work investigating the role of technology in reunion. Almost all the current literature in that area has been conducted within physical separation and only scarcely mentions reunion. The gap that this thesis addresses is presented in Figure 2-1.
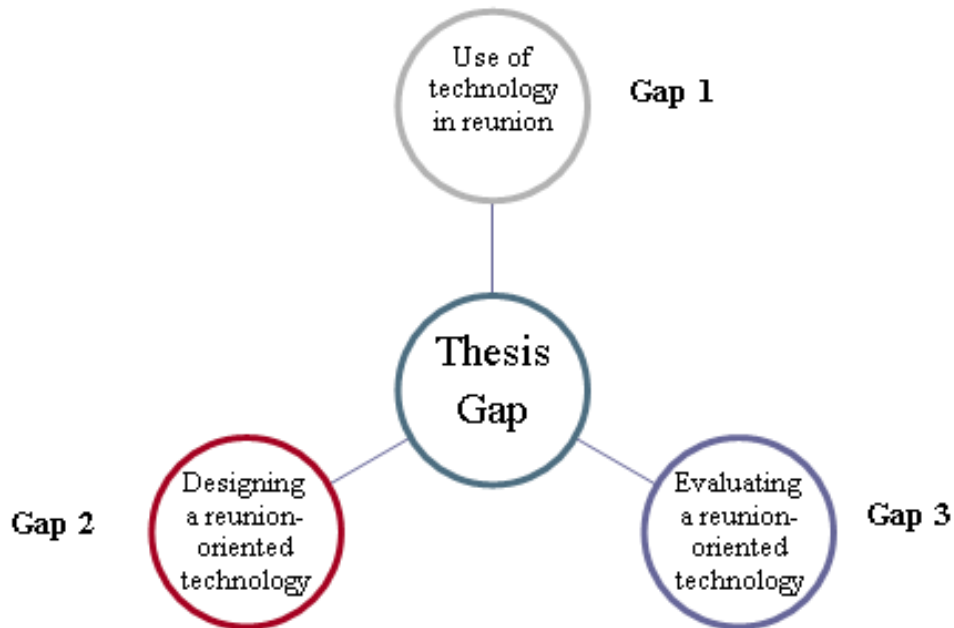
Figure 2-1: Current Literature Gaps

The first gap, detailed in Section 2.4.1, relates to the current role of existing technologies in parent–child reunion. The second gap, discussed in Section 2.4.2, focuses on the limited knowledge on designing technologies for parent–child reunion. The third gap, illustrated in Section 2.4.3, centres on the limited evaluation of technologies for parent–child reunion.

2.4.1 Gap 1: Limited Understanding on Current Technology Use in Reunion

The review of the current literature has proven that there is little research within the field HCI that investigates the relationship between existing digital technologies and

parent–child reunion. All studies conducted on the subject implicitly highlight the value of reunion for family members through the analysis of the findings that emerge when investigating the role of technology in mediating family interactions when the family are physically separated.

As discussed in Sections 2.3.2 and 2.3.3 and presented in the current sociological and family studies literature (Moss & Moss 1988), reunion is distinct from collocation. Collocation refers to being in the same physical and temporal dimension. Reunion is being in collocation after being physically and temporally separated. Consequently, an important dimension that influences reunion is the physical separation that precedes the collocation. Research in mediating family interactions over a distance has only begun to scratch the surface on how current technologies are used in parent–children reunion as in the case of Yarosh and Abowd (2011), whose work on the role of synchronous and asynchronous technologies in supporting contact in work-separated families, emphasised the anticipation that children feel for the eventual reunion compared to keeping in touch while physically separated. This was one of the first studies that indirectly referred to an essential aspect of reunion, which guided the direction of this thesis.

The presence of numerous digital technologies was used as a medium for the physically separated parents to maintain an active role in their children's daily lives. These insights echoed Odom, Zimmerman and Forlizzi's (2010) work on the role of interactive systems in supporting dynamic family structures. Their study highlighted the importance of further investigating the nuances and complexities of parent–child interactions among 'dynamic family structures'—families that experience continuous physical separations due to personal or other reasons (Odom, Zimmerman & Forlizzi 2010, p. 3). However, these are different to families who undergo periodic reunions, which is the focus of this thesis.

Guided by these two studies, this thesis' first study addresses the gap that relates to exploring the role of current technologies in supporting or hindering parent–child reunion. The findings of this study help in identifying the aspects of reunion that are or are not supported by current technologies. It will be further investigated in Chapter 4.

2.4.2 Gap 2: Little Knowledge on the Interactional Qualities of Reunion Technologies

Current studies have extensively investigated opportunities for the design of technologies aimed at supporting collocated or mediated family interactions (examined in Sections 2.3.2 and 2.3.3). These works have yielded a variety of design implications for technologies that are focused on strengthening closeness, presence, intimacy and sharing of experiences among parents and children while they consider the importance of distance and time. These implications include, but are not limited to, the need for (in most cases) synchronous technologies as well as material artefacts that have digital components to afford play since this is a key characteristic of the parent–child relationship (Vetere et al. 2009; Follmer et al. 2010; Raffle et al. 2010; Raffle, Mori et al. 2011; Yarosh & Kwikkers 2011). Further, they need to support social communication between parents and children through different forms of media (e.g., photos or video) to enrich the parent–child bond (Patel et al. 2009; Judge & Neustaedter 2010; Judge, Neustaedter & Kurtz 2010; Inkpen et al. 2012; Vyas et al. 2012). Last, another body of research has highlighted the value for digital technologies in mediating stories between older and younger family members who are physically separated with the aim to further strengthen their relationship (Mäkelä et al. 2000; Jomhari, Gonzalez & Kurniawan 2009; Vutborg et al. 2010; Raffle, Revelle et al. 2011; Follmer et al. 2012).

In the context of parent–child reunion there have been few studies that explicitly examined the design of technologies for parent–child reunion. The closest studies focused on mediating the parent–child relationship when family divorce occurs (Yarosh 2008; Yarosh, Denise Chew & Abowd 2009; Odom, Zimmerman & Forlizzi 2010). That body of research identified the value of asynchronous technologies in supporting the complexities of the interaction between children and the physically separated parent. Moreover, it demonstrated the importance of considering children's autonomy and management of material possessions (either physical or virtual) for technologies that are aimed to enrich the interactions of 'dynamic family structures' (Odom, Zimmerman & Forlizzi 2010, p. 6).

There is clearly a gap in understanding the interactional qualities of technologies that support family reunion. It is not only a question of how to design reunion-oriented technologies, but also what are the specific attributes or facets of the reunion experience that guide the design of these technologies. Answering this latter question constitutes the main goal of Study 2 of this thesis. The findings of this study help in identifying the interactional qualities of technologies aimed to support reunion (further investigated in Chapter 5).

2.4.3 Gap 3: Partial Understanding on Supporting Parent-Child Reunion with Technology

Since the shift in HCI research interest from the work to the domestic domain, there have been numerous research studies that aimed to understand the practices that surround the deployment and evaluation of technology in the home (Judge & Neustaedter 2015). Most of this research has centred on evaluating digital technologies when parents and children are either physically separated or collocated (Vetere et al. 2009; Follmer et al. 2010; Judge, Neustaedter & Kurtz 2010; Yarosh & Markopoulos 2010; Patel & Clawson 2011; Procyk & Neustaedter 2014). As discussed in Sections 2.3.2 and 2.3.3, these studies identified a set of distinctive challenges when conducting field trials of technologies aimed at enriching the parent–child closeness, presence, intimacy and sharing of experiences when collocated or physical separated.

These include key considerations that researchers need to undertake before the in situ evaluation (e.g., family members' hesitations or data privacy concerns) and the complexity of selecting the proper evaluation methods (in the form of key metrics) when children are present in the study. Additionally, previous research has demonstrated the value of technology probes as a bridge between evaluating technologies at home and collecting data that can inform the future design of these technologies (Hutchinson et al. 2003; Neustaedter, Harrison & Sellen 2012).

Despite the recent research that has conducted field trials of technologies in collocated or physically separated family contexts, there has been no formalised study that focuses on evaluating reunion-oriented technologies. This absence of prior work on evaluating technologies that are designed to support parent–child reunion is the third gap that this

thesis addresses and is the focal point of Study 3. The findings of this study help highlight the specific aspects of reunion that are supported by reunion-oriented technologies (investigated in Chapter 6).

2.4.4 Research Questions

The overall aim of this thesis is to understand the role of technology in supporting parent–child reunion—a prevalent yet relatively unexamined family experience. The main research question that guides this thesis is:

> **Main research question:** What is the role of technology in supporting parent–child reunion?

Each of the gaps in the current literature guides this research questions of this thesis that in turn lead to each study. The research question that drives the first study of this thesis is:

> **Research question 1:** How are current technologies used in parent–child reunion?

The answer to this question provides an understanding of the way that current technologies are used within the experience of reunion and identify the unique aspects of parent–child reunion that are not well supported by current technologies.

Prompted by the lack of understanding of the qualities of reunion-oriented technology and inspired by the answer to the first question, the second research question asks:

> **Research question 2:** What are the interactional qualities of technologies that support parent–child reunion?

By identifying these interactional qualities and incorporating them into a reunion-oriented technology (*Rendezvous*), the aim of the third research question is to better understand how that technology supports the experience of parent–child reunion. The third research question asks:

> **Research question 3:** How does *Rendezvous* support parent–child reunion?

These research questions highlight the reunion attributes that are not well supported by current technologies, inform the design of reunion-oriented technologies and identify ways that the reunion experience is supported through the deployment of *Rendezvous*—the first reunion-focused artefact.

2.5 Conclusion

This chapter reviewed the current literature on the role of technology in family reunion that focuses on closeness, presence, intimacy and sharing of experiences—all key components of the parent–child relationship.

The review highlighted three gaps in the existing knowledge that limit a better understanding of the role of technology in supporting parent–child reunion. First, there is a lack of understanding of how current technologies are used in family reunion. Second, the current research on technologies and family reunion is scarce and has not identified the interactional qualities of technologies aimed to support the reunion experience. Third, there exists a gap in understanding the specific features of parent–child reunion that is supported by reunion-oriented technologies. This thesis' main research question and three sub-questions are based on these three research gaps. The next chapter describes this thesis' overall approach by detailing the research design of the three studies that aim to address the three research questions.

Chapter 3: Research Design

3.1 Introduction

The previous chapter explored and critiqued the current HCI research on technology in the context of family reunions and the nature of collocated family interactions when collocated and separated. This chapter describes the research design and the overall thesis architecture that addresses the gaps in the current literature.

An integral part of any research is the soundness of the research process (Crotty 1998). The close alignment of methods, methodologies, theoretical perspective and epistemology ensure the research's soundness and strengthen its potential contributions (Crotty 1998; Neuman 2005). A researcher needs to have a clear theoretical perspective and coherent methodology and methods that are selected to respond to the specific research questions. Further, it is essential for the researcher to clarify the epistemology that guides the theoretical perspective and propels the research process (Creswell 2012). Within the context of this thesis, both assisted in creating a research design that responds to this thesis' main aim: to better understand the role of technology in parent–child reunion.

The following sections further elaborate on the rationale behind the choice of the specific theoretical perspective and methodology and delve into this thesis' architecture. Sections 3.4, 3.5 and 3.6 explore each study's research question and justify the choice of the appropriate data collection and analysis methods, while Section 3.7 concludes with a summary of the overall research design.

3.2 Theoretical Perspective and Methodology

The strength of the research design emerges from a coherent and grounded justification of the theoretical perspective, methodology and, consequently, the methods that will be used to address the aims of the research (Crotty 1998; Neuman 2005).

This thesis aims to better understand the role of technology in parent–child reunion. When crafting the research design, constructionism was chosen as the most appropriate

line of epistemological thought alongside interpretivism, as the main theoretical perspective. In constructionism, based on Crotty (1998) and Neuman (2005), 'all knowledge is being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context' (Crotty 1998, p. 120). Interpretivism is concerned with:

> The systematic analysis of socially meaningful action through the direct detailed observation of people in natural settings in order to arrive at understandings and interpretations of how people create and maintain their social worlds (Neuman 2005, p. 64).

In attempting to gain a stronger understanding of technology and reunion, this thesis constructs an interpretation of the 'social-life world' (Schwandt 2007, p. 16) which highlights the value of dialogue (Blumer 1986). This line of thought stresses the importance of the social interaction as the main lens through which to construct meaning. At the core of this thesis' research, there are the interactions between individuals within the boundaries of a family unit with a focus on the experience of parent–child reunion. Further, this thesis follows the main methodological approach used in its field research, alongside systems development and UCD. Field research is the coherent and meticulous study of everyday life through observations, interviews and other research techniques (Bailey 2006). The basis of field research is naturalism—the direct observation and interpretation of events in the natural environment. Systems development includes the construction of an initial theoretical understanding, the development of a system's architecture, the analysis and design of the system, the building of the system prototype and the observation and initial evaluation of the system (Nunamaker & Chen 1990). Further, UCD is a process that is driven by an early focus on the users and tasks, is characterised by empirical measurement and is associated with an iteration in the actual building phase (Gould & Lewis 1985; Rogers 2012). Table 3-1 outlines this research's epistemological and theoretical perspective and the methodological approach.

Table 3-1: Thesis' Overall Approach

Epistemology	Constructionism
Theoretical Perspective	Interpretivism
Methodology	Field research
	Systems development approach
	In- field deployment
Methods for Data Collection	In-field observations
	Qualitative interviews
	Field notes
	Design workshops
	Design scenarios
	Paper prototyping
	Questionnaires
	Technology probes
	Data Logging
Methods for Data Analysis	Grounded theory
	Memo-taking
	Thematic coding
	Log file analysis

Guided by this this methodology and inspired by the third paradigm in HCI (Harrison, Tatar & Sengers 2007)—which, similar to interpretivism, focuses on the construction of meaning through interaction—it was decided to conduct field research to gain a more nuanced understanding of the current role of technology in parent–child reunion. Different methods were employed, including qualitative interviews, in-field observations and field notes, to identify how current technologies are used within parent–child reunion. Following that, UCD methods (e.g., scenarios, design sketching and low-fidelity prototyping) were selected with the aim of designing a technology that could better support the reunion experience. Finally, upon deploying in situ the technology that was developed, both quantitative and qualitative methods (data logging, questionnaires and interviews) were employed to develop a more structured meaning of the role of a reunion-oriented technology within the family space.

The next section presents the architecture of this thesis and situate the reasoning behind the selection of overall methods that follow the interpretivist theoretical perspective. This provides the context and background of each of the studies, which are further discussed in the relevant sections (see Sections 3.4, 3.5 and 3.6).

3.3 Thesis Architecture

The previous section provided an overview of the theoretical perspective and methodology that guides this thesis. The review of the current literature unveiled the lack of understanding about the role of technology in parent–child reunion. The literature review of recent HCI work highlighted the limited state of the knowledge on how current technologies are used in parent–child reunion, the interactional qualities of reunion-focused technologies that can support the challenges faced by parents and children during this experience and the ways that reunion is augmented with these technologies. Based on these research gaps, this thesis' main research question is:

> **Main research question:** What is the role of technology in supporting parent–child reunion?

Since the overall research question covers different aspects of this research, it is distilled into three sub-questions. Each of these questions, in turn, drove the development of each of this thesis' three corresponding studies and helped in selecting the appropriate methods for each study. The three research sub-questions are:

> **Research question 1:** How are current technologies used in parent–child reunion?

> **Research question 2:** What are the interactional qualities of technologies that support parent–child reunion?

> **Research question 3:** How does *Rendezvous* support parent–children reunion?

The first two sub-questions explored the current practice of reunion, the values surrounding this experience and the role of technology within this experience. This

allowed for the identification of the shortfalls of current technologies in supporting parent–child reunion. Guided by these shortcomings, the focus was shifted to envisioning the future practice of reunion with the identification of the qualities of technologies that focused on supporting parent–child reunion, resulting in the design and development of the first reunion-oriented artefact: *Rendezvous*. The third sub-question focused on the longitudinal use of *Rendezvous* by parents and children who experience periodic reunion and unpacked the dimensions of this significant parent–child experience. Table 3-2 describes each of the studies' research aims, participant requirements and the data collection and data analysis methods.

Table 3-2: Research Design

Studies	Research Aim	Participants	Data Collection Methods	Data Analysis Methods
Study 1 (Exploratory Study)	To explore the current use of technologies within the experience of parent–child reunion	Parents and children (aged between seven and 12 years old) who experience periodic reunions due to work-related reasons	Participant observations Qualitative Interviews	Grounded Theory Memo-taking
Study 2 (Design Study)	To identify the main interactional qualities of technologies aimed to support the different facets of reunion	Interaction design experts Parents and children (some are new, others participated in the previous study)	Design scenarios Low-fidelity prototyping through design sketching In-lab interviews and observations	Qualitative description of sketches alongside interviews (thematic coding and affinity diagram)
Study 3 (In-Field Deployment Study)	To better understand the experience of parent–child reunion using the technology probe through its in situ deployment	Parents and children who experience periodic reunion due to work-related reasons (some are new, others participated in the previous studies)	Qualitative interviews, observations Demographic questionnaires Data logging	Thematic analysis of interviews, observations, questionnaires and qualitative snippets of log files Quantitative log file analysis using simple metrics

The following sections describe each of the three studies in detail and justify the selection of the specific methods chosen to address the research question of each study. To provide a grounded explanation, an account of methods used in related HCI literature relating to families and technology is provided.

3.4 Study 1 Research Design

The aim of the Study 1 was to explore the current use of technologies within the experience of parent–child reunion. To achieve this goal, it was essential to draw a more nuanced picture of the different dimensions of reunion and to investigate the role of current technologies in those dimensions. The research question that guided the first study was:

> **Research question 1:** How are current technologies used in parent–child reunion?

The methodology that best responded to the exploratory nature of this study was field research (Bailey 2006). This section describes the rationale and justifies the selection of the field research data collection and analysis methods for the first study of this thesis.

3.4.1 Qualitative Fieldwork Data Collection Methods

One of the most difficult and most significant facets of conducting field research is the way in which the researcher collects the data (Creswell 2012). Throughout the field research, qualitative fieldwork methods are used to provide the field researcher with a sense of the social meanings that are constructed in natural social settings (Neuman 2005). In many cases, field research is extended to include ethnography and ethnomethodology, both built around the constructionism epistemology, to which this research also aligns. Ethnography 'emphasizes on providing a very detailed description of a different culture from the viewpoint of an insider' (Neuman 2005, p. 156), whereas ethnomethodology 'combines philosophy, social theory and method to study common-sense knowledge' (Garfinkel 1967, p. 47).

The more generic term field research and qualitative fieldwork was chosen for this study to avoid labelling the data collection and analysis methods as driven by ethnography and ethnomethodology, since both terms have been used in an ambiguous manner from researchers within the field of HCI (Dourish 2006; Randall, Harper & Rouncefield 2007; Crabtree et al. 2009). According to DeWalt and DeWalt (2010), fieldwork involves informal interviewing, writing detailed field notes alongside patience'. An important element of qualitative fieldwork is triangulation, which can lead to a more coherent social meaning of the investigated phenomenon by employing different methods that capture the phenomenon from different standpoints (Bailey 2006). Two common methods of qualitative fieldwork are used in this study: participant observations and qualitative interviews.

3.4.1.1 Participant Observations

The aim of participant observations is to create a detailed picture of the activities and social processes that individuals experience in their natural settings (Gobo 2008). Depending on whether the research is covert or overt, the actual process of observation differs. In the former, the researcher is an external member of the observed group and does not interfere with the activities that occur in the setting (Kawulich 2005). In the latter, the observer can be a member of the community that they study and thereby be treated as a participant (Kawulich 2005). An important component of participant observations, as inferred by Gobo (2008), is taking field notes which can help the researcher record, in an unstructured or semi-structured way, activities that are being carried out at the research site (Creswell 2012). These field notes can be written either during or after the research visit and capture a selective and subjective interpretation of the phenomenon that is observed, including the researcher's feelings, opinions and reflections (Wolfinger 2002; Hammersley & Atkinson 2007; Gobo 2008).

HCI and CSCW researchers that investigate phenomena or activities associated with technology and the family setting have extensively used participant observations as a data collection method. Early work on imagining the future of designing media for interpersonal communication employed field observations within families (Tollmar & Persson 2002). Further, Crabtree, Rodden and Mariani (2004) used unstructured observations alongside field notes to explore the types of communication that occur

inside a domestic setting. In other HCI studies, researchers have also used observations and field notes in understanding the use of photos within families (Durrant, Frohlich et al. 2009) and when mapping the processes for deploying ubicomp technologies in the home (Tolmie et al. 2010). Other researchers have used online observations in which online data is harvested and clustered with the help of field notes (Paay et al. 2012). Field observations and field notes have been used extensively when conducting research with families and technology as they can assist in exploring phenomena that have not been investigated before in a naturalistic setting.

3.4.1.2 Qualitative Interviews

Apart from participant observations, researchers who administer field research employ qualitative interviews that supplement the insights gathered by observations. Through interviews, researchers collect a more detailed picture of the phenomenon by concentrating on how the individuals perceive, experience and interpret it. The way that an interview is conducted by qualitative researchers varies depending on what is being investigated and how that investigation is being undertaken. Neuman (2005) has noted that interviews can be run in an open-ended or semi-structure way to draw out the life history of an individual or a group of individuals. In certain cases, interviews are used to informally validate emerging findings that resulted from interviews with other participants (Roulston 2010). Qualitative interviews can also be inspired by objects or information available in the field and can be conducted either face-to-face or using online communication tools (e.g., Skype) (Sturges & Hanrahan 2004). Moreover, the qualitative researcher who conducts the interview usually records it as video or audio for later analysis. This practice allows them to repeatedly listen or view the interview and reflect on what was being said by the participant. Additionally, when an interview happens the researcher needs to transcribe the content of the discussion. According to Hammersley and Atkinson (2007), this is not a straightforward process, as it includes different approaches. For example, the researcher is obliged to decide on the level of detail that will be included in the transcription and whether the whole or selected parts of the interview will be transcribed. However, this procedure empowers the researchers to immerse themselves in the interview data and reflect on the significance and validity of the new findings that emerge (Hammersley 2010).

Similarly, qualitative interviews have been used extensively within HCI studies. In the context of digital technologies within the family domain, researchers have utilised interviews to collect qualitative data when investigating parent–child physical separation due to work-related or personal reasons, with a particular interest on the role of technologies in mediating parent–child interactions (Modlitba & Schmandt 2008; Odom, Zimmerman & Forlizzi 2010; Yarosh & Abowd 2011). In particular, Yarosh and Abowd (2011) interviewed each parent and child from a set of families while exploring their views on physical separation due to work-related reasons. In other studies, researchers use interviews in conjunction with home objects to elicit insights about the sense of being together as a family or about the importance of photos in family life (Durrant, Taylor et al. 2009; Kim & Monk 2010). Interviews give additional opportunities to HCI researchers to access the family space, which is one of the most challenging research environments.

3.4.2 Qualitative Fieldwork Data Analysis Methods

As highlighted by Miles and Huberman (1994), when collecting data using field research methods it is essential to start analysing the collected data as soon as possible, even during the collection process. This practice can then inform the design of new strategies for the collection of data (Creswell 2012). Among the most widespread data analysis methods within qualitative fieldwork are grounded theory and memo-taking, which are used in the first study of the thesis.

Grounded theory is a 'type of inductive social theory that builds toward abstract theory often by making comparisons of empirical observations' (Neuman 2005, p. 178). In grounded theory, the researcher elicits concepts that emerge from the data analysis and uses them to drive the data collection and sampling. This continues until theoretical saturation has been reached (Charmaz 2006; Strauss & Corbin 2008). The data analysis is comparative, since the researcher needs to constantly compare different pieces of data for similarities and differences, and guided by the codification process (Strauss & Corbin 2008). In this, the researcher first breaks down, examines, conceptualises and compares the data, which results in the creation of named categories (open coding). Then, the data is put back together in new ways based on the categories that resulted in the previous phase, resulting in new subcategories (axial coding). In the final stage, the

emerged codes and categories are systematically refined with the aim of creating a core category (selective coding). The benefit of using grounded theory lies in the standardised coding procedure alongside the rigor that is added to the overall analytical process (Charmaz 2006). Strauss and Corbin (2008, p. 25) highlight the importance of 'sensitizing concepts' that arise from literature and other theories to better interpret what is happening inside the phenomena that are investigated. Within grounded theory, the qualitative researcher also produces a series of memos, which are a synthesis and culmination of his thought and ideas regarding the data collected (Neuman 2005).

HCI researchers have used grounded theory as the main analytical lens for qualitative data collected through interviews and/or observations. In relation to this thesis' content, researchers have employed grounded theory when exploring the role of digital technologies that mediate family intimacy over a distance (Vetere et al. 2005; Branham, Harrison & Hirsch 2012; Neustaedter & Greenberg 2012), when better understanding the values that surround long-distance communication in relationships (Alsheikh, Rode & Lindley 2011) and when investigating the role of technology in supporting the parent–child ties in sensitive contexts (e.g., divorce) (Yarosh, Denise Chew & Abowd 2009; Odom, Zimmerman & Forlizzi 2010).

3.4.3 Justification of the Appropriate Methods for Study 1

The research aim of this study is to explore the role of current technologies in parent–child reunion. Table 3-2 presents this study's research aim, requirements, methodology and methods used. There were four requirements posed in relation to the recruiting of participants for this study. First, it was essential for parents and children to be the sole participants; the thesis' interest was not on the interactions between extended family members (including grandparents and grandchildren), but rather on the close and intimate experience of reunion as lived by parents and children. Further, children were required to be between seven and 12 years old, since recent child psychology research has depicted that children within this age range have good understandings of their surroundings (including their sharpened ability to communicate with their peers and their parents) (Kaczmarek & Sibbel 2008). Additionally, the participating families would experience periodic reunions solely due to work-related reasons and not personal

ones. Finally, the members of the family would have some or prevalent access to different technologies while they were physically apart and during their reunion.

Qualitative fieldwork methods such as participant observations and qualitative interviews were used throughout the first study. The first step was to draw a more nuanced understanding of the reunion experience. During my upbringing I had personally experienced numerous work-related reunions as a member of a defence family and it was important to sustain an objective lens towards this phenomenon as I tried to understand it in a more naturalistic setting. To that extent, I visited the local Melbourne airport for a few hours each day over a couple of weeks, timing my arrival for when the amount of traffic for international flight arrivals was heaviest. With the use of observations, I carefully captured the interactions that unfolded when family members reunited. I collected these observations and my interpretations in field notes, starting in a broad and comprehensive structure (as recommended by Wolfinger [2002]). There, I noted on the map of the airport where the actual first contact occurred, the interactions that unfolded throughout the reunion experience and my own thoughts and personal feelings (since I had never reflected before on what were the constituents and impact of reunion) (Coffey 1999; Gobo 2008). As my visitations to the airport continued, I collected a large data set of observations that related to prior sociological work on reunion (Moss & Moss 1988; Wood, Scarville & Gravino 1995). However, I also identified new insights that I was not acquainted with.

The observations of the reunion experience in the airport only provided a limited and time-laden understanding of the reunion experience. Further, since this was an uncharted territory within HCI, I chose to carry out qualitative interviews with family members so that I would be able to further extend my understanding. I used the interviews to discuss with the participating parents and children their understandings of the reunion experience, the role of current technologies within this experience and the observations that I had made while visiting the airport. Despite commencing the interview with a specific set of questions on the experience of reunion and the role of current technologies, I allowed for flexibility when conversing with the participants to be as open as possible to new insights. Moreover, I decided to interview each family member alone (in the order of father, mother and child) as I wanted to draw a richer

picture of this experience (see Yarosh, Denise Chew & Abowd 2009; Yarosh & Abowd 2011). When I interviewed children, depending on the age of the child, I employed additional techniques in recording their opinion. For example, in certain cases—mainly when the child was seven to eight years old—I asked them to draw what they thought of reunion or, upon introducing myself prior to the beginning of the interview, I altered its structure to resemble a game (inspired by Yarosh and Abowd [2011] and Raffle, Revelle et al. [2011]). Apart from face-to-face interviews, I also used online channels (e.g., Skype) since some participants were either travelling or located in a different city. Following each interview, I personally transcribed it to become more immersed with the basic concepts that arose from the data inductively and to ensure that, prior to commencing the data analysis, there existed a clear lens for the analysis (Hammersley & Atkinson 2007).

The analysis of the data was directed by the principles of grounded theory. However, a more sensitised approach was used as the review of related work on reunion and technology helped ground and interpret the data from this study. The data analysis consisted of continuous comparison, making memos and the different levels of coding to ensure an inductive understanding of the role of current technologies in parent–child reunion (Strauss & Corbin 2007). The triangulation of the different methods alongside the participation of each family member in the interviews enabled examination of the specific and personalised understandings of the current role of technology within reunion. Thus, the credibility of the findings was increased by manifesting different data points to similar findings (Hammersley 2010). To better organise the data and to keep a more efficient record of the grounded theory process, NVivo software was used to facilitate the clustering of different kinds of data (field notes and interview transcripts), the coding process and the continuous checking of the analytic ideas that formulated at the end of the analysis of the data.

3.5 Study 2 Research Design

The aim of Study 2 was to identify the quality of the technologies aimed at supporting parent–child reunion. The research question for Study 2 was:

> **Research question 2:** What are the interactional qualities of technologies that support parent–child reunion?

In the context of this thesis, 'interactional qualities' are defined as key design features aimed to support the interaction between individuals. To better answer this question, this study followed the systems development approach to information systems research through the employment of UCD methods. At its core, the systems development (or engineering research) embraces the development of a working prototype based on a theoretical understanding of a specific phenomenon that informs the design of the digital artefact. As Burstein and Gregor (1999) posit, this approach can bridge the gap between the technical and the social aspects of information systems, since the technology developed is an integral part of the theoretical base.

Following this methodological approach, this section describes the data collection and analysis methods that were used in this study and justify the rationale behind their choice, which resulted in the design and development of the first reunion-oriented artefact (*Rendezvous*).

3.5.1 Design Methods for Data Collection

Design is often referred to as a cognitive activity in which creativity and practicality merge together to develop a technology that supports the individuals' goals (Löwgren & Stolterman 2004; Rogers, Sharp & Preece 2011). This thesis is influenced by the third paradigm in HCI, which approaches design as a platform for meaning-making (Bødker 2006; Harrison, Tatar & Sengers 2007). To that extent, I conducted a series of design workshops alongside sketching and low-fidelity prototyping that enabled all participants (interaction design experts and academic family members) to participate in the artefact design.

3.5.1.1 Design Scenarios

One of the most common design techniques is the use of scenarios, which assist in envisioning the form of new artefacts (Carroll 2000; Bødker 2006; Notari 2009). Numerous studies in the areas of family and technology have demonstrated the value of scenarios as a facilitation for design ideation. In their work on supporting mediated interactions among family members, Tollmar, Junestrand and Torgny (2000) used design scenarios as a pathway for identifying the core components of the envisioned technology.

Scenarios have been extensively used within interaction design when it is important to develop alternative designs from initial design requirements (Feltham, Vetere & Wensveen 2007; Guha, Druin & Fails 2010; Pedell et al. 2010). The potential of scenario-based design is mirrored in its capacity to enable brainstorming around qualities of potential technologies and to support collaboration between experts and users (Carroll 2000), which was crucial for the second study of this thesis.

3.5.1.2 Low-Fidelity Prototyping with Design Sketching

Another widespread technique within UCD is the use of prototyping. Its aim is to connect the artefact's use requirements and design possibilities through the implementation of one or more conceptual designs (Buxton 2010; Rogers, Sharp & Preece 2011). Prototyping can be categorised as either low fidelity (one that does not significantly resemble the final artefact) or high fidelity (one that produces an artefact that is very similar to the final product) (Buchenau & Suri 2000; Lim, Stolterman & Tenenberg 2008; Rogers 2012).

A common technique of low-fidelity prototyping that has been used within HCI is sketching. According to Fallman (2011), sketching is an archetypal activity conducted in all design work that is not only a useful tool for extending and resolving initial design challenges, but also a platform for strengthening the thinking process of designers. Design sketching is an inherent part of the creative process that fosters the dialogue between designers and users (Fallman 2003). Sketching, similarly to low-fidelity prototyping, requires very little technological support. In most cases, pen and paper and

conducive environment (in most cases, simply a flat surface is sufficient) (Fallman 2003; Rogers, Sharp & Preece 2011).

In studies on family and technology, researchers have adopted sketching as a quick and easy way of externalising the individual's desires for the envisioned technology (Kaye & Goulding 2004; Vetere et al. 2005; Schatorjé & Markopoulos 2012). Moreover, other studies that have investigated the role of technology regarding children have also used sketching in more flexible forms to cater for the challenges and complexity of designing with and for children (Guha, Druin & Fails 2010).

Design sketching is a convenient, reliable and fast technique that can enable younger and older users to engage in a dialogue between themselves and with designers while crafting artefacts that fulfil their needs (Buxton 2010). It was used throughout the second study to incorporate the theoretical understandings into a physical form.

3.5.1.3 Qualitative Interviews and Observations

Interviews and observations are commonly used methods to collect data within the UCD process. Rogers, Sharp and Preece (2011) highlighted the value of these qualitative data collection methods in the design of digital artefacts in terms of identifying the needs of the users, establishing requirements and supporting the evaluation of concepts. In many cases, interviews are embedded in other design activities (e.g., they follow design scenarios or clarify the rationale behind the sketching of a specific artefact) (Rogers 2012).

When conducting design-oriented research with children, numerous researchers have used interviews that aim to encourage younger or older children to reflect on their selection of a design or engage in collaborative interactions with other individuals (Plaisant et al. 2006). Other research uses interviews and observations within family and technology studies to draw design requirements of the envisioned digital artefact (Frohlich et al. 2002; Vetere et al. 2005; Thieme et al. 2011; Branham, Harrison & Hirsch 2012). Ciolfi and Bannon (2003) highlighted the significance of observations and in-lab or field note taking when evaluating the use of a low-fidelity prototype by individuals. A finding supported by many subsequent research projects (Sengers &

Gaver 2006; Judge, Neustaedter & Kurtz 2010). Both methods were used in Study 2 to collect the thoughts and feelings of individuals while they participated in a series of design workshops.

3.5.2 Analysis Methods for Design-Related Data

Data gathered throughout the design process can be either qualitative or quantitative. In the context of design scenarios and design sketching, qualitative data (collected mainly through interviews and observations) can be analysed using qualitative analysis methods, including thematic analysis which can yield a series of patterns (Rogers, Sharp & Preece 2011).

An important aspect of this form of analysis is to keep consistent records of what has been found so that the findings address the goals of the design activity. The use of affinity diagrams helps analysing collected data that might be associated with opinions relating to, for example, design sketches. Affinity diagramming (or mapping) is used in contextual design (Beyer & Holtzblatt 1998), whereby notes relating to a specific content are grouped together leading to specific patterns rapidly without sacrificing the quality of the analysis. Affinity mapping also supports the analysis of the transcription of the interviews and the observations of the design workshops. This form of analysis was employed throughout Study 2 to support the output of the main insights that responded to the research question.

3.5.3 Justification of the Appropriate Methods for Study 2

As noted in Section 3.5.1, methods from UCD were employed to support the systems development approach that guides the research design of Study 2. One of the biggest challenges for HCI research (especially within the family domain) is the transition from the initial field research insights (in the context of this thesis, the outcomes of Study 1) to the design of an artefact that ensures the embodiment of the initial theoretical insights into a physical form (Randall, Harper & Rouncefield 2007). Table 3-2 provides an overview of the research aim of Study 2 and the methodological approach that was followed.

Study 2 made extensive use of both design sketching and scenarios to transfer the design sensitivities relating to the theoretical understanding to specific features of the digital artefact. Design scenarios were used as an efficient technique in assembling the different facets of the theoretical insights of the reunion experience that arose from Study 1. When alternative design ideas emerged from the scenarios, the sketching technique could facilitate the representation of these ideas in a quick and easy manner using low-fidelity prototyping. This low-cost, low-risk and timely way of exploring the potential designs also served as an evaluation of the design itself when the participants reflected on its value and association with the eventual goal of the workshop, alongside the evaluation of its feasibility and cognitive appeal. The presence recorded interviews (audio and video) during the design activities permitted the consistent analysis of the data through thematic coding and affinity mapping in an effort to choose the specific qualities of the eventual system. The initial designs—the outcome of a dedicated design expert workshop—were presented in a special workshop to the families and children, where they acted as a basis for a new round of sketching. Eventually, a specific design was selected that manifested the qualities of the technologies that aim to support parent–child reunion. The selected design was the basis of *Rendezvous*—the first reunion-orientated artefact.

3.6 Study 3 Research Design

The aim of the Study 3, building on the outcome of Study 2, was to evaluate *Rendezvous*—the reunion-oriented artefact that was developed as part of Study 2—and better understand how it supports parent–child reunion. The main research question for Study 3 was:

Research Question 3: How does *Rendezvous* support parent–child reunion?

The overall methodological approach for Study 3 was in-field deployment that enabled a more nuanced understanding of the way that reunion is felt by both parents and children through the naturalistic use of *Rendezvous*. Within the realms of this thesis' theoretical perspective (interpretivism), the deployment of the artefact in a naturalistic setting adopts one of the main principles of HCI's third paradigm, the construction of meaning (Harrison, Tatar & Sengers 2007). Meaning-making, in that context, is

'constructed collaboratively, by people in specific contexts and situations and therefore the interaction itself is an essential element in meaning construction' (Harrison, Tatar & Sengers 2007, p. 6).

Thus, the deployment of *Rendezvous* was not only an in-field evaluation, but also, and most importantly, a way of creating and collecting different interpretations of how reunion was experienced through the artefact. To that end, *Rendezvous* was a technology probe. Hutchinson et al. (2003) define technology probes as instruments that are deployed to inquire about the unknown and bring together the social science goal of collecting more information about a specific phenomenon alongside the engineering goal of evaluating the technology in situ. The data collection and analysis methods that were used throughout Study 3 were qualitative and spanned from interviews and observation to demographic questionnaires and system data logging, as well as qualitative analysis of the log files and the interviews.

3.6.1 In-Field Deployment Data Collection Methods

The deployment of a new artefact in a natural setting creates new opportunities for both users and researchers to gain deeper insights from its naturalistic use (Wright & McCarthy 2010). Within the field of HCI, numerous studies on family and technology use both qualitative methods to evaluate new prototypes (Brown, Reeves & Sherwood 2011; Neustaedter & Greenberg 2012) and quantitative methods (Yarosh & Markopoulos 2010). The use of both approaches for data collection allows for a more coherent and triangulated view of the potential effect of the new artefacts in the lives of users (Rogers 2012). Guided by previous work, Study 3 used qualitative interviews, along with observations, demographic questionnaires and system data logging.

3.6.1.1 Qualitative Interviews and Observations

Apart from field research and design-related activities (described in Sections 3.4.1 and 3.5.1), qualitative interviews are ideal for enabling users of a new artefact to share their thoughts and emotions that stem from their use. Qualitative interviews are widely used within HCI studies that aim to understand the practices that surround the use of a technology when deployed in a specific context.

In the context of studies on family and technology, researchers have used structured or unstructured interviews to explore how family members conceive, feel and experience the use of novel prototypes (Brown 2007; Brown, Reeves & Sherwood 2011; Neustaedter, Harrison & Sellen 2012). Alongside interviews, observations support the researcher to more closely analyse the experience of use of a specific artefact. Various studies in HCI employ observations and field notes as way of gathering data, which can inform their understanding of the impact of the new artefact to the individual's and family's life (Vetere et al. 2009; Durrant, Taylor et al. 2009; Yarosh, Denise Chew & Abowd 2009; Bhömer et al. 2010; Judge et al. 2011). Previous works have highlighted the value of observations to not only draw a richer picture of the phenomenon that is investigated, but to also act as a prompt for discussion between the researcher and the user of technology through interviews.

3.6.1.2 Questionnaires

Questionnaires are a well-established HCI method to collect demographic data and opinions from users when they experience the use of specific technologies (Lazar, Feng & Hochheiser 2010). This form of data gathering can be composed of either open or closed questions. When designing a questionnaire, it is essential to consider the ordering of the questions, provide clear instructions on how to complete the questionnaire and balance the length of the questionnaire.

Different lines of research within the field of HCI have used questionnaires as an evaluation metric when evaluating an artefact within the family domain or when conducting lab studies as part of q more thorough usability evaluation (Yarosh, Denise Chew & Abowd 2009; Yarosh & Markopoulos 2010). Other studies have employed questionnaires in the early phases of deployment as a means of gathering more demographic or technology use information from the users (Romero et al. 2007). In both cases, questionnaires offer another opportunity for HCI researchers to construct a better understanding of both the users' background and the experiences they have when introduced to a new technology.

3.6.1.3 Behavioural Data Logging

When deploying a prototype in a specific context (e.g., a family setting), another method that can be used to collect primarily quantitative data is the logging of the interactions of the users with the system itself. Different research lines within HCI have used this method to better understand the way that the artefact is used by family members. Hutchinson et al.'s (2003) early study on technology probes created log files of the pictures and digital content that the participants of the study exchanged when using their technology probes. Other prototypes that have used log files as an additional data collection method include those focused on enriching the understanding of the role of technology in mediating intimacy (Vetere et al. 2005), on drawing the value of storytelling in bringing intergenerational family members closer while physically separated (Vutborg et al. 2010) and on unveiling the significance of technology in fostering the sentiments of closeness through video and domestic media spaces (Judge, Neustaedter & Kurtz 2010). In most cases, apart from the digital content and the interactions mediated through the system, log files also record temporal or spatial characteristics (e.g., the time or physical location where the system was used, as in Bentley, Basapur and Chowdhury [2011]). Log files, as in the case of questionnaires, can also be used as a basis for the construction of the interview questions during or after the deployment. The value of log files lies in the opportunity they offer to the researcher to triangulate his or her insights and capture another dimension of use when conducting in-field deployments.

3.6.2 In-Field Deployment Data Analysis Methods

Two of the most common methods used for analysis of field trials and in-field deployment related data are thematic analysis and open coding (the latter was previously covered in Section 3.4.2) (Strauss & Corbin 2007). Thematic analysis is a form of qualitative data analysis focused on:

> Identifying, analysing and reporting patterns (themes) within data. It minimally organizes and describes your data in rich detail. However, frequently it goes further than this and interprets various aspects of the research topic (Braun & Clarke 2006, p. 136).

The use of thematic analysis is thus different to grounded theory, as its focus is not to create theory, but to construct meanings based on the themes that emerge from the data. This makes it an appropriate method for analysis when evaluating new artefacts in their naturalistic settings. In the case of quantitative log files, the data can be analysed using simple metrics (e.g., the amounts of activity over time) (Bruckman 2006). These metrics can be used to extract vital information about the number of interactions with the system, the percentage of use or the type of digital content that was shared among the participants.

3.6.3 Justification of the Appropriate Methods for Study 3

Recent research within the field of HCI has depicted the challenges associated with conducting field trials of technologies in natural settings (Brown, Reeves & Sherwood 2011). The careful choice of methods used to collect and analyse the data that emerges from in-field deployments can reduce the danger these challenges pose. The selection of both the data collection and analysis methods within Study 3 adhered to the importance of being open to interpretation when deploying a technology in field (Sengers & Gaver 2006). Table 3-2 provides an overview of the research aim of Study 3 and the data collection and analysis methods that were used.

Questionnaires were used to gather participants' demographic information, as well as a short background on their use of technology when in reunion and their understanding of reunion (prior to the deployment of *Rendezvous*). The use of interviews and observations followed a similar approach to many recent works within the HCI field that aim to either evaluate or interpret the practices that surround the use of new technologies in the family setting (Judge & Neustaedter 2010; Neustaedter, Harrison & Sellen 2012; Procyk & Neustaedter 2014). Both interviews and observations gave the opportunity to further investigate the multiple meanings that new technologies construct when used in familiar settings, as in the case of parent–child reunion. Moreover, it was determined that it was essential to have a series of interviews and visitations to the family homes—before, during and after the use of *Rendezvous*. This is a common practice in in-field deployment studies, as it allows for more detailed understandings of the use of technology (Rogers 2012). A logging mechanism was embedded in the *Rendezvous* artefact, since the data that was collected through the recording of the

digital content formed a richer picture of how parents and children experienced reunion through this technology. Thematic analysis was performed on the gathered qualitative data, as the aim in this Study 3 was to construct a deep interpretation of the reunion experience with the deployment of *Rendezvous*, not to create a theory. Finally, data collected through the logging mechanism was analysed using simple metrics that focused on the percentage of use. This was then analysed in the qualitative analysis to create a more holistic understanding of the experience of the use of *Rendezvous*.

3.7 Conclusion

The overall design of this thesis and the underlying research design has been detailed in this chapter. The research was guided by interpretivism. Driven by this philosophical stance, a research design composed of three studies was outlined.

The aim of these studies was to explore the current use of technologies within the experience of parent–child reunion, to identify the interactional qualities of a reunion-oriented technology (*Rendezvous*) that addresses the shortcomings of current technologies and to understand how the use of *Rendezvous* can support parent–child reunion. Each of the study designs contained a justification of the rationale behind the selection of the appropriate methods that are best suited to address each of the research questions.

The following chapters present more detail on each study's research approach and present the main insights that the discussed methods helped to generate.

Chapter 4: Study 1: Exploring Current Technologies in Supporting Parent–Child Reunion

4.1 Introduction

The previous chapter provided an overall description of the research design of the thesis. This chapter describes Study 1, which explores the ways that current technologies are used within parent–child reunion. Section 4.2 details the study's objectives and the research question that drives this investigation. Section 4.3 provides a background on the experience of parent–child reunion in the context of defence and academic families, the two cohorts that were selected for this study. Section 4.4 describes the methods used to collect and analyse the data, while the findings of the qualitative fieldwork are presented in Section 4.5, structured around pre-reunion, upon reunion and post-reunion (guided by Moss and Moss [1988]), with the themes of preparation, demonstration and reaffirmation presented respectively. Section 4.6 discusses the significance of the main insights generated by Study 1 and Section 4.7 summarises the main contributions of the study. Section 4.8 provides a critique of Study 1, while the final comments on Study 1 and the preparation of the groundwork for Study 2 are provided in Section 4.9.

4.2 Study 1: Objectives and Research Question

The main aim of Study 1 was to explore the use of current technologies in parent–child reunion[1]. As discussed in the literature review (Section 2.4.1), there is little research that focuses on better understanding the way that technologies are currently used within parent–child reunion. Specifically, there is limited knowledge on identifying the limitations of current technologies in supporting specific facets of reunion. To address this gap, Study 1 was guided by the temporal dimensions of the reunion experience detailed within sociological and family studies research (described in Section 2.2.2 and in Moss and Moss [1988]). The employment of pre-, upon and post-reunion as the main

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[1] Parts of study 1 were published in Kazakos, Howard and Vetere (2013), which is provided in Appendix D, publication 2. The appropriate content of this paper has been incorporated into this chapter.

guiding lens (Moss & Moss 1988) facilitates the mapping of technology use to the specific dimensions of reunion. Consequently, the research question that guides this study is:

> **Research Question 1:** How are current technologies used in parent–child reunion?

The answer to this research question maps the existing role of technologies in reunion and discusses their limitations in supporting specific facets of this prevalent yet relatively unexplored parent–child experience.

4.3 Parent–Child Reunion in Defence and Academic Families

As discussed in Section 3.4.3, there were specific reasons for choosing a case approach for Study 1. First, it was essential that the central focus was on families who experience periodic reunion due to work-related reasons only. Second, it was necessary for children aged between seven and 12 years old to be eligible and willing to participate since the thesis' focus is on parent–child reunion. Guided by those two requirements, this section provides a contextual description of the reunion experience in the family cohorts that were selected for this study. Section 4.3.1 describes the reunion experience in defence families, who experience periodic separations and reunions because of at least one parent being in the military. Section 4.3.2 describes the reunion experience in academic families, who experience periodic reunions due to at least one parent's academic commitments.

4.3.1 Parent–Child Reunion in Defence Families

Defence families are families who have at least one member who is enlisted in the military (in terms of the participants of this thesis, the Australian Defence Force [ADF]) and deployed to a location that removes them from family home. Some locations might be considered safe and are familiar to the deployed member and the family (e.g., well-supported military bases). However, in other cases, the defence member is required to be deployed to unknown and dangerous settings (e.g., war-prone countries or active war zones such as Iraq or Afghanistan). The main characteristic shared by all defence families is that they experience the deployments in a periodic manner and for a specific

period. This type of family life influences the family ties and puts a heavy strain on the psychosocial wellbeing of children (Barker & Berry 2009).

The reunion of the defence family takes place after the deployment (Wood, Scarville & Gravino 1995). During reunion, parents and children physically come together and enrich their ties through different family activities. Reunion, in most cases, is perceived as a positive event during which all defence family members engage with each other and foster the family togetherness. However, there are many negative facets that are created within defence reunion. Family studies have delineated the effort that is needed from all family members to adapt to the new conditions that are set within the family with the return of a loved one (Wood, Scarville & Gravino 1995). Further, even though parents and children consider themselves fortunate to overcome the difficulties that a sensitive deployment has set and to be together again, during reunion they might encounter difficulty in connecting due to the changes that each member may have endured while apart (Applewhite & Mays 1996). These difficulties impose new stressors to the family and highlight the fact that a reunion within defence families might not always be an event that is easily manageable. Ultimately, this experience can create the grounds for the family to re-discover themselves and to enrich their sense of connectedness and family togetherness.

4.3.2 Parent–Child Reunion in Academic Families

Another family cohort that shares characteristics with defence families is academic families. These are families that have at least one parent who resides away from the family home for durations of time working in an academic environment (e.g., a university or a research organisation). Academic family members experience their physical separation and consequent reunion due to reasons relating to the different responsibilities of the academic. These may include continuous trips for fieldwork or, in most cases, profession-related opportunities (e.g., a university position). It is not uncommon for academics to expatriate to a location where their family is not able to join them for personal or other reasons (Richardson & McKenna 2002).

The reunion that follows the physical separation of an academic family acts as an opportunity for the parents and children to share their experiences and strengthen their

togetherness (Repetti & Wood 1997). In many ways, the reunion of academic families resembles the reunions of business-related travellers or other work-related reunions (e.g., FIFO families) (Tremblay 2005). Within academic families, the return of the loved one is considered more secure, since they may be in a safer environment while they are apart. However, academic family members do experience challenges while in reunion. These relate to the change that occurs within the family and the work that needs to be conducted by all family members to further enrich their bonds, which were impacted while in physical separation (Kaczmarek & Sibbel 2008).

4.3.3 Current Technology Use in Defence and Academic Reunion

Reunion is an inherent component of both defence and academic family life. Little work within the recent literature that has focused on technology use within family reunion (discussed in Section 2.3.4), while the studies that mention family reunion do so in the context of supporting physical separation. Previous literature has demonstrated the opportunities that digital technologies offer to current defence family members in supporting their relationship while deployed. Blasko and Murphy (2016) have highlighted four key areas in which technology use can assist these family members: information seeking, communication, social support and wellbeing. They argue that despite the complex nature of deployment, both synchronous and asynchronous communication technologies can foster parent–child relationships and further strengthen family bonds. Other studies identified the difficulties that defence families face when trying to keep connected while physical separated (Schumm et al. 2004) and highlighted the important role of synchronous technologies in providing support for both the deployed parent and the at-home family members (Seidel et al. 2014). These works only occasionally comment on reunion, solely to highlight the significance of the return of the deployed parent back to the normality and warmth of family life (Gewirtz & Youssef 2016).

Investigation into technology and family reunion revealed the lack of previous studies on this subject. The only body of literature that explicitly refers to reunion and technology in the setting of reunion are the studies on academic mobility and immigration (Tremblay 2005). That work studied the patterns of students that had children and were physically separated from them. The outcomes highlighted the

importance of technology for mediating physical separation in that context and the convenience that synchronous technologies provided to the students in regard to communicating with their children. This work only mentions reunion in the context of the anticipation that the students and their children feel towards their upcoming reunion and did not relate the technology use (either while in physical separation or while in reunion) with that family experience. Guided by the lack of knowledge on technology use in defence and academic reunion, Study 1 explored current technology use in family reunion with a focus on these family types.

4.4 Study 1 Research Design

In this study, a set of qualitative methods was employed to better understand how current technologies are used in parent–child reunion. This section describes in detail the overall research design (Section 4.4.1), the pre-study preparatory activities (Section 4.4.2) and the specific data collection and analysis methods used in this research (Sections 4.4.3 and 4.4.4 respectively).

4.4.1 Overview of Study Design

The methodological approach that directed this study was qualitative fieldwork and field research. The selection of this methodological lens was guided by the exploratory nature of the research question and allowed for a thorough investigation of this uncharted territory within the field of HCI. According to DeWalt and DeWalt (2010), qualitative fieldwork embraces active looking, informal interviewing and assembling observations with the help of constructive field-note taking. Following this rationale, it was decided to use two methods—observations and interviews—for data collection. The triangulation of these methods enabled the understanding of the use of current technologies in parent–child reunion and framed this experience through the lens of the family members. The study consisted of three phases of activities: preparatory, data collection and data analysis (as showed in Figure 4-1).
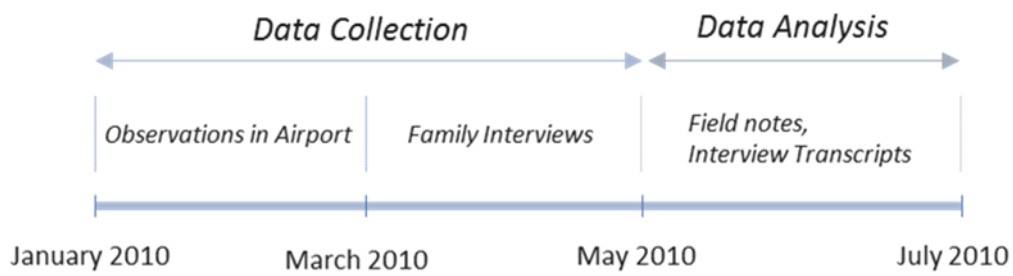
Figure 4-1: Timeline of Study 1

Approval for the research was granted from The University of Melbourne's ethics committee (see Appendix A.1) and participants were recruited by distribution of a call for participation through the local defence and academic organisations (see Appendix A.2).

4.4.2 Preparatory Study Activities

Before commencing the main fieldwork, informal observations were conducted at the local Melbourne airport during weekends (either Saturday or Sunday) over a seven-week period between January 2010 and March 2010. The rationale behind choosing the airport was that this physical space was the best one to observe natural expressions of reunion in which verbal and nonverbal intimacy unfolded (Heslin & Boss 1980). Further, this short activity laid the foundations for choosing the appropriate research methods for the study. Finally, it enabled identification of the particularities and the patterns that arose within that experience that had not been identified before the study.

4.4.2.1 Airport Observations

Before starting Study 1, the decision was made to visit the local Melbourne airport to try to gain a better understanding of the experience of parent–child reunion as depicted inside a closed physical space. The initial intent was that the insights from this week-long activity would help establish a foundation for the future structure of the study.

Observations were conducted from mid-afternoon for approximately eight hours (when most international flights landed). As the interactions that unfolded between reunited loved ones were observed, the whole spectrum of the reunion experience was noted. Standing next to the arrival door allowed observation of the faces and physical

manifestations of excitement that the loved ones would exhibit when they were reunited. Field notes were taken when trying to depict not only the different sentiments that were apparent in the arrival section of the airport, but also the nature of the patterns that appeared. For example, in many cases it was common that the reunion would follow a specific pattern that resembled more of a ritual. First, the family members would anxiously walk close to the door and, in most occasions, be on the phone (possibly with their returning loved one). Then, as the door opened, the family members and the returning family member would wave to each other and show their excitement through intimate actions (mostly hugs). Finally, the returned family member would give a gift to their children while the reunited family talked and walked towards the exit. Throughout that observation period, the aim was to capture as much of the different dimensions of the at-airport reunion as possible through field notes and validate the manner with which I would apply that method throughout the subsequent family observations.. A sample of these field observations can be found in Appendix A.3.

4.4.3 Data Collection Methods

Guided by the preparatory study activities, it was decided that the most appropriate research methods suited to address the study's exploratory research question would be observations and qualitative interviews (previously discussed in Section 3.4.3).

4.4.3.1 Demographics of Participating Families

The initial intention was to recruit only families that lived in Victoria (and preferably in Melbourne), as this would make it feasible to meet them face-to-face. However, given that recruiting within the family space is a complex activity (Isola & Fails 2012), it was also decided to proceed with the recruitment of families who resided outside Victoria. The only requirement was that they fulfilled the study's criteria.

Table 4-1 lists the demographics of all participant families. There were nine families in total (N = 9)—four defence families and five academic. In all cases, the father was the family member who was parting and reuniting with the at-home mother and children. The duration of separation varied between two to six months for defence families and one to six months for academic ones. Family members in defence families experienced

physical separation two to three times per year, whereas academic families experienced it, on average, between two to six times per year.

Table 4-1: Participant Information for Study 1

#	Interviewees (Age in years)	Cohort	Frequency per year (Separation)	Duration (Separation)	Duration (Reunion)	Communication technologies while separated			
						Mobile Phone	Landline Phone	Email	Skype Video
1	F: 34, M: 32, C: 7	Defence	2	6 months	2 months			✓	
2	F: 43, M: 40, C: 8	Defence	3	4 months	1 month		✓	✓	
3	F: 48, M: 45, C: 7	Defence	4	3 months	2 months		✓	✓	
4	F: 42, M: 40, C: 9	Defence	4	7 months	1 month	✓	✓		
5	F: 41, M: 38, C: 11	Academic	Approx. 4	3 months	2 weeks to 2 months	✓			✓
6	F: 52, M: 40, C: 11	Academic	Approx. 4	4 months	2 weeks to 3 months	✓		✓	✓
7	F: 34, M: 32, C: 10	Academic	At least 5	2 months	2 weeks	✓		✓	✓
8	F: 41, M: 38, C: 5	Academic	2	6 months	2–3 weeks	✓			✓
9	F: 38, M: 34, C: 10	Academic	At least 6	1 month	2 weeks	✓		✓	✓

The duration of reunion was almost identical among defence families (one to two months) and among academic families (two weeks to three months). Finally, both family cohorts used synchronous and asynchronous technologies to communicate while apart (see Table 4-1). Defence families used mostly email and landline phone to keep in contact, whereas academic families used mobile phones and video-based communication (Skype).

4.4.3.2 Observations with Academic and Defence Families

Throughout the beginning of the Study 1, observations were conducted with the participating families from both cohorts. Even though an initial understanding of the reunion experience had been acquired from observations at the airport, it was evident that reunion unfolds differently within the domestic space. Access was gained to six of the nine families' homes (four academic and two defence) to observe the first instances of reunion with all family members. In all cases, the visit (by invitation) would occur within the first five to seven days of the arrival of the loved one. The visit started with entering the premises of the family house and sitting in the kitchen for no more than two hours while family members were having dinner. At the request of the family members, no photos or video or audio records of their interactions were taken.

Observations during those two hours were captured in field notes. At first, preliminary field notes were written on paper during the visit, though in many cases it was felt that this might further alter the behaviour of the family members (which was already changed with the presence of an unknown individual in their life). The first task performed upon exiting the house was to audio record any immediate thoughts or insights, which were guided by the short notes taken during the visit. An additional set of more organised notes was produced upon returning to the office. These contained observations about the discussion topics in the family, the nature of the questions asked by each family member (father, mother and child), the apparent physical interactions among the family members and the responses that parents would give to sensitive questions from children (e.g., 'did you miss us?'). The audio recordings of immediate thoughts and insights were also included in the notes (see Hammersley & Atkinson 2007), to select and distinguish the noteworthy and significant observations from the ones that were not related to the nature of the research being conducting. An example of the field notes from one of the visits is included in Appendix A.3. The knowledge generated from the observation and the field notes guided the structure of the interviews and assisted later analysis.

4.4.3.3 Qualitative Interviews with Academic and Defence Families

Following the observations, a series of qualitative semi-structured interviews were conducted with families from both cohorts (see Table 4-1). The aim of the interviews was to gain a deeper understanding of the reunion experience and further investigate the role of current technologies within this experience. To achieve this aim, interviews were conducted with the separated parent, at-home parent and one of the children (selected by the parents) who fulfilled the age criteria. Three interviews were conducted per family, for a total of 27 interviews (N = 27).

Prior to each interview, some general information was collected about the family's reunion history along with some demographic data. This was done to ensure that the potential participants satisfied the criteria of the study, strengthen the guidance of the interview questions and as raw data for later analysis.

Each participant was interviewed alone, apart from the children of families 1 and 8 (see Table 4-1) who felt more comfortable with the presence of either parent during the interview, for no longer than 30 minutes (an average of one and a half hours of interviewing per family). During an interview, each participant was asked to describe in their own words how they perceived the current family life. The discussion was then directed towards the experience of reunion and physical separation. Questions covered the feelings of the interviewee on the separation of their loved one, the manner in which they kept in touch while separated and their perception of the role of current technologies in their experience of reunion. Six face-to-face interviews were conducted in Melbourne (including regional Victoria) and 21 through Skype with the families that were residing in Western Australia (families 3 and 4) and New South Wales (family 9). All interviews were audio recorded either with the use of an audio recorder or through the Skype recording (add-on) software. One of the children preferred to reply in writing, which was subsequently emailed by their parent.

A sample of the interview questions can be found in Appendix A.4. Immediately after each set of interviews (three per family), the audio recordings were played and key issues that participants highlighted for each question were written down. Short descriptions of these insights were also created and these guided the data analysis

process. Verbatim transcripts of all interviews were created and can be found in Appendix A.5.

4.4.4 Data Analysis Methods

The following data was collected by the end of observations and interviews:

- Seven (7) field notes from observations at the airport
- Six (6) field notes from the visits to the families' homes (those families that only agreed to participate in that part of the study)
- Twenty-seven (27) interview transcripts (one for each of the 27 family members interviewed)
- Observations made during the interviews written as field notes (27 in total).

The analysis of the data was an ongoing process throughout the fieldwork, with most of the analysis happening over a period of three months (see Figure 4-1). The first part of the analysis focused on developing analytic memos that captured observations on similarities and differences among family members. The aim was to develop initial concepts that described the reunion experience alongside the development of theoretical concepts to increase understanding of the phenomenon. Moreover, personal reflection memos were written. These were pieces of writing that enabled reflection on being involved in the sensitive experience of parent–child reunion and allowed further understanding of the progression from an external researcher to a peripheral participant in the specific family setting (following the advice of Hammersley and Atkinson [2007]). The memos assisted in three ways: identifying the concepts that emerged from the data, narrowing down the scope of the study and framing the response to the main research question (see Section 4.2).

The analysis of the memos was conducted using an iterative process guided by the phases of open, axial and selective coding that are an inherent part of grounded theory (Strauss & Corbin 2008). In addition to proceeding with iterative coding, the coding process was sensitised with theoretical concepts from the related work (per Bowden's [2008] recommendation). All coding was conducted using the NVivo software, which permitted the attachment of several codes to particular data

instances (Charmaz 2006). The interviews, after being transcribed, were imported alongside the field notes into NVivo before commencing the coding process (see Appendix A.6). The sections below describe the three stages of coding in further detail and identify on a top level the various concepts that emerged from the data.

4.4.4.1 Open Coding

Following Strauss and Corbin's (2008) approach to grounded theory, the first stage of coding commenced with the exploration of the data and the development of analytic codes relevant to the research questions (Neuman 2005; Charmaz 2006). These codes were situated in the theoretical lens towards reunion (pre, upon and post) as described by Moss and Moss (1988). The data transcripts were coded directly to NVivo, where different codes for different sections of the transcript were produced. These codes encapsulated the different facets of the reunion experience, the technologies used in this experience and certain challenges that related to reunion. During the first coding of the data, it was evident that the codes developed had different sources. Some codes were developed inductively using the traditional principles of grounded theory (Charmaz 2006). Certain inductive codes, following Strauss and Corbin (2008, p. 33), represented concepts used by participants (e.g., 'the return of the loved one' or 'the mobile phone as a reunion medium'). Other inductive codes described recurred facets of the reunion experience and the role of technology that were important to note, such as 'sharing through technology' and 'emotion-laden reunion at first eyesight'. Additionally, codes were constructed based on the related work and the research questions. For example, the early work of Moss and Moss (1988, p. 12) helped identify the different layers of reunion within the data and the code 'sharing reunion through stories' was directly linked to the research question of the study.

The coding of the data continued throughout the data collection, meaning that the codes continuously changed as more data was collected. The data was passed numerous times until the data collection was completed. In each data passing, previous coding instances were 'refreshed' with iterated codes. After coding 15 interviews the codes did not change significantly, indicating that saturation had been reached. After coding all interviews, a final full pass through the data was conducted to ensure refinement of the

codes. The open coding process resulted in 280 different codes, unveiling the different facets of the reunion and the technology use in this experience.

4.4.4.2 Axial Coding

The second stage of coding was focused on the code review, the establishment of connections between the codes and the organisation of the codes into themes (Neuman 2005; Strauss & Corbin 2008). In theory, axial coding is regarded as a separate stage in the coding process, but in practice it can happen concurrently with open coding (Strauss & Corbin 2008). While the emerging codes were partially organised in a hierarchical order during open coding, it was during the axial process that the derived hierarchy was iterated and the data re-coded. This enabled the addressing of new ideas that surfaced and the fixing of data conflicts to better understand the reunion experience and technology use.

Much of the conceptual development of these hierarchical themes was investigated in paper with the use of mind maps and affinity diagrams through post-it notes. At first, NVivo was used to organise the derived codes and map their relationships through the software's diagram functionality. However, large sheets of paper depicting the processes in flow charts were also used to have an easier mapping of all the codes' connections. When a connection was seen in the codes on paper, the corresponding codes would be clustered together in affinity diagrams using post-it notes. Finally, a series of inductive codes and codes that came out of the related work concepts were employed to establish the main themes. For example, multiple child participants highlighted the significance of artefacts exchanged in reunion. This was used to structure codes relating to family interaction based on artefacts identity through artefacts and experience with artefacts. The approach of Moss and Moss (1988, p. 13) to reunion ('reunion as a process' rather than 'reunion as an one-time phenomenon') was employed, resulting in three distinct phases—pre-, upon and post-reunion—that sensitised analysis at this stage. The iterative process resulted in three different main themes in the experience of parent–child reunion, which were organised into the different reunion phases.

4.4.4.3 Selective Coding

The last stage of coding centred on the scanning of all coded data to choose data excerpts that illustrated the themes relating to the research questions of the study. The main challenge encountered was the selection of indicative participant excerpts that demonstrated the different facets of reunion and technology use in this experience. The reiteration of the codes permitted the identification of outliers that had not been detected in earlier analysis, which were then coded into the constructed themes. Eight codes that described reunion and the use of current use of technologies in this experience were selected based on the frequency of themes and their importance to family participants, as were an additional four codes that related to the limitations of the current technologies about the reunion experience.

4.4.4.4 A Note on the Reporting of the Data

The findings from Study 1 are presented in the next section. Prior to that, some comments must be made and the rationale followed on reporting the data must be presented. Direct quotations of raw data excerpts are indented and italicised. The names of all participants have been changed to protect participant privacy. The 27 participants are referred to with a combination of keywords and numerals—for example, 1F denotes the father of family 1, 6M denotes the mother of family 6 and 4C denotes a child in family 4. Further, 'interview' or 'field note' are used to note the source of which the data excerpt is a part. In the case of a field note, the place and date of observation are used to ascertain the data source. The quotations' line range in the source is also included at the end of the quotation.

4.5 Current Technology Use in Parent–Child Reunion

The analysis of the data (including the preparatory study activities) unveiled eight concepts that relate to the use of current technologies in parent–child reunion and an additional four that are associated with the limitations of these technologies in this experience.

Table 4-2 presents an overview of all 12 concepts, organised by the three main themes of preparation, demonstration and reaffirmation. These themes emerged from the data during analysis and refer to the concepts used by the participants. Additionally, these themes and their construction were guided by the current sociology literature that considers the reunion experience to be a process rather than a one-time event—namely, reunion has a pre-, upon and post-phase (Moss & Moss 1988; Diamond & Hicks 2008).

Table 4-2: Overview of Study 1 Findings

	Pre-Reunion	**Upon Reunion**	**Post-Reunion**
Major Themes	*Preparation (§4.5.1)*	*Demonstration (§4.5.2)*	*Reaffirmation (§4.5.3)*
Role of current technologies in reunion	• Mediating essential interactions • Supporting family bonds	• Rituals that unpack upon reunion • Emotions surrounding the return of the loved one • Gifts as transitional reunion tools	• Physical Presence in strengthening family ties • Enriching parent-child relationship through interaction • Coming together through common activities
Limitations of current technologies in reunion	• Lack of anticipation	• Lack of initial engagement	• Lack of sharing experiences • Lack of preparation for the next separation

The preparation theme refers to the use of current technologies in mediating family interactions and supporting the family bonds throughout the first phase of reunion, the pre-reunion phase. During pre-reunion family members are not physically together, but are very close to the eventual reunion. The actual duration of this phase spans from a week to some hours based on the interpretations of the participants. Overall, family members experience the use of current technologies in pre-reunion as a tool for preparing the family for the upcoming reunion.

The demonstration theme describes the nature of current technologies within the second phase of reunion, the upon reunion phase. Upon reunion comprises the first moments of the physical coming together of the family members. The duration of this phase can span from seconds to several minutes. An example, which emerged from the data, was the arrival of the loved one at the airport gate and the subsequent physical interaction

(e.g., hugging and kissing). This theme includes the rituals of the return of a family member, the emotion that is manifested during this return and the gifting practices that follow as a way of encapsulating and mediating the intimate ties among parents and children.

The reaffirmation theme was inspired by Moss and Moss' (1988) understanding of the experience of parent–child reunion. Their work highlighted the significance of reunion in reaffirming the values and bonds of the parent–child relationship. This theme is associated with the last phase of reunion, the post-reunion phase. Post-reunion follows the eventual return of the loved one and lasts until the next physical separation. During this phase, family members are physically present within a specific and well-known space (the home) where they can interact and engage in common activities to further enrich their ties and strengthen their unity.

The following sections provide a detailed discussion on these three themes in the context of technology and parent–child reunion, guided by both academic and defence family cohorts. For each theme, the concepts that are attached to the uses of current technologies in parent–child reunion are presented, followed by the limitation of these technologies as described in the collected data.

4.5.1 Preparation for the Upcoming Reunion

> *Dreaming of how the moment that I would hold them once more in my hands will be like (2F, interview, line 23).*

The first theme that emerged from the data was the preparation for the upcoming reunion. The two different family cohorts had different interpretations of what this preparation entailed, but in all families a sense of the return of the loved one was apparent. As noted above, this theme was associated with the pre-reunion phase in which all family members are still physically separated, but close to reunion.

Within the defence families, it was common for the mothers and children to have plans for the welcoming events that would surround the return of the loved one:

> *we would meet days before he comes back and his mum, dad the kids. everyone would pitch in the preps (4M, interview, lines 35–36).*

The defence fathers also highlighted the significance of preparing emotionally and mentally for their return after the deployment. Further, preparation for the reunion would also be visible in the academic families. The mother, in most cases, was the initiator of such activities:

> *I would think of making a special dinner for him where the kids might help (9M, interview, lines 48–49).*

The father and children mentioned the importance of preparation but also both family cohorts highlighted the value of current technologies during the pre-reunion phase. Current technologies within this theme were primarily used to mediate essential family interactions and support the family bonds just prior to the upcoming reunion.

4.5.1.1 Mediating Essential Interactions in Pre-Reunion

As highlighted in the overview of the findings, pre-reunion is the period experienced by parents and children just before the upcoming reunion. That phase occurs when family members are in physical separation and very close to the reunion. As part of the preparation for the reunion of the loved ones, the main use of technology during pre-reunion was to mediate essential interactions between family members.

Within the defence family cohort, technology afforded the need for the deployed father and the at-home family members to mediate their love and intimacy through, primarily, asynchronous communication channels (as depicted in Table 4-1). It was common for defence fathers to initiate the mediation process through email and landline phone:

> *He would be the first one calling us at random times, since everything is so time constrained where he is (2M, interview, line 56).*

> *Dad would just call us out all of a sudden…I don't think mum had his telephone number (4C, interview, line 18).*

During pre-reunion, these families employed different approaches in harvesting the most of their sporadic communication as a way of being prepared for their reunion:

> *I would try to call as often as possible, even email every day the week before returning. I just wanted to make sure that they know I would be coming (1M, interview, lines 56–58).*

The children of defence families highlighted the significance of a phone call from their deployed father:

> *I like when daddy called. It is as if he is here, but all I can hear is his voice (3C, interview, line 19).*

At the same time, the academic families noted the importance of technology in mediating their interactions while in pre-reunion. The easy access to technologies that can be used wherever, whenever and in a synchronous manner was considered a unique advantage by the family members:

> *You know it is great to just be able to call him or Skype whenever. I, and the kids, can see his face and feel as if he is here. It was not like that the first time he was away ten years ago (6M, interview, lines 25–27).*

Most of the academic families mediated the fine elements that characterised their bonds with mobile phones and Skype video chat. When Skype was used, it was regarded as a fun way of communication by the children:

> *It is just so cool to see dad in Singapore. Talking to him and at the same time see what strange stuff he is eating is just as if I am there (5C, interview, lines 19).*

Moreover, academic families would use the current technologies just before the upcoming reunion to make sure that the scheduled time of the loved one's return would not alter (i.e., as a time scheduling and awareness medium):

> *I would call them, just before I enter the plane and tell them what time I will be arriving to make sure that they will be there to pick me up (9F, interview, lines 21–23).*

4.5.1.2 Supporting Family Bonds in Pre-Reunion

The use of current technologies in pre-reunion enabled both cohorts to support their family bonds while they were apart and just before reuniting. In the case of defence families, even though the infrequent access to communication technologies and the short time that each family had to talk to each other was considered a challenge, family members tried to adapt in this situation:

> *He would call us and say that he has only 10 minutes to talk. So there will be this need to cover everything in this short period of time. It was not what we wanted, but at least I could sense he is trying to support us (3M, interview, lines 45–47).*

Additionally, defence children would enquire with deployed father about his experience of being in a country that they know little about:

> *I would talk to my little boy and he would ask me about Afghanistan. The people, the life. This kind of story I was saying brought us closer (4F, interview, lines 36–37).*

> *I would call dad and ask him about the place he is in. I always wanted to know about how people are there and he would tell me (4C, interview, lines 24–25).*

At the same time, defence mothers were, in some cases, acting as the mediators of the discussions between the deployed fathers and the children when it was not possible for either of them to talk due to time commitments:

> *He would call us and ask me about our young one. I would tell him funny stories and he would also tell me to let the young one know how much he loves him and that he will be here soon (1M, interview, lines 37–38).*

Academic families experienced the support that technologies provided during pre-reunion in a distinct way. The presence of different communication technologies that could be used anytime and anywhere by each family member was considered the main medium of support between the separated parent and the at-home parent and children:

> *The feeling that he is only a click away is something that keeps us going. I know that whatever happens I can just Skype him and ask his opinion (7M, interview, lines 22–23).*

Further, children of academic families denoted the significance of technologies in giving them the sense of support with their daily activities:

> *Sometimes mum would just not know how to handle a math problem. I would then Skype dad and he would help me (8C, interview, lines 45–47).*

Supporting the family bonds in pre-reunion was, therefore, an easy activity for the academic family due to the communication technologies that afforded a sense of immediate connectedness.

4.5.1.3 Limitations of Technologies in the Preparation for the Upcoming Reunion

Throughout the data analysis, it was clear that the use of current technologies in the pre-reunion phase was not only enabling family members to prepare for the eventual reunion, but also had a very important limitation. The anticipation to reunite was evident from the interviews with defence families—the quotation at the beginning of this section being an indicative example.

In all four defence families, the use of technologies added to the anticipation to reunite:

> *We would try to talk to him as often as possible three or four days before he comes. Emailing welcome-back pictures (3M, interview, lines 57–58).*

Academic families interpreted the anticipation to reunite in a different way:

> *We might feel what you call anticipation, but really the existence of so many technologies do not really help. I feel the anticipation we have now is different compared to ten years ago (6M, interview, lines 78–79).*

When investigating the data relating to the academic families, a noticeable outlier was found that related to the relationship between the use of current technologies in pre-reunion and the anticipation to reunite. Academic family members appreciated the different synchronous communication technologies they could use, but at the same time noted that they felt the reunion was changing each time since the anticipation was slowly disappearing:

> *I would really look forward to seeing them once more. But it would be more interesting [for the reunion] if sometimes we just not share everything over the phone (9F, interview, lines 66–67).*

At first glance, this might seem a non-significant aspect of the use of current technologies in pre-reunion, but it was an important finding of this study since reunion is an interconnected process and not a one-time experience. The significance of this outlier will be discussed later in this chapter (in Section 4.6.1). Having discussed the

first main theme, which is connected to preparation for the upcoming reunion, the next section explores the second theme, which relates to the use of current technologies when reunion occurs.

4.5.2 Demonstration of Family Interactions upon Reunion

We would hug and cry and just be excited and happy that he is back (1M, interview, lines 66–67).

Following pre-reunion, the next phase is upon reunion—the first moments of the actual physical coming together. The main theme that emerges during this phase in relation to the use of current technologies is the demonstration of family interactions. The above quotation highlights the main facet of pre-reunion. Some academic families engaged in a similar demonstration of their feelings upon reunion:

It is so good to see my family again. Every time I see them after some time away I feel blessed (8F, interview, lines 71–72).

The main sub-themes that emerged were the rituals practiced upon reunion, the emotions surrounding the return of the loved one and the use of gifts as transitional reunion tools.

4.5.2.1 Rituals Practiced Upon Reunion

Since the preparatory study activities (the observations conducted at the airport), it had become clear that reunion had a certain ritualistic character for each family. These rituals, as narrated in my field note excerpts, were common across most of the defence and academic families:

it is as if all family members when they see each other with the return of the loved one, they have a ritualistic pattern: wave, hug, kiss, talk, exchange (field note, 13Feb2010, Melbourne Airport, lines 16–17).

Defence families regarded the moment of the return of the loved one as a celebration of family unity. Along with their preparation for the reunion (described in Section 4.5.1), the at-home defence family members would wait at the airport, in many cases bringing their loved ones' favourite chocolate or a cake:

> *We would have something that he loves cooked and bring it to us to the airport. The whole family would join and we would just wait (3M, interview, lines 89–90).*

Throughout the defence families, it was visible that on the day the family reunited the at-home and returning family members would follow their personal rituals:

> *I know that, depending on the time, my wife would wake up, look pretty, then wake the kids up and will pass the day getting ready to welcome me back home. I would do the same thing while counting the hours to pass (4M, interview, lines 77–78).*

Similar rituals would occur within certain academic families. Upon the return of the father, the at-home family members would have something minor prepared (e.g., dinner) that all of them may have assisted in making. In some cases, older children that had experienced multiple reunions would carry a drawing to the airport or have one ready at home to show their father:

> *I remember since two years ago. I would draw something the day that dad arrived (6C, interview, lines 87–88).*

Further, the mother in many cases arranged for the extended family to be present upon reunion with the loved one:

> *Well, I know that he does not really like it, but it is more like a ritual for me. I would have everyone waiting for him with us too as a way of making it nice for him. (9M, interview, lines 67–68).*

In general, rituals were a key component for each family upon reunion. In certain cases, family members would use technologies (e.g., mobile phones) to coordinate upon the return of the loved one or to capture and share the rituals that the at-home family members were preparing (e.g., photos of baking a special cake or of the first dinner together).

4.5.2.2 Emotions Surrounding the Return of the Loved One

An emerging concept across all families during the upon reunion phase was the emotions that surrounded the return of the loved one. Defence family members depicted their excitement and celebration of family reunion at every moment of the upon reunion phase:

> *We would wait eagerly at the airport and when he would appear the kids would run, shout from excitement and everyone would hug and cry (3M, interview, lines 44–45).*

The overall sentiment of being together again was vividly demonstrated:

> *Daddy would appear with many of his work friends. I will run and shout and he will run towards me and hug me. I would ask mum why she is crying and she would tell me that she is happy. I do not understand why she would cry still (2C, interview, lines 19–20).*

The emotions were shared by extended family members, all of whom were present for the return of the deployed father. In many occasions, defence families perceived the moment of reunion as the event when the family can finally start to recuperate from being apart:

> *For me it is all about being together again at our home. Doing all those activities that we have not done for some time now. It all starts from the moment of seeing him in the airport (2M, interview, lines 33–35).*

Defence families, in numerous cases, would also capture their different emotions upon reunion with the use of technologies (e.g., mobile phone cameras):

> *We would use cameras to just take photos and remind ourselves of this wonderful moment (4F, interview, lines 41–42).*

At the same time, academic families exhibited a range of emotions upon reunion:

> *Of course, we would be delighted to see him again, we would hug and touch his face to see that it is really him—he would immediately start playing with the kids (9M, interview, lines 66–68).*

Aside from physical touch, a couple of academic families also noted a feeling of sadness related to the thought that this reunion might not last for the expected time:

> *His job requires him to be in Singapore a lot and even though with the technology and all we feel him being close to us, sometimes I feel sad as I know that he will be here only for four days—the kids of course know nothing (8M, interview, lines 43–44).*

> *He will return and the kids would be upstairs carrying on with their stuff. Not sure why this happens still (6M, interview, lines 55–56).*

Four of the academic families noted that, in many cases, the children would show modest interest in the first moments of the reunion with the father. That would not mean they were disinterested in the presence of their father, but rather, that they were employed in different forms of engagement that drew their attention away from the eventual return of their father.

4.5.2.3 Gifts as Transitional Reunion Tools

Apart from following specific rituals and demonstrating their emotions, the returning and at-home members also exchanged gifts upon reunion. It was common throughout the participating families for the father to bring gifts upon his return. In Figure 4-2, an academic child shows the gift that she received from her father in their last reunion.

Figure 4-2: Gift that an Academic Child Received from Her Father

In this family (family 5), the father would bring a DVD disc of his daughter's favourite movie to every reunion. For defence children, the excitement for the return of the father was also metaphorized with the gifts that he would bring:

> *Daddy would come back and he would also bring me my favourite video game (4C, interview, lines 58–59).*

Academic children would also await eagerly for their gifts to arrive alongside their father:

> *Yes, we both know that he will bring something back with him. We really like that (7C, interview, lines 63–64).*

Children in most cohorts felt that the gifts that were exchanged upon reunion symbolised the eventual return of the father. At the same time, parents in most cohorts felt that their bond with the children was reinvigorated through the process of gift exchange upon reunion:

> *It is as if the gift brings us more together. I remember I bought him a very cheap analogue camera [he really likes taking photos] and he immediately started using it (8M, interview, lines 89–91).*

In that sense, the gift itself was perceived as a tool that enhanced and helped the transition from being physically apart to being physically together. On one hand, children had realised that their father had returned with a gift—a physical expression of his love for the younger family members. On the other, the at-home parent expressed their satisfaction with the eventual reunion of the whole family and the joy that the children felt through the opening and sharing of gifts.

4.5.2.4 Limitations of Technologies in the Demonstration of Interactions Upon Reunion

Upon reunion, current technologies were used to coordinate, capture and share the rituals and emotions that surrounded the first moments of the reunion process. Further, more tangible technologies (in the form of gifts) were also used as a metaphor of reunion and as a confirmation of the return of the loved one. However, within the theme of demonstration of family interaction a limitation of current technologies was evident.

The lack of initial engagement upon reunion that four of the five academic families experienced was surprising:

> *It is not only that we have been experiencing this for many years, but we also have technology now that gives this feeling of being even closer when he is not here. This has somehow changed something in the first moments of seeing him once more (9M, interview, lines 98–100).*

The engagement upon reunion refers to the degree to which the reunited family members would experience the first moments of their reunion. This finding within academic families posed a paradox. Even though the basis was there for the family members to experience the first faces of reunion (e.g., through gifts), the presence of communication technologies somehow affected this:

> *Well dad might be back, but I might not see him immediately. I might be playing or doing stuff. I love him of course, but I already talk to him while he is away. A lot [laughs] (8C, interview, lines 52–53).*

This limitation will be elaborated on and related to the anticipation to reunite (from the pre-reunion phase, discussed in Section 4.5.1) later in this chapter (in Section 4.6.2). Prior to that, the findings that emerged in relation to technology use and post-reunion are presented in the next section.

4.5.3 Reaffirmation of Family Ties in Post-Reunion

> *After the dinner, we will just sit down and talk with the kids about stuff. We will also look at the photos and just connect as a family (3F, interview, lines 85–87).*

The last phase of reunion, that follows the first minutes of the return of the loved one, is post-reunion. During this phase, family members are physically together until their next physical separation. The main theme that surfaced in post-reunion was the reaffirmation of family ties. Overall, defence families experienced the reunion of their members as a unique opportunity to connect once more (as portrayed in the above quotation). Additionally, academic families felt that post-reunion was a fertile ground for parents and children to recover from being physically apart. However, in many cases, this would not occur to the extent that family members had hoped:

> *Returning back to home is like coming back to tranquillity. But it has changed over the years. We do not talk as we used to (6F, interview, lines 103–104).*

Across all the family cohorts, three sub-themes were present regarding the reaffirmation of family ties in post-reunion: the importance of physical presence in strengthening the family ties, enriching the interaction between parents and children with the help of current technologies and coming together through common activities in post-reunion.

4.5.3.1 The Importance of Physical Presence in Strengthening the Family Ties

One of the main characteristics of post-reunion is the physical presence of all family members in one place (the home) for a specific duration of time before the next physical separation. By all accounts, this sentiment of having another member present in the household enabled the family to strengthen their ties.

In the context of defence families, the presence of the deployed father gave the opportunity to the mother to step back and receive more help in the daily household activities. Similarly, within academic families the physical presence of the returning father enabled the family to retrieve the 'missing family link':

> *The fact that he is back, healthy, is fantastic! He can also help me now with the kids [laughs] (1M, interview, lines 104–105).*

> *Even though we do talk a lot while he is away it is different when he is back as we now see him here. He is not in front of a screen. It is as he was missing and now the whole links come together again (8M, interview, lines 91–93).*

At the same time, defence children highlighted the value of having their father back home. For them, the presence of their father was welcomed and related to a strong sense of togetherness in the daily events that encircled their life:

> *Dad is here and we can do so many stuff. He will take me to the school and come and pick me up and then we can go, do something and just have fun (3C, interview, lines 67–68).*

Being present in the family once more also reminded the deployed fathers of the little things that they are missing while they are away. Further, the deployed fathers sensed

the gravity of their presence in the family and in all cases interpreted it as the right time to contribute to the family:

> *We don't really talk using phone or Skype while away. When I come back home I value this. Being together again. We are a family again (2F, interview, lines 97–99).*

> *We are together now. It is what we always wanted since I left. Now it is my time to be here for the children and [my wife] (4F, interview, lines 86–88).*

As in the case of defence families, the presence of another parent in academic families was regarded as an opportunity for them to assist with household obligations:

> *So, I will return and the next day I will immediately start helping. Doing shopping, helping with the kids. I can see why she is feeling tired now (5F, interview, lines 95–97).*

Finally, most academic children highlighted their positive sentiments towards seeing their father again at home:

> *I just am happy to wake up in the morning and she that he is here again. There is so many things that we can do together (7C, interview, lines 63–65).*

Ultimately, the physical presence of the reunited parent strengthened the family ties either through their own contribution to daily activities or with the emotional support that they instilled in the whole family.

4.5.3.2 Enriching the Parent–Child Relationship Through Interaction in Post-Reunion

Another sub-concept that was apparent within the theme of the reaffirmation of family ties with the use of current technologies was the enrichment of the parent–child relationship through interaction. All defence families highlighted the value of current technologies in enriching their interactions when they were reunited:

> *In the day after I come back we would just sit down and go through photos, laughing and having fun. We are becoming stronger I can see (1F, interview, lines 104–106).*

Specifically, defence family members mentioned the role of images in positively surrounding and aiding the discussions that occur during the first days of the family reunion:

> *We would spend many days going over photos or drawings that children had made while we were apart. We just enjoy chatting and having fun once more! (3F, interview, lines 111–113).*

In certain occasions, children noted that they would employ different types of technologies in giving a sense to their father of what had occurred while they were apart:

> *I have this video of my dancing competition. Dad was not here and I decided to show it to him when he arrived. We watched it and then I redid my solo (4C, interview, lines 67–69).*

Further, mothers described that in specific cases they used technology to not only help with reflection on what had occurred while the family was separated, but also to provide a sense of what it was for the family to be dispersed:

> *We would see photos and we would not only chat about these photos, but also say more stuff about what it means to not be together—kind of like saying stories and making meaning out of them (4M, interview, lines 107–109).*

This indicated that defence families enriched their relationship with the help of current technologies through reflection, discussion and understanding of the meaning of being apart.

In the case of academic families, it was evident that the use of technologies during post-reunion with the aim of enriching the parent–child interaction was perceived differently. There existed similar occasions to the defence families during which academic family members would employ technologies to create the grounds for an enriched interaction, but actual employment would rarely happen:

> *We would use photos or in some cases see a video that he took during his trip, but not really use it as a way to chat as we have already shared it through Skype (7M, interview, lines 96–98).*

The fact that we do talk a lot using Skype while we are apart means that really we do not use photos or video when I come back (6F, interview, lines 102–103).

When dad is back we do not really see photos or think like that. He would email everything to us or through Facebook anyways (9C, interview, lines 73–74).

The overarching sense, therefore, of most of the academic family members was that the use of technologies in post-reunion was not a necessity. In fact, as an academic mother described:

Well, I don't think that we really share photos when he is back. We used to do so, long time ago—the first time he left I remember—but just not do so anymore (5M, interview, lines 121–123).

The above quotation demonstrated the difference in the way that academic parents and children experienced the important aspect of post-reunion interaction with the presence of technologies compared to defence ones.

4.5.3.3 Coming Together Through Common Activities in Post-Reunion

Following the use of current technologies in enriching the parent–child interactions in post-reunion, another sub-concept that was evident across the data was the value of common activities that parents and children engaged after reuniting. Defence family members recounted in detail the different types of activities that they would participate in during the post-reunion phase. These included playing with kids, having daily family meals together, travelling or simply sharing the daily family activities:

Oh, that was the best part. We would play with the kids all the time—cards, monopoly, build imaginary castles (2F, interview, lines 138–139).

When dad is back we would go out playing footie or if the weather is really bad we would just sit inside and play—mum does not do that so often (4C, interview, lines 97–99).

Further, it was common for defence families to employ different practices of storytelling as a way of coming together through this common activity:

In many cases, I would read a story to the kids before going to bed. [Mum] would be in the same room—it would just make it much better for all of us (1M, interview, lines 120–123).

In one case, the mother and children created a collage of photos that they took while being apart from the father and created a story that they shared in post-reunion:

Yes, we did this and daddy really liked it—I also liked it because I performed a little role for him (3C, interview, lines 84–86).

Conversely, Academic families delineated the importance of common activities in post-reunion, but at the same time noted that they might happen once or twice in the beginning of the reunion:

Well, apart from having him here to help with kids we would do some stuff together like arrange a family trip or sometimes play, but not really do this constantly (8M, interview, lines 139–141).

The common activities within academic families were focused more on practical issues such as household tasks. There were two cases in which the parents and children would play computer games after dinner:

The best time with dad is when we play FIFA [well known video game] soccer together in Xbox. It is so much fun! (7C, interview, lines 101–103).

However, it was clear that most academic family members would rarely use any type of current technologies during any common activities:

Well, to be honest we just stopped doing it—and it is more like the technologies now are not really appealing; I find it boring to use photos again and again (7M, interview, lines 120-122).

The reason for the absence of use of technologies in post-reunion was mainly because parents and children felt that they already had the opportunity to share their thoughts and connect while they were apart due to the presence of numerous communication technologies. They felt that the current technologies could not offer them an alternative way to further enrich their ties while they were in the post-reunion phase.

4.5.3.4 Limitations of Technologies in the Reaffirmation of Family Ties in Post-Reunion

The use of current technologies in post-reunion relates to the reaffirmation of family ties. In many cases, both academic and defence families would use different types of technologies to either complement the physical presence of the whole family, to enrich their interactions or to accompany the common activities that were interwoven in their family life. When viewing the data, however, one overarching thread was visible. Within the academic families, it was clear that there were two limitations of current technologies in the post-reunion. These limitations related to the sharing of experiences and the lack of preparation for the next separation.

It was evident that numerous academic family members, especially mothers, felt that the use of communication technologies while apart influenced the sharing of experiences when in post-reunion:

> *It is wonderful to be together again, don't get me wrong, but when the dinner time comes I feel that I am trying to provoke discussion. It is as if we have shared everything while apart and now we have nothing more to talk about (8M, interview, lines 143–147).*

> *It is like we are together, but struggle to really be together. We struggle to feel connected again (6M, interview, lines 140–141).*

This 'absence in presence' was an obvious facet of the lack of the current technologies in enabling the distinct case of academic families to share their experiences in a way that was different compared to previous ones. Further, academic family members underlined the importance of feeling prepared for the next separation, something that current technologies did not support:

> *I do not know if it is only us, but even though we have been through this for so many times, I still do not feel prepared for 'losing' him once more. I would still want him and the kids to chat about how the next separation will be (5M, interview, lines 152–156).*

The underlying worry across the academic families was that the reunion would occur and reoccur without taking advantage of reaffirming and reconstructing the family ties. The current technologies had certain limitation in supporting the sharing of experiences

and the preparation for the next separation in this distinct family type. One academic mother expressed her worry as follows:

> *It is as if he comes, he goes and nothing really goes on in between. We have become used to it, but I worry that we have to do more in between—the technologies are there, but they don't really seem to fit in our own special case (7M, interview, lines 161–165).*

The possible reasons for the lack of sharing experiences and the lack of preparing for the next separation are expanded on later in this chapter (in Section 4.6.3).

4.6 Discussion

Study 1 addressed the current understanding regarding the use of existing technologies in the experience of parent–child reunion. The research question that guided this study was:

> **Research Question 1:** How are current technologies used in parent–child reunion?

Section 4.5 and Table 4-2 presented 12 findings that describe the uses of current technologies within the experience of parent–child reunion as shared by the academic and defence families who participated in this study. These insights were clustered into three themes (preparation, demonstration and reaffirmation) that correspond to the three phases of reunion. They also relate to the predominant needs that the participating families had throughout their pre, upon and post reunion phases.

First, throughout the pre-reunion phase, parents and children used different technologies to prepare for the upcoming reunion. These enabled the family members of both participating cohorts (defence and academic) to mediate their essential interactions and support their ties just before the actual reunion occurred. While HCI research has depicted the importance of communication technologies to mediate and support parent–child ties (Neustaedter, Harrison & Sellen 2012), the element of preparation for the reunion is a new aspect of the current technologies that was apparent in both family types. In this regard, an important finding that emerged from this study was the

limitation of current technologies in triggering anticipation for the reunion within the academic families.

Upon reunion, the family members use current technologies to demonstrate (and capture) their interactions. Parents and children follow a ritualistic process that surrounds the practice of technology use, such as taking photos or exchanging gifts to respectively capture and demonstrate their emotions towards the return of the loved one. Research has underlined the value of moment capturing through photos (Sontag 1978) and of gift-sharing that can aid the strengthening of family bonds (Petrelli et al. 2012). Yet, a finding that was visible within the academic families was that there was a lack of initial engagement upon reunion. This was different to the return of the deployed defence father during which, similar to the findings of Kaczmarek and Sibbel (2008), the sensitivity of the deployment context alongside the sporadic access to communication technologies elevated the significance of the moment of reunion.

Further, in post-reunion, parents and children employed different technologies to reaffirm and reconstruct their bonds. Specifically, the use of technologies after the initial moments of reunion (e.g., while driving, at home or during the first dinner) complements the presence of all family members in strengthening the family ties. All defence and some academic families utilised photo-based technologies in enriching their relationship through discussion and narrative practices surrounding the photo sharing. Further, in numerous cases, current technologies enabled parents and children to experience coming together by providing support to common activities as in the case of parent–child play. Van House (2009) highlighted the significance of collocated storytelling for the enrichment of the parent–child bonds, which was apparent in the case of defence families. However, similar to the other phases of reunion, a surprising finding within this theme was spurred by academic families and related to the shortcomings of current technologies in stimulating the sharing of experiences and preparation for the next separation. Different HCI research lines have investigated the social practices that surround photos and storytelling between family members (Frohlich et al. 2002; Durrant, Frohlich et al. 2009). The findings from Study 1 unearthed the different interpretation of collocated technologies in that specific context of reunion.

While current HCI and CSCW research argues that technologies can support the mediation of essential interactions between parents and children when they come physically together (Jacucci et al. 2010; Patel & Clawson 2011), this study highlights that within the specific context of parent–child reunion, the same technologies need to address certain limitations to further foster parent–child interaction. The subsequent sections further elaborate on these limitations and connect them to the current literature.

4.6.1 Preparation for Reunion but Less Anticipation

The first theme of the study unpacked the different angles of technology use in preparing the family members for the reunion (see Section 4.5.1). During pre-reunion, which overlapped with the last moments of physical separation, parents and children from both cohorts exhibited similar approaches to mediating the essential interactions and supporting the family bonds through current technologies. The main distinction between academic and defence families, as far as the technology use was concerned, related to access to and nature of available communication technologies. Defence parents had little access to synchronous technologies and even scarcer opportunities to use other forms of communication (primarily asynchronous technologies such as email). Conversely, academic parents had extensive access to separate communication technologies that both parents and children could use whenever they wished, including synchronous technologies that supported the mediation of visual cues.

Extensive research studies within the field of HCI have highlighted the role of technologies in mediating the fundamental interactions between parents and children while apart (Yarosh & Abowd 2011; Isola & Fails 2012; Neustaedter, Harrison & Sellen 2012). In line with these studies, it was apparent that all families (defence and academic) benefited from the presence of these technologies despite the scarcity (or in many cases problematic access) that defence families faced. Even though numerous studies have investigated the different mechanisms that parents and children employ to stay connected while physically apart (Christensen 2009; Tee, Brush & Inkpen 2009; Raffle et al. 2010), this study's findings shifted the focus of these efforts to the reunion experience. The preparation for the upcoming reunion was another aspect of the use of

technologies while not physically together. While this has not been researched thoroughly in the HCI and CSCW literature, it is common within sociological studies in which the nature of the discussions between the at-home family and the deployed parent members revolve around his or her return (Wood, Scarville & Gravino 1995; Applewhite & Mays 1996). The closest works in the HCI literature to echoing the preparation for reunion theme were the recent studies on divorce families (Yarosh, Denise Chew & Abowd 2009; Odom, Zimmerman & Forlizzi 2010). Specifically, the insights of Yarosh, Denise Chew and Abowd (2009) on the way that children anticipated the upcoming reunion with their parent bears great similarity to how defence children felt. However, when the interpretation of the findings pivoted to the academic family cohort, there was a clear difference to defence families: the anticipation to reunite.

Apart from the expected uses of current technologies in the pre-reunion phase, the lack of the anticipation to reunite was a paradoxical finding apparent within academic families. While defence family members would count the days backward and denote their anticipation to see their loved one soon, that was not the case for three of the five academic families. As delineated by the participants, the presence of different communication technologies throughout the physical separation and upon reunion gave the unique opportunity to the family members to feel continuously connected. This, in turn, influenced their anticipation of the upcoming reunion, which was considered primarily as an issue of family cohesion by the mothers. Further, this finding does not align with Modlitba and Schmandt (2008), which investigated the use of current technologies by parents and children who were physically separated due to work-related reasons and highlighted that the younger members of the family would look forward to the return of their parent. Even though that was the case for some academic families within Study 1, it was not the overall situation. By no means is the aim of discussing this finding to be regarded as a dystopian view of communication technologies. Even though it seems at first glance to relate to the work of Turkle (2011) in relation to the negative influence that technologies might have on interpersonal relationships, the lack of anticipation to reunite relates also with the periodic character of the reunion experience as well as the cumulative experience of physical separation over time. Current sociological research unveiled the role of periodic coming together in the

expectations that children and parents formulate for their subsequent interaction (Campos et al. 2009). However, this study's main finding demonstrated the limitations of current communication technologies in further supporting the preparation for the upcoming reunion when it occurs periodically, which was an essential thread of the reunion experience.

4.6.2 Demonstration of Interactions but Lack of Initial Engagement

The second theme that surfaced from the data related to the uses of current technologies upon reunion. In both family cohorts, parents and children used different technologies upon reunion. These were enmeshed in their first emotions and the ritualistic nature of their interactions. Even though there were numerous similarities between the two cohorts with respect to technology employment upon reunion, striking dissimilarities also appeared.

Defence family members, following their preparation for the upcoming reunion and their anticipation to see each other again, exhibited significant emotions during the first moments of reunion. This was not surprising, given the sensitive deployment context and the cumbersome access to different communication technologies while physically apart. Related military family studies have highlighted the significance of the first reunion in paving the way for the unity of both the deployed parent and the at-home family members (Schumm et al. 2004; Seidel et al. 2014). Throughout the study, it was clear that defence parents and children used cameras to capture the return of the family member. It was common for the whole family to take photos of the actual reunion reactions and emotional interactions as a way of taking a historical snapshot of their family life. While analysing the data there were consistent similarities between how defence family members viewed the act of photo taking and Sontag's (1978) interpretation of photography's purpose. Additionally, the exchange of gifts upon reunion signified for all defence family members an activity that was perceived as a metaphor of the reunion experience that sealed the return of the parent. The giving of gifts from the parent to the children represented the emotional significance of the reunion that has been captured in the sociological literature (Komter & Vollebergh 1997; Berking 1999).

In certain academic families, parents and children enjoyed the return of the family member similarly to their defence family counterparts. Specific rituals occurred, whereby the at-home parent and children would pick up the returning parent from the airport and exhibit their emotions upon welcoming the family member. However, in three of five academic families, striking differences were apparent between these families and defence families in regard to initial engagements upon reunion. In academic families, the parents and children did not engage upon reunion. This was due to the presence of communication technologies while parents and children were physically apart and the repeated nature of the reunion. In the first instance, parents and children underlined that the use of technologies while apart allowed for the mediation of their interactions. Thus, when they reunited, there were no grounds for feeling surprised or overwhelmed. They highlighted that they were happy to have the family member back, but the initial engagement was low compared to the first reunion. That, in turn, led to describing the importance of the repeating factor of reunion. Similar to the preparation for reunion theme (discussed in the previous section), the recurring experience of reunion influenced the way that technology was used upon reunion. For example, certain academic family members did not take photos to capture the moment since they had already lived this experience repeatedly. In that sense, technology was not used at all in demonstrating and capturing the family interaction upon reunion.

Moreover, these academic parents and children did exchange gifts, but not while in the airport or upon reunion as the defence families did. Initially, this might not seem like critical finding, but the underlying reasoning for this occurring denotes its value. The postponement of the gift exchange is a practical manifestation of the lower worth that academic family members consider to the initial engagement that occurs upon reunion (as compared to military family members). Within HCI, studies have investigated gift-giving as a practice that is mediated with the use of technology. Taylor and Harper (2002) examined the role of mobile technology in supporting the act of gift exchange through the metaphor of text messaging. Their findings depicted the interpretation of messages by teenagers as gifts, even though their tangibility differed from the materiality of a gift. In that sense, it seemed that within academic families the

mediation of interactions that occurred in pre-reunion substituted in part the gift exchange that traditionally happened upon reunion. This lack of initial engagement in academic families was an unforeseen finding within this theme that related to the lack of anticipation to reunite as the continuum of the reunion process unfolded.

4.6.3 Reaffirming the Family Ties but Lack of Sharing Experiences

The third theme within this study resonates with the main aim of the post-reunion phase, the reaffirmation and reconstruction of the parent–child ties (Moss & Moss 1988). The unique situation of both defence and academic families that experience continuous reunions elevates the significance of this theme, as the recurring transitions between being physically together and apart influences the parent–child bonds (Kaczmarek & Sibbel 2008). During post-reunion, both family cohorts had unique opportunities to recuperate from the strenuous life of being physically apart and to further enrich their relationship using different technologies. However, defence and academic family members experienced post-reunion in different ways.

The physical presence of the deployed parent in the home enabled both parents and children to interact in a different manner through common activities and enrich the family ties. They employed numerous technologies that spanned from photos to videos to computer games that supported their discussion and, subsequently, their reunion process. The main practice that surrounded the use of photos and videos was storytelling, in that the returning parent would create and share stories with the at-home family members that were inspired by his experiences while being apart. A similar activity would be employed by the children, with the help of drawings and photos of their school functions. Within HCI and CSCW research, numerous studies have signified the significance of technology in augmenting this practice (Kim & Zimmerman 2006; Van House 2009). In particular, Landry and Guzdial (2006) highlighted the importance of retrospective storytelling with the use of digital photos as a way of covering the lost ground between family members and adding further meaning to the parent–children relationship. This type of storytelling, which perceives the photo as a medium for rebuilding the story that is based in real facts, was visible in all four defence families. Further, parents and children of these families used different computer games that they played while physically together to overcome the first days of being in

a new situation. In that sense, technology acted as a therapeutic factor for the alleviation of potential conflicts that were apparent in certain cases and for the strengthening of family ties. Voida, Carpendale and Greenberg (2010) have emphasised the positive effects of computer and console gaming in bringing the family group together and in fostering group interactions. Finally, through healthy and continuing discussions between the defence parents and children and with the help of technology, defence family members reflected on the value of being together again and of the nature of the next separation. Similarly, within the field of HCI, Thieme et al. (2011) described the role of technology in allowing intimate partners to reflect their understanding of their relationship and elicit a richer picture of where they stand as a couple. A key difference in this work is that the presence of children alongside intimate partners adds further complexity.

Academic families exhibited different perceptions of the post-reunion phase in the context of the reaffirmation of family ties. Even though the physical presence of the returning parent would be regarded as a positive addition to the family, interactions between family members would not be common in post-reunion. In three of the five academic families, it was clear that everyone in the family would continue with their normal activities despite the safe return of the father. Following this, it was uncommon for these families to use photos or other technologies when reunited as a platform for sharing their thoughts on being apart and coming together. This was due to how parents and children felt that they had kept up with each other's lives while apart using communication technologies. The ease of access that these technologies offered (which can be referred to as presence in absence) did have an influence on how academic family members used the time that they were physically together to share their experiences and prepare for the next separation. This was the main difference to defence families—the feeling of absence in presence that was created in three of the five academic families (as an academic mother identified). This meant that even though the family members were together again, they did not exploit this circumstance. Further, the limitation of current technologies that can be used when physically collocated did not enable family members to instigate and refresh their interactions while in post-reunion. Media studies literature has pinpointed the effect that communication technologies may have on interpersonal interactions (Lewandowski et al. 2011; Turkle 2011). However,

the distinction in the case of academic families was that they underlined the positive aspects of technologies, but could not discern the way that these technologies could be used in a novel manner when they were reunited.

Essentially, the lack of sharing experiences within post-reunion was a significant finding of Study 1. It manifested the attention that is needed to rethink the way that collocated technologies for sharing of experiences are perceived in the context of those family cohorts.

4.7 Synopsis of Study 1 Contributions

The aim of this study was to address a gap in the current HCI knowledge (discussed in Section 2.4.1) and was guided by the lack of understanding of how current technologies are used parent–child reunion. Through interviews and observations with parents and children of defence and academic families, this study identified three main themes that are inspired by the assertion that reunion is a process (Moss & Moss, 1988): preparation, demonstration and reaffirmation of family ties.

In pre-reunion, parents and children of both family cohorts used synchronous and asynchronous technologies to prepare for the upcoming reunion. They did so to mediate their essential interactions and support their family bonds. The findings of this study complemented the current work on communication technologies within families separated by distance and time (Neustaedter, Harrison & Sellen 2012). Additionally, this study extends these works in the sense that it provides empirical evidence that delineate the use of technologies through the lens of reunion, whereas previous studies focused solely on separation (Modlitba & Schmandt 2008; Odom, Zimmerman & Forlizzi 2010; Yarosh, Denise Chew & Abowd 2009; Yarosh & Abowd 2011).

Upon reunion, parents and children of both family cohorts used synchronous technologies to demonstrate their interactions during the first moments of reunion. Family members demonstrate rituals that have been developed throughout many reunions, exchange gifts to feel connected again and use photo-related technologies to capture the emotions that surface at the distinct moment of reunion. These findings support the sociological work on the emotional significance of interactions that occur

upon reunion, either using gifts as a material representation of social exchange and communication (Komter & Vollebergh 1997) or the capturing of the moment for future reflection (Durrant, Frohlich et al. 2009). The specific findings of Study 1 extend the current work on the role of photographs in storing content (Van House 2009), as they disclose the significance of photos in the experience of reunion upon the return of the family member.

In post-reunion, parents and children of both family cohorts used synchronous technologies to reaffirm and reconstruct their family ties. Family members highlighted the importance of physical presence in strengthening the family bonds with the use of technologies that can enrich the parent–child relationship through interactions, which particularly occur in the context of common family activities. These findings agree with recent HCI studies on the significance of technologies in fostering family connections while members are collocated (Bohanek et al. 2006; Landry & Guzdial 2006; Van House 2009; Neustaedter, Harrison & Sellen 2012). They also extend the current work by identifying the manner that these technologies are used by each family member (father, mother and child), thereby treating the family as a collection of individuals rather than a group (see Yarosh & Abowd 2011).

More importantly, Study 1 highlighted a series of limitations in current technologies regarding each of the three themes (see Table 4-2). These technological limitations were visible within the academic families and related to the periodic nature of reunion and the pervasiveness of communication technologies. In pre-reunion, certain academic families highlighted the lack of anticipation that was present due access to different communication technologies while parents and children were physically apart. Even though this finding related to the media studies literature (Lewandowski et al. 2011), in which a clear effect of computer-mediated communication on face-to-face interaction was delineated, its significance focused on the meaning of anticipation. Additionally, upon reunion, academic families mentioned the lack of initial engagement that was associated with the lessened intensity of emotions upon reunion. They emphasised the fact that not only did they not use any technologies (e.g., photos) to capture the moment, but also, in many cases, they would not be waiting for the loved one to return at a specific physical place. Finally, when the academic families were physically together

during post-reunion, they attributed the lack of sharing experiences that resulted (among other things) to the shortened preparation for the next separation. Parents and children had little to share while they were together, since they had been kept aware of each other's life events while apart through communication technologies. This extends the current work on sharing experiences when collocated, through storytelling or other activities (Landry & Guzdial 2006; Van House 2009; Bhömer et al. 2010), in that it draws attention to the importance of sharing actively when in post-reunion.

Last, the empirical nature of this study contributes to a better understanding of the differences between two distinct family cohorts regarding technology and the experience of parent–child reunion. The continuous comparison between defence and academic family members in this study extends the current understanding of how two distinct family types use technology in the context of reunion. Thus, it extends previous work on family and technology (Neustaedter, Harrison & Sellen 2012) by focusing on two cohorts that are relatively understudied within the field of HCI.

4.8 Critique of Study 1

A clear challenge from the beginning of this study was the recruitment of participants. This study required the active participation of the father, mother and at least one child aged between seven and 12 years old. These specific requirements decreased the opportunities for recruitment within the Melbourne area. For this reason, the call for participation was extended to areas outside Victoria. Particularly in relation to the defence families, it was extremely difficult to gain access without the support of the local Defence Families Australia network. In many of the cases, it was evident that interviews would need to be conducted either through telephone or with the assistance of online chatting tools (e.g., Skype). Guided by Sturges and Hanrahan (2004), it was found that both telephone and Skype interviews yielded rich findings that aided in the unpacking of the reunion experience. A related challenge was the interviewing of young children. As described in Section 4.4.3, it was decided to interview each child alone without the presence of his or her parents. Although this approach was cumbersome in the beginning, interviewing techniques from the child psychology literature were employed. In particular, Applewhite and Mays (1996), whereby the interview is

conducted with the elicitation of other activities (e.g., drawing). Ultimately, the decision to interview each family member provided valuable insights and aided the triangulation of the understanding of technologies in parent–child reunion.

Further, a critical challenge for this study was the systematic review of the findings. Miles and Huberman (1994) advocated for the transparency of the research process, which was followed in this study through the detailed descriptions of the research question, data collection and analysis. However, it was not possible for another researcher could to be employed to independently code the data in parallel with my coding,. This issue was solved by having comprehensive discussions with this researcher's supervisors, based on the quotations and codes that were produced. Finally, this study focused solely on a very small number of family members from only two cohorts that reside within Australia. The phenomenon of work-related reunion is widespread in many other family cohorts (e.g., pilots, businessmen and fishermen) (Clark & Taylor 1988). Therefore, the three significant outliers found in the academic families' data cannot be generally applicable to other families who share identical characteristics unless more formalised research is conducted.

4.9 Conclusion

The aim of this study was to develop an understanding of how current technologies are used in parent–child reunion. Based on observations and qualitative interviews with defence and academic family members, this study showed that parents and children use current technologies in preparing for an upcoming reunion during the pre-reunion phase, in demonstrating their interactions upon reunion and in reaffirming their ties in post-reunion. Moreover, parents and children in both family cohorts emphasised the importance of current technologies in mediating and supporting their interactions close to the upcoming reunion, capturing the family emotions surrounding the return of the loved ones and in further enriching the parent–child relationship through technology-based interaction.

Nevertheless, specific limitations emerged from interviews with the academic families about the use of technology within the three study themes. The lack of anticipation for an upcoming reunion, the lessened feeling of initial engagement upon reunion and the shortage of technologies that could support the sharing of experiences and preparation for the next separation were considered of crucially importance by certain academic families. The feeling that technology could better support parent–child reunion throughout the reunion phases emphasised the need to further explore the design of technologies in which the constructs of anticipation, engagement and sharing of experiences could be incorporated.

4.9.1 Towards Study 2

Guided by the limitations of current technologies in parent–child reunion, Study 2 examines the qualities of technologies that are aimed to support the experience of parent–child reunion. Particularly, Study 2 further investigates the design of a reunion-oriented artefact based on the constructs of anticipation, engagement and sharing. This is achieved through a series of workshops with interaction design experts and the active participation of both parents and children from academic families only.

Chapter 5: Study 2: The Design of *Rendezvous*

5.1 Introduction

The previous chapter described Study 1, which generated an understanding of the current use of technologies within the reunion experience by both parents and children of two family cohorts. The findings of Study 1 highlighted the role of current technologies in preparing for the upcoming reunion, supporting the demonstration of family interactions upon reunion and reaffirming the family ties in post-reunion. However, certain limitations of current technologies were evident in the case of academic families. These were associated with the lessening of anticipation when in pre-reunion, lack of initial engagement upon reunion and paucity on sharing experiences in post-reunion.

Guided by these insights, this chapter describes Study 2, which aimed to identify the interactional qualities of technologies that support parent–child reunion, with a focus on the limitations of current technologies. To achieve this, Study 2 employed a series of UCD methods distributed throughout a series of design workshops with interaction design experts, children from academic families and other academic family members (as described in Section 3.5). The workshops' outcomes assisted in the design of *Rendezvous*, the first reunion-oriented artefact. Study 2 highlighted the importance of co-creation in pre-reunion, co-engagement upon reunion and co-sharing in post-reunion as key interactional qualities of technologies that focus on supporting this family experience.

This chapter is organised into nine sections. Section 5.2 outlines the objectives and research question of Study 2. Section 5.3 describes the research design of this study in detail, including a thorough account of the design workshops that were conducted. Section 5.4 presents the core qualities of reunion-oriented technologies. Section 5.5 maps these qualities to the *Rendezvous* artefact. Section 5.6 discusses the findings to answer the study's research question, followed by a summary of the contributions of this study in Section 5.7. Section 5.8 includes a critique of Study 2, while Section 5.9 concludes the chapter and situates these findings towards Study 3.

5.2 Study 2: Objectives and Research Question

Driven by the findings of Study 1, the overall aim of Study 2 is to identify the interactional qualities of artefacts that focus on supporting the experience of parent–child reunion. To better address the objective of Study 2, a series of UCD methods were carefully selected and carved to answer the following:

> **Research Question 2:** What are the interactional qualities of technologies that support parent–child reunion?

This research question supports the transition from the theoretical understanding of the use of current technologies in the reunion experience to the knowledge associated with the design of technologies that can better support this experience. Therefore, the answer to this question extends the current understanding of the specific interactional qualities of reunion-oriented artefacts. The next section provides a detailed account of this study's research design, the rationale behind the choice of academic families that participated in this study and the data collection and analysis methods that resulted in the design of *Rendezvous*.

5.3 Study 2 Research Design

This study used a series of UCD methods with the aim to identify the interactional qualities of a reunion-oriented technology (as discussed in Section 3.5). This section describes the overall study design (Section 5.3.1) and the reason for this study being centred solely on academic families (Section 5.3.2). Sections 5.3.3 and 5.3.4 give a more detailed account of the data collection and analysis methods.

5.3.1 Overview of Study Design

One of the key pillars of UCD is the active participation of the user in the design process in the form of creating, shaping and deciding the user-oriented qualities of an envisioned artefact (Wright & McCarthy 2010; Nelson & Stolterman 2012). Design workshops are among the most common techniques that users and designers can collaborate in towards a common goal—the design of an artefact that suits the individuals' needs (Zimmerman & Forlizzi 2014). These come in the form of organised

sessions during which participants and design team members work together as equal partners to further generate potential directions of the design and ideate together towards an artefact. An advantage of the design workshop is the trust and input that is constructed through common activities between the individuals and the designer. The structure of the design workshop needs to be tailored to the expected outcome of the sessions and differs from project to project, depending on the nature of the research question that needs to be answered. Numerous techniques can be used within a workshop. These include collage, mapping, diagramming exercises, card sorting and sketching to name a few (Baskerville & Myers 2015).

In the context of this study, it was decided to conduct a series of design workshops for two reasons. First, to give an opportunity to the participants and designers to think collaboratively about reunion-oriented technologies. Second, to identify the key interactional qualities that a reunion-oriented technology requires, guided by the limitations of current technologies (explored in Section 4.6). There are three series of design workshops (see Table 5-1).

Table 5-1: Design Workshops, Aims and Participant Information in Study 2

Design Workshop	Aim	Participant Information	Data Collection	Data Analysis
Workshop A: Interaction design experts	Produce a series of design sketches based on the key findings of Study 1 through design scenarios	Eight interaction design experts with four years of experience on average	Photos, audio recording, design scenarios, design sketches and observations	Thematic Analysis
Workshop B: Academic children	Generate design sketches using the sketches from the Workshop A as inspiration	Eight children (aged between eight and 12 years old)	Photos, audio recording, design sketches, observations and interviews	Thematic Analysis
Workshop C: Academic families	Member-check the design sketches from Workshop B	Four academic families (total of 12 participants; two had participated in Study 1)	Photos, audio recording, design sketches, observations and interviews	Thematic Analysis

The first design workshop was conducted with the team members and produced numerous design attributes of potential artefacts based on design scenarios. The structure of the scenarios was guided by the key aspects of parent–child reunion that are not well supported by current technologies. A specific set of these attributes was then chosen to elicit design sketches. These sketches were used in the second workshop, in which only academic children participated, as a basis for eliciting enriched design sketches that were more constrained and focused on the academic families. Finally, these designs were presented in a workshop with academic families to select one that suited the needs of both parents and children when in reunion.

Approval for the research was granted by The University of Melbourne's ethics committee (see Appendix B.1) and the participants were recruited through a distribution of a call for participation (see Appendix B.2).

5.3.2 Selection of Academic Parents and Children for Study 2

While both academic and defence family members participated in the previous study, it was decided to conduct Study 2 solely on the academic family cohort. The rationale behind this choice was based on the findings of Study 1 and the logistical issues that were raised prior to Study 2.

First, the preceding study revealed that only academic families experienced the deficiencies of current technologies in augmenting specific aspects of the reunion experience—anticipation for the upcoming reunion, initial engagement upon reunion and sharing experiences and preparing for the next separation in post-reunion (previously discussed in Section 4.6). The inclusion of only academic families in the design study enabled both parents and children of this family type to be involved in the design process of an artefact alongside the interaction design team, with the aim to better support the families' reunion experience. Second, working with defence families underlined the logistical difficulty of this family cohort due to the security issues that were raised by ADF Headquarters. To be more specific, while designing Study 2 (when still in the process of deciding whether to include the defence family cohort), it was clearly highlighted by the ADF that it would not be possible to include these families, as this researcher did not hold the necessary Australian security clearance. Therefore,

Study 2 focused only on academic families—the appropriate choice to constrain the design process of an artefact and to better answer the research question.

5.3.3 Data Collection Methods

In their seminal book on interaction design, Preece, Sharp and Rogers (2015) describe it as a cognitive activity in which creativity and practicality coexist with the aim to create a technology that supports the user's goals. Within interaction design, there exist numerous methods that enable the designer and researcher to collect data to better understand how to design technologies for specific users' needs. In Study 2, a series of design workshops were conducted with interaction design team members and the participating academic families with the aim of collaboratively designing the first reunion-oriented artefact. To achieve this, both design and qualitative methods were used—design scenarios and design sketches, alongside in-lab observations and interviews (see Table 5-1).

5.3.3.1 Workshops' Aims and Participant Information

Study 2 was structured around three workshops with the interaction design team and academic family members (see Table 5-1). Eight (n = 8) interaction design experts (all familiar with this research) participated in Workshop A. The aim of this workshop was to ideate and elicit a variety of conceptual designs based on the requirements that were identified in the first study. Table 5-1 demonstrates that one of the commonalities was the experience that each one had had in design-related projects. Further, Workshop B included the participation of eight (n = 8) children from academic families. Three children (n = 3) were involved in the previous study and were familiar with this research. All children were between the ages of eight and 12 years old and had experienced several reunions throughout the last year. It was decided to invite only children for the Workshop B, as it was essential to be equal participants in the co-design of the reunion-oriented technology (Druin 2009). Finally, four academic families (n = 4) were invited to take part in Workshop C. The aim of this workshop was to eliminate conceptual designs from Workshop B. All family members (father, mother and child) participated in Workshop C. Twenty-eight participants were involved in this study,

including eight (n = 8) interaction design experts, eight (n = 8) children and four academic families (n = 12).

5.3.3.2 Using Design Scenarios to Elicit Design Attributes

A common method used to bridge the transition from user requirements to design attributes in interaction design and HCI research is the design scenario. Carroll (2000) highlighted the importance of a scenario as an informal way to narrate the description of a use case of technology, whereby human activities or tasks are described within a story. This allows for further exploration of the needs, contexts and requirements between design team members and for manifesting and externalising imagined situations that can assist in the conceptual design process (Preece, Sharp & Rogers 2015). Further, Bødker (2000) signified the role of scenarios as a basis for the overall design and eventual implementation and a means of coordination and cooperation among design team members. Within the family context, scenario-based design has been used extensively to inform the design process and bridge the insights from qualitative fieldwork to the eventual design attributes (Dourish 2006; Neustaedter, Harrison & Sellen 2012; Judge & Neustaedter 2015; Sharp, Dittrich & Souza 2016).

Scenarios were employed during Workshop A, with eight (n = 8) interaction design experts invited to participate (see Table 5-2). The development of the scenarios was guided by the findings of the Study 1 that related to the limitations of current technologies in supporting reunion throughout the pre-, upon and post-phases (as expressed by members of academic families, see Table 4-2). There were four scenarios in total, each of which related to the four limitations of current technologies for all reunion phases. Even though there was a clear relationship between each scenario and each concept, the scenario question was left deliberately open to allow for discussion of the possible design attributes (following previous recommendations on the construction of scenarios from Sas et al. [2014]). Figure 5-1 shows a scenario that was crafted with a focus on ideating technologies that can support the sharing of experiences in post-reunion:

For the last one and a half years, you have been working for a large academic institution You live in Melbourne but your family resides in Europe. You have a ten year old daughter and an eight year old son. You see your family twice per year during holidays for no more than a month each time. While away you have access to technologies that mediate separation (Skype etc). It is now time for you to go back to Europe as the semester ends.

Suppose that you could use a piece of technology that would give you the opportunity to share your experiences with your children upon reunion. What would it look like?

Figure 5-1: A Design Scenario

It was decided to exclude any personas throughout the scenarios, as the focus was on the activities and context of use compared to specific attributes of the person and aspects of the personality (in line with Adlin and Pruitt [2010]). However, all the scenarios were personified to the team members with the use of the word 'you' to ensure that they would perceive the selection of the design qualities as a personal lived experience. Each of the designers was given 30 minutes to reflect on their choice of the potential attributes of the design. This was followed by a 30-minute discussion in which 20 design attributes were presented and recorded in post-it notes. After this, the team members spent 30 more minutes discussing the essential attributes that not only encapsulate the main reunion concepts, but could also be envisioned to be appropriated by academic families. The final 30 minutes of the workshop included the selection of the most important attributes and the creation of three designs perceived as most appropriate by the team members. Throughout this process, the discussions of the participants were recorded using audio recorders and the main points captured through photos and written notes. An example of the design attributes produced by Workshop A alongside two of the designs is in Appendix B.3.

5.3.3.3 Creating Low-Fidelity Prototypes with Design Sketching

Another method for collecting data during the design process is the creation of low-fidelity prototypes that can be used in the early stages of development during the formulation of conceptual designs (Lim, Stolterman & Tenenberg 2008). The simplicity of low-fidelity prototypes enables the exploration of different designs and ideas that enrich the design process. In many instances, low-fidelity prototypes are created with the help of sketching. This archetypal tool not only enables design teams to generate designs, but also urges them to think and rethink their outcome (Fallman 2011). In that sense, sketching promotes dialogue between the participants of design workshops, the design and the participant. It acts as the medium of communicating thoughtful ideas that relate to the design itself (Nelson & Stolterman 2012). Further, the activity of sketching and building prototypes encourages reflection in design and ensures a solid incorporation of the design aims into the design process (Schon 1995; Löwgren & Stolterman 2004). Throughout the three phases of Study 2, all participants unveiled their thoughts through design sketching and informed the interactional qualities of reunion-oriented technologies with the help of low-fidelity prototypes.

In the first phase (Workshop A), during which the interaction design experts participated, 20 different sketches were produced. Each of the design sketches related to a design attribute produced by a team member. However, after dialogue between the participants, only three low-fidelity prototypes were selected for the next round of the design process. When these designs were presented in the second phase of Study 2 (Workshop B), the academic children used sketching to present their thoughts about the three low-fidelity prototypes and to construct new enriched prototypes that they felt more appropriate for the academic families. In the last phase of Study 2 (Workshop C), which involved the participation of four academic families, sketching was also used as a validation tool. When each of the low-fidelity prototypes produced by the second workshop was introduced to the academic family members, the members sketched on the produced low-fidelity prototypes and asked each other for opinions. Figure 5-2 presents a series of indicative low-fidelity prototypes for each of the three workshops.

Throughout the workshops, all the sketches generated continuous dialogue among the participants by inviting design ideation and validation of the different low-fidelity

prototypes that were produced. This was a clear manifestation of what Fallman (2003) denoted as the power that a sketch gives to a non-professional designerin fostering dialogue as part of the design process. Low-fidelity prototypes and sketches were yielded throughout the workshops, which enabled researchers, parents and children to think and reflect on the specific aspects that the design should embed to better appropriate the reunion concepts. Two examples of the sketches produced for each of these workshops are in Appendix B.3 and Appendix B.4.

Design Workshop (A)
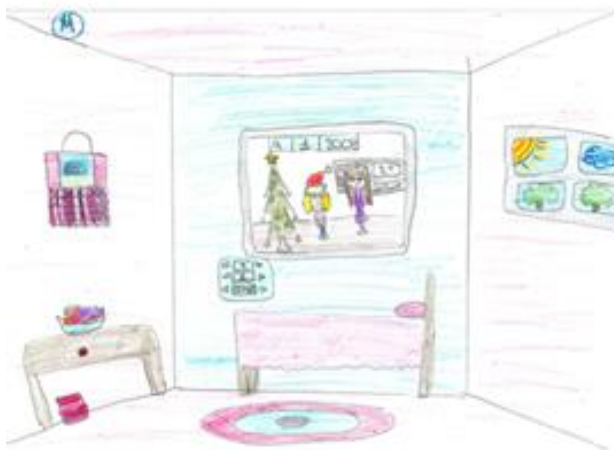
Design Workshop (B)

Design Workshop (C)

Figure 5-2: Indicative Low-Fidelity Prototypes Produced in Study 2

5.3.3.4 In-Lab Qualitative Observations and Interviews

It is common for qualitative methods to be used for data collection within design research. Two of the most widely used qualitative methods are observations and interviews. Rogers (2012) and Preece, Sharp and Rogers (2015) highlight the importance of these two data collection methods in supporting designers to further understand the nuances of the artefacts that users are employing during the production of the conceptual and physical designs. The use of interviews ensures the triangulation of the data collected and, in many cases, can be used throughout the design cycle as a way for the participants to express their opinions about a developed design (Creswell 2012; Zimmerman & Forlizzi 2014). In many cases designers use a combination of observations and interviews when conducting in-lab design activities to capture the thoughts and concerns of the users.

Guided by the previous work, two qualitative data collection methods were used throughout the three workshops that comprised Study 2. During the final workshop, the manner in which the interactional design experts generated the design attributes and design concepts was observed and an unstructured interview conducted to inquire into their choice of a specific attribute to further comprehend their design rationale. During the second workshop, it was decided to walk around the lab space to observe each child's sketches and take field notes without interfering with the children's design process. Previous research has found this approach to be one that enables the designer to capture data more effectively when children are present (Fails, Guha & Druin 2013). However, close to the completion of the children's workshop a series of semi-structured questions were asked that guided the selection of specific sketches that all children considered the most appropriate.

This ensured that the Workshop B outcome was not many different low-fidelity prototypes, but a more constrained number that captured the different children's opinions (thus filtering the designs). In the last workshop, a series of semi-structured interview questions were posed, guided by the designs produced from Workshop B. It was determined that this was the best approach for Workshop C, as it acted as a validation of the designs produced without generating further designs that could diverge from the initial aim of designing an artefact that incorporated the reunion concepts.

Appendix B.5 includes an example of the interview questions as well as fieldnotes that were collected throughout the workshops.

5.3.4 Analysis Methods

With the conclusion of the three workshops that comprised Study 2, the following data was collected:

- twenty (20) different conceptual designs that related to each of the potential design attributes generated from the first workshop
- six (6) different low-fidelity prototypes that were selected as the most appropriate by the participants of all three workshops
- twenty (20) interview transcripts from the participants of all workshops
- personal observations during the workshops written as field notes.

Prior to proceeding with the analysis of the data, each of the data snippets was prepared by recording it and creating an assortment of post-it notes that created a holistic picture of the collected data for each workshop. The data was also searching during this time for any recurring patterns or themes that might emerge (Nicholas & McDowall 2012). Thematic analysis was used, along with affinity mapping that enabled clustering and organisation of the data and produced further insights on the research question that this study aimed to answer.

5.3.4.1 Thematic Analysis through Affinity Mapping

According to Braun and Clarke (2006), thematic analysis is a qualitative analytic method that constitutes of 'identifying, analysing and reporting patterns (themes) within the data. It minimally organizes and describes your data set in rich detail' (Braun & Clarke 2006, p. 16). Thematic analysis is different to grounded theory, in that its aim is not produce a theory, but to provide a rich explanation of the phenomena that are apparent within the data. In that sense, the selection of thematic analysis was reasonable, since it enabled the creation of a detailed picture of the recurring patterns and themes related to this study's research question. The main parts of thematic analysis include the familiarity with the data, the generation of initial codes, the search for themes and the review and naming of themes (Padgett 2016).

It was decided to use affinity mapping for the first part of the thematic analysis. Affinity mapping is commonly used in contextual design, but it can also provide an initial sensitised understanding of the data collected throughout the design process (Beyer & Holtzblatt 1998; Blandford, Furniss & Makri 2016). The main rationale of the affinity diagram is the organisation and grouping of notes that relate to each other in some fashion and emerge from the data. Therefore, familiarity with the data was achieved after each workshop by organising each participant's design concept, interview transcripts and this researcher's observations in a card that related to the participant. In the first stage, there were 20 different cards organised per workshop (eight for the first one, eight for the second one, and four for the last one). Once these cards were complete, the generation of initial codes per workshop was commenced. The analysis of each workshop's cards produced codes that were alike to some extent. All the workshops generated 45 codes. The next step was the search for a categorisation scheme across the codes.

This resulted in the identification of six qualities that the participants felt the reunion-oriented technology should have. The qualities were clustered into three themes, guided by the findings of Study 1 and the way that the design qualities addressed these findings: co-creation of content, metaphorizing reunion and inspiring co-sharing. Each of those themes had specific codes. The analysis was conducted on paper, without the use of any computer-assisted software, as this was easier to reflect on when conducting the actual analysis process and helped to build a holistic picture of the data collected (in Appendix B.6). Section 5.4 discusses in further detail each of the themes that were produced during the design workshops that help in the incorporation of the reunion concepts of Study 1 into the artefact that was produced in Study 2.

5.3.4.2 A Note on the Reporting of the Data

As in Chapter 4 (Section 4.4.4), direct quotations of the raw data excerpts are indented and italicised. The names of all participants have been changed to protect their privacy and participants are referred to with a combination of keywords and digits. For example, 'designer1' is the first designer who took part in the interaction design workshop. 'Interview' or 'field note' and a workshop keyword ('IxDWorkshop',

'ChildrenWorkshop' or 'FamiliesWorkshop') are used to denote the kind of source of which the data excerpt is a part.

5.4 Interactional Qualities of Reunion-Oriented Technologies

The analysis of the data collected during the design workshops yielded six interactional qualities that were considered essential when designing technologies aimed to support parent–child reunion. Table 5-2 provides an overview of the findings of this study.

Table 5-2: The Interactional Qualities of Reunion-Oriented Technologies

	Pre-Reunion	**Upon Reunion**	**Post-Reunion**
Major Themes	*Stimulating Co-Creation (§5.4.1)*	*Motivating Co-Engagement (§5.4.2)*	*Inspiring Co-Sharing (§5.4.3)*
Sub-Themes	• Uniform contribution of digital content • Selective postponement in the display of content	• Materialistic representation of co-engagement • Gifting as the pathway towards content exchange	• Affording novel approaches in co-sharing • Fostering reflection on the value of being together again
Limitations of current technologies (as identified in §4.6)	• Lack of anticipation	• Lack of initial engagement	• Lack of sharing experiences • Lack of preparation for the next separation

As seen in Table 5-2, the interactional qualities were clustered into three main themes that related to each of the reunion phases.

In the pre-reunion phase, the theme of stimulating co-creation of content emerged from the data collected throughout the design workshops. This theme referred to the importance of creating and producing digital content together while approaching reunion. It unearthed the importance of uniform contribution of digital content from all family members while postponing the display of the content until the eventual reunion. The underlying rationale of this theme was constructed to address the failure of current technologies to support anticipation during the pre-reunion phase, as identified in Study 1 (see Section 4.6.1).

In the upon reunion phase, the theme of motivating co-engagement highlighted the need for a reunion-oriented technology to consider the importance of initial engagement during the first moments of reunion. This theme encapsulated the design qualities of representing engagement with the use of objects and employing the concept of gift exchange as a metaphor of the digital content exchange. This theme was associated with the sparseness in initial engagement of current technologies in the upon reunion phase as identified in Study 1 (see Section 4.6.2).

In the post-reunion phase, the theme of inspiring co-sharing underlined the value of sharing content together after the reunion has occurred to strengthen the parent–child bonds. Throughout the workshops, it was essential for the envisioned reunion-oriented technology to afford novel approaches in co-sharing content between parents and children. Further, it was necessary for parents and children to reflect on the importance of being together again with the use of the technology. This theme addressed the paucity in sharing of experiences and the lack of preparation for the next separation regarded as an important limitation of current technologies as found in Study 1 (see Section 4.6.3).

The following sections provide a detailed discussion of these three themes with a focus on the specific design qualities of the reunion-oriented technology that emerged from the design workshops.

5.4.1 Stimulating Co-Creation of Digital Content in Pre-Reunion

> *I think that a way to make everyone in the family feel the importance of anticipation is to create stuff together while apart yet without knowing what it is until we reunite (mother2, FamiliesWorkshop, interview, lines 56–59).*

In the Study 1, it was found that an implication of the current use of technologies while in pre-reunion was the dilution of anticipation (Section 4.6.1). Specifically, most academic families that participated in the first study felt that the sentiment of anticipation was diluted due to the presence of communication technologies in pre-reunion and the way that these technologies were used by academic family members.

Within Study 2, the theme of stimulating co-creation of digital content described the set of qualities that a reunion-oriented technology aims to have to address the limitation of current technologies. This theme was composed of two significant qualities of the

envisioned technology. The first related to the creation of digital content by all family members while physically apart, yet close to the upcoming reunion (uniform contribution of digital content). The second referred to the delay in viewing the created content until the reunion eventually occurs (postponement of the display of content). These two key findings will be described further in the following sections.

5.4.1.1 Uniform Contribution of Digital Content

One of the key facets of the envisioned reunion-oriented technology was the uniform contribution of digital content during the pre-reunion phase. This technology attribute was relevant to the significance of creating digital content by all family members (e.g., photos or video) while being physically apart.

During the first design workshop, during which the interaction design experts were presented with a scenario that related to the lack of anticipation of current technologies, numerous participants highlighted the importance of ensuring that the process of creating content while in pre-reunion is a uniform one:

> *Throughout the session today, the team members talked about how important is to make sure that the technology affords the family members to create content in a uniform manner. They agreed that the difference between the current technologies and the envisioned one is the way with which the uniformity will be stimulated. All the conceptual designs presented different ways addressing this aim (IxDWorkshop, field note, lines 136–142).*

When the design workshop with academic children commenced, the significance of uniform contribution was evident:

> *I would like to be able to draw or create stuff for my dad and he can also do that. Mum can help either me or dad or she can create her own stuff. That would be awesome (child1, ChildrenWorkshop, interview, lines 26–29).*

The continuous discussion among the children emphasised the difference in views between the children and the previous workshop participants on the potential design:

> *When I presented the conceptual designs from the previous workshop to the children, they immediately showed their interest to them but still did not feel that they were what they wanted. Then, they put their creativity at work and 'twisted' certain characteristics of the previous ones. They, then, agreed on*

two designs that they felt they were appropriate (ChildrenWorkshop, field note, lines 41–47).

In the last workshop, the two conceptual designs created in the children's workshop were presented to the participating academic families. Three of the four families' interest was directed towards one concept. That concept included the presence of a box into which all family members can put digital content using a mobile phone or a website. The father of family 2 noted:

I really like the idea of having a box where all the family members can put their thoughts, pictures or anything else with a digital or physical way. This does not only allow for all of us to send stuff to the box wherever we are, but also it [the box] is like a symbol of what we are going through (Father2, FamiliesWorkshop, interview, lines 31–37).

Finally, the mothers and children of the academic family workshop highlighted their appreciation in having a material artefact that can enable all members to create their understandings of being physically apart. The uniform contribution of digital content was one that all the participants found essential for the envisioned technology to enable all members to create content that can act as a basis for the upcoming reunion.

5.4.1.2 Selective Postponement in the Display of Content

While in pre-reunion, the second quality that characterised the future reunion technology was the postponement of the display and subsequent viewing of content. Current technologies give the opportunity to family members to mediate their experiences instantly (Neustaedter, Harrison & Sellen 2012; Heshmat et al. 2017). However, even though that characteristic of current technologies was appreciated by the workshop participants, they also challenged its presence in a reunion-oriented technology.

The design scenarios that were introduced in the initial workshop with the interaction design experts yielded numerous questions about the timing of the display of the content, despite all of them agreeing that each family should be able to contribute while they were apart:

> *While chatting about the uniform creation of content by all family members, a couple of the team members noted that the technology should also make an explicit statement about the viewing of this content. When should it be viewed? During the pre-reunion, upon reunion or after the reunion? (IxDWorkshop, field note, lines 361–366).*

The issue of the display of the content was difficult for the team members to address without the presence of the potential users of the technology. However, they all noted its significance and probable implication on the overall experience of reunion. Following the identification of this quality by the interaction design experts, the participating children in the second workshop were questioned on their opinion. This inclusion to the design of technology was regarded as peculiar, but at the same time as playful:

> *Wow. That's weird. Why would I not use the phone to send him something at once? well even if I select say something for him to be seen later that could be interesting. But I have never seen something like that (child2, ChildrenWorkshop, interview, lines 81–86).*

> *I think it will be like a game. I will select some photos that I do not want to send him now and since he will not know which photos I selected he can see them later. It is like hide and seek with photos (child3, ChildrenWorkshop, interview, lines 63–66).*

Throughout the children's design workshop, most of the participants could not envision a conceptual design in which this specific quality would be included. However, all children were encouraged to imagine of a potential aspect of this technology in which this quality would be presented. The elicited designs ranged from rather creative ones (e.g., the 'magic carpet'—see Appendix B.4 Children's Workshop Design Sketches in Study 2) to simpler ones (as in the case of locking the mobile phone with a code that only its user knows). Even though the idea of having a box was clear, participants were unsure as to how include the postponement in the display of content. Therefore, prior to proceeding with the family workshop, I decided to not pursue (at this point) the identification of a specific design that was linked to this quality, but rather to seek the different views of the participating families that related to the potential value of designing an artefact that included the selective postponement of the display of content.

The families who participated in the last workshop designated the innovative element of having a technology that can support this quality:

> *It is definitely something that I have never thought before. It kind of stops the time as I can select what to share with the kids and [name of wife] when I see them. I cannot see how you can put this in a technology but I like the idea (Father3, FamiliesWorkshop, interview, lines 79–83).*

Further, family members described the importance of having a technology that can afford this quality since it had the capability to further augment the reunion experience:

> *I think that if there was something like that around, then it would give me a different view of our reunion. I would be like gathering stuff before our reunion to show it to them when we come together (Mother4, FamiliesWorkshop, interview, lines 46–49).*

Nevertheless, in all cases, there was not a comprehensible approach on the actual design that this conceptual quality might have. It was clear, though, that the addition of this quality was an essential one when aiming to address the lack of anticipation during pre-reunion. Section 5.4.2 provides a description of the second theme that directed the design of the reunion-oriented artefact (motivating co-engagement upon reunion).

5.4.2 Motivating Co-Engagement upon Reunion

> *I think that the 'reunion-oriented technology', as you call it, should somehow allow for us to find again the excitement that we used to feel when he returned. We do feel excited, don't get me wrong, it is just different and something that can remind us how it used to be the first time would be fantastic (mother1, FamiliesWorkshop, interview, lines 165–169).*

One of the previous study's findings, which related to the implications of current technology use upon reunion, was the sparseness in the initial engagement as experienced by the academic families. Within Study 2, it was necessary for the envisioned reunion technology to address this issue in the upon reunion phase. The data collected throughout the workshops with the indicated that the future technology needed to motivate the engagement of all family members upon reunion. This referred to the active participation of both the at-home and returning members in the first moments of the reunion experience. This theme was described by two important aspects that also were considered qualities of the reunion-oriented technology: the materialistic

representation of engagement; and the importance of using the concept of gifting as a metaphor of digital content exchange. This is described in detail in the following sections.

5.4.2.1 Materialistic Representation of Co-Engagement

This quality of the potential reunion-oriented technology referred to the significance of motivating the sense of co-engagement through the materialistic representation of this reunion attribute. The word 'materialistic' is used to signify the necessity for a material artefact to embody the sentiment of engagement for all family members.

The participants in the interaction design experts workshop, upon being presented with one of the design scenarios that spoke to the sparseness of initial engagement, highlighted the value of using technology to symbolise the feeling of co-engagement:

> *You know, I think that engagement upon reunion is something that family members might take for granted. I know that in my case this happens and I can somehow identify with what the scenario. I feel that the technology should address that—well, in fact it might be that this is a component of the actual technology (designer3, IxDWorkshop, interview, lines 265–270).*

The general sense in the interaction design experts workshop was that somehow the co-engagement upon reunion necessitated a greater attention from the envisioned technology. The conceptual designs that were created during this workshop provided initial demonstrations of how the co-engagement could be afforded by the technology. For example, designers talked about the existence of a 'proxy-dad': a full-size replica doll of the father who is away that upon the return of the loved one, would be replaced by the real father. Even though this was considered an 'extreme' example of a potential technology, it indicated the direction towards having a technology that focuses on co-engagement upon reunion.

During the children's workshop, it was apparent that one specific design that attracted the attention of the children was the box:

> *This box idea, that we talked about before, is something that I really like. I can see for sure that I will be much more interested to see what happens when dad returns and the box is there. Not sure what it might be but it is for sure interesting! (child7, ChildrenWorkshop, interview, lines 48–52).*

Children expressed their interest in having an object around the home that can enable them alongside their parents to experience the first moments of reunion in a different way than before. However, during the workshop, there was no clear pointer on how the box idea could be extended—or even if that was possible—to include the sense of co-engagement. While preparing for the families' workshop, and after discussions with other researchers, I had several ideas of how co-engagement could be manifested with the box. At the academic families' workshop, I presented the idea of the box and the different approaches to the materialistic representation of co-engagement.

All participating family members leaned towards the concept of having a box locked and unlocked with the presence of a physical key:

> *Yes! I really like the idea of having a key for the box. Not sure when you can use it, maybe somehow time the box, the key and the reunion, but I do know that it would certainly influence our coming together and, obviously, the first moments of our reunion (mother4, FamiliesWorkshop, interview, lines 136–141).*

> *Indeed, I agree. It is very different to what we are used to so it will for sure bring a change on how we experience either before or after coming together (father4, FamiliesWorkshop, interview, lines 98–101).*

The idea of having a key for the box resided as an essential one within all the participating academic families. They all highlighted the difference that not only the presence of the box but also the existence of a key would make in sensing and experiencing the first moments of reunion.

Overall, the materialistic representation of co-engagement was a design quality that was considered essential from all the participants when designing a reunion-oriented technology. By creating an object representation of the engagement sentiment upon reunion (through the potential use of the key) the participants felt that it could better address the sparseness in the initial engagement that was provoked by current technology use upon reunion.

5.4.2.2 Using Gifting as a Metaphor of the Upcoming Digital Content Exchange

Another design quality that was visible under the theme of motivating co-engagement upon reunion was the use of gifting as a metaphor for the digital content exchange. As discussed in Section 4.5.2, one of the common aspects across all families was the exchange of gifts upon reunion. Within the design of a reunion-oriented technology, participants felt that the concept of gifting could be extended to encompass the potential digital content exchange to motivate the co-engagement upon reunion.

Throughout the design workshop with the interaction design experts, most of the conceptual designs revolved around the concept of gifting upon reunion. The significance and prospective use of this concept in the design of a reunion-oriented technology was visible from the early stages of the workshop. The main agreement between the workshop's participants was that gifting should somehow be instantiated in the design of the reunion artefact.

> *It seems that all the potential technologies have gifting at their core. One design talked about the use of dolls that can capture somehow the memories of being apart from the side of the father and then upon reunion offer the doll as a gift to the child that would slowly discover the memories that his/her father created. That is interesting but still something that I do not have concrete evidence that might be considerate appropriate by the parents and children (IxDWorkshop, field notes, lines 241–248).*

Following this workshop, the presentation of this idea to the participating academic children stirred a lot of enthusiasm. In fact, children immediately accepted the notion of having gifts upon reunion, which was expected. However, when queried about the idea of using the gifts as an inspiration for the exchange of digital content that was captured in pre-reunion, a sense of bafflement was apparent in the design room:

> *What do you mean? So instead of receiving a real gift I will receive something that is not real? (child8, ChildrenWorkshop, interview, lines 56–58).*

After a thorough discussion, children indicated that if such a technology did exist, whereby the exchange of the digital content resembled the one of gifting, then it would be interesting to see and use. The vagueness that surrounded the children's design workshop was cleared when the academic families workshop was conducted. During

this workshop, the idea of using the gift as a metaphor for digital content exchange upon reunion was presented and most of the families agreed that the presence of the box and the key were the best approach to instantiating this:

> *Since you have the box and the key, that we talked about before, what I think would be fantastic is to somehow bring those two together. There could be a locking/unlocking of the box that would be connected to gifting (mother2, FamiliesWorkshop, interview, lines 101–105).*

The sense of using the key to unlock or lock the box presented an ideal instantiation of the gifting concept. Upon a reformulated proposal of the potential link between the two aspects, the participating families indicated that the parents and children could lock and unlock the box that included the digital content gathered by the family members throughout pre-reunion. In that way, the opening and closing of the box resembled the practice of exchanging a digital gift since the at-home and away family members would have no idea of the nature of the content that was stored in the box.

Overall, the concept of using gifting as a metaphor for the digital content exchange upon reunion was considered one of significance by all the participants of the design workshops regarding motivating co-engagement. Specifically, the participants foregrounded the importance of the box, key and digital content in being combined to represent the usual practice of gifting in an unorthodox way. Section 5.4.3 describes the last theme that emerged from the design workshops: inspiring co-sharing in post-reunion.

5.4.3 Inspiring Co-Sharing in Post-Reunion

> *I surely think that since we are not really sharing our experiences after he comes back, something that could inspire us more to do so would be ideal. Maybe a new technology would just allow us to rethink the nature of our family (mother4, FamiliesWorkshop, interview, lines 185–189).*

One of the main findings of Study 1 was the paucity in the sharing of experiences between the family members in post-reunion (Section 4.6.3). To that extent, one of the requirements for the reunion-oriented artefact was to address this specific limitation of current technology use that was apparent within academic families. Throughout the design workshops, the participants demonstrated different aspects of the envisioned

technology that resided under the theme of inspiring co-sharing in post-reunion. It was clear that post-reunion necessitated the co-sharing of thoughts, experiences and values among all family members. Co-sharing involved the process and activity of not only sharing together but also aiding each other to further understand the significance of sharing. This specific quality of the future reunion technology encapsulated two basic threads: affording novel approaches in co-sharing and reflecting on the value of being together again. The following sections investigate these reunion technology attributes.

5.4.3.1 Affording Novel Approaches in Co-Sharing

One of the most important qualities of technologies that focus on parent–child reunion was their ability to afford novel approaches in co-sharing. That was one of the most clearly outlined facets of the technology throughout the design workshops. Most participants felt that the current technologies lack significantly in adopting or fostering this quality.

During the interaction design experts workshop, the team members while engaging in the discussion that surrounded the design scenarios highlighted the noteworthiness of the technology to create new grounds for sharing experiences among family members when in post-reunion:

> *Six of the designers clearly stated the need for the technology to reconfigure and change the landscape of how the sharing of experiences occurs after the family reunites. The other designers agreed but there was a clear dichotomy on how this could be actually instantiated in the technology—many talked about the use of 'futuristic' tools and others felt that simpler tools that could support a different way of being appropriated was the right direction (IxDWorkshop, field note, lines 201–208).*

Even though there were numerous designs created by the interaction design experts workshop, all of them mapped different ways with which a novel approach to co-sharing could be afforded. With the commencement of the second workshop, when these designs were presented to children, the discussion that they elicited created a series of different understandings of how the co-sharing could be supported in post-reunion. Most of the children depicted the role of the technology to promote playful interactions:

How awesome it would be if after dad comes home, there is like this game that as it slowly goes on we get to find out of the cool things of his trips and he can also do this with us. Like imagine an Xbox kind of game that we get to play only when he comes back (child3, ChildrenWorkshop, interview, lines 92–96).

This specific view that children had inspired a series of new conceptual thoughts that had the opportunity to become a potential technology. The discussion with the children unveiled also the importance for the sharing of experiences to occur in a way that could also attract children's interest.

In trying to refine the different designs, prior to beginning the concept validation family workshop, I chose two designs (the box and the storyteller—a tablet-based system that shows photos of all family members while they are apart) to use prompts for discussion with the participating families. Even though they initially indicated their preference for the box, the families also suggested to somehow bring the storyteller inside the box too:

I think it would be a really nice idea if you could put the tablet inside the box. The box can be locked and when it opens, the tablet will show something— maybe pictures in a game-like manner (father3, FamiliesWorkshop, interview, lines 81–85).

The families agreed with that view, and supported the idea of visualising the content in the tablet in different ways to be more playful. The obvious sense was that the box alongside the key and the storyteller-like tablet would create a prosperous ground for the family members to share their thoughts and experiences while in reunion.

The apparent feeling across all workshops was that the reunion-oriented technology necessitated affording a novel approach in co-sharing of experiences, thoughts and values among the reunited parents and children. To accomplish this, the participants indicated their preference for having a storyteller-based system that is included in a box that also is locked and unlocked according to the frequency of the reunion experience.

5.4.3.2 Fostering Reflection on the Value of Being Together Again

A further design quality of the reunion technology that could inspire the co-sharing in the post-reunion phase was the fostering of reflection on the importance of being together again. This additional quality emerged from the talks with the participants of

the workshop and related to the ways with which the artefact could better support parents and children in understanding the value of being reunited once more prior to their next separation.

All through the interaction design experts workshop, the design team members underlined the uniqueness of the reunion-oriented technology in encouraging family members to reflect their reunion after they had experienced it:

> *Listening to the participants of this workshop, I can clearly see that one of the most important attributes of the reunion-oriented technology is to enable parents and children to reflect on the value of their reunion. The response of all the designers to the concept scenario I presented was uniform in having the technology supporting this (IxDWorkshop, field note, lines 221–227).*

The way with which family members could reflect on the value of reunion using technology instigated numerous interpretations from the participating team members. The most prevalent feeling was that the technology should somehow support the narrative interaction between family members through the elicitation of digital content material (that was gathered in pre-reunion). During the second workshop, this concept was presented to the children and they all agreed that this is ideal since they felt that there were instances it was tedious for them to be using the same kind of technology after they reunite with their parent:

> *Yes, I like this. Sometimes it just gets very boring to chat about the same stuff while looking at photos. It is ok but it is just really boring (child1, ChildrenWorkshop, interview, lines 79–81).*

There was no clear understanding of the nature of the technology that could be employed to support the reflection of being reunited (apart from the usual approach that photos create). However, in the third workshop, the participating families denoted the role of the box and storyteller combination to further establish a deeper interpretation and reflection of reunion for all family members:

> *I think that the box and the storyteller combined can bring a different lens to not only how we interact but also what we talk about and therefore the whole reflection that goes on with our situation (father3, FamiliesWorkshop, interview, lines 92–95).*

Upon further discussion among the participating families on how the box and storyteller combination could enable parents and children to reflect on their value of being together again, it was clear that the digital content that would be stored while in pre-reunion and become visible in post-reunion would the main pointer to directing and supporting the family dialogue. The parents of the families that participated in the last workshop felt that in this way, the richness of the interaction between the family members could be better supported because it would elicit further reflection on what it means to be reunited.

Overall, the design quality of fostering reflection on the value of reunion was regarded as an essential one by all participants since it enabled family members to think more deeply about the significance of reunion. Like the previous quality (affording novel approaches in co-sharing), the best approach to a reunion-oriented technology that the participants felt ideal to address the limitations of current technologies was a combination of the box, key and storyteller. Section 5.5 describes in detail how each of the findings is mapped to *Rendezvous*, the first reunion-oriented artefact.

5.5 From Interactional Qualities to *Rendezvous*

The interaction design expert, academic children and academic families' workshops highlighted a series of interactional qualities that guide the design of reunion-oriented technologies. These qualities were:

- stimulating co-creation of digital content in pre-reunion (as described in Section 5.4.1)
- motivating co-engagement upon reunion (as described in Section 5.4.2)
- inspiring co-sharing in post-reunion (as described in Section 5.4.3).

This section describes the rationale that informs the mapping of these qualities to the design of *Rendezvous*. This commences with an overview of *Rendezvous* (Section 5.5.1) followed by an explanation of how each quality is mapped to the artefact (Sections 5.5.2, 5.5.3 and 5.5.4).

5.5.1 An Overview of *Rendezvous*

The design outcome of Study 2 is *Rendezvous*, a physical artefact (lockable wooden box) with a digital component (Tablet). *Rendezvous* comprises a wood-crafted box, a key and a small tablet. It is inspired by the discussions throughout the design workshops alongside the previous work by Thieme et al. (2011). Figure 5-3 presents each of *Rendezvous*' parts. The box has a size of 17 x 19 x 12 centimetres and contains two compartments. The tablet resides in the left compartment, whereas the right one was left intentionally empty to allow for future improvements. A local Melbourne artist not only assisted in building additional boxes but also provided additional creative input in the form of recommendations for the choice of wood as the proper selection of water-resistant material for the key base. A significant attribute of the box is the unique key that associates with the locking and unlocking of the two compartments. Each of the families are presented with a key and a box (and therefore a tablet), which can be situated within the premises of the location of the household (e.g., kitchen, living room or children's room).
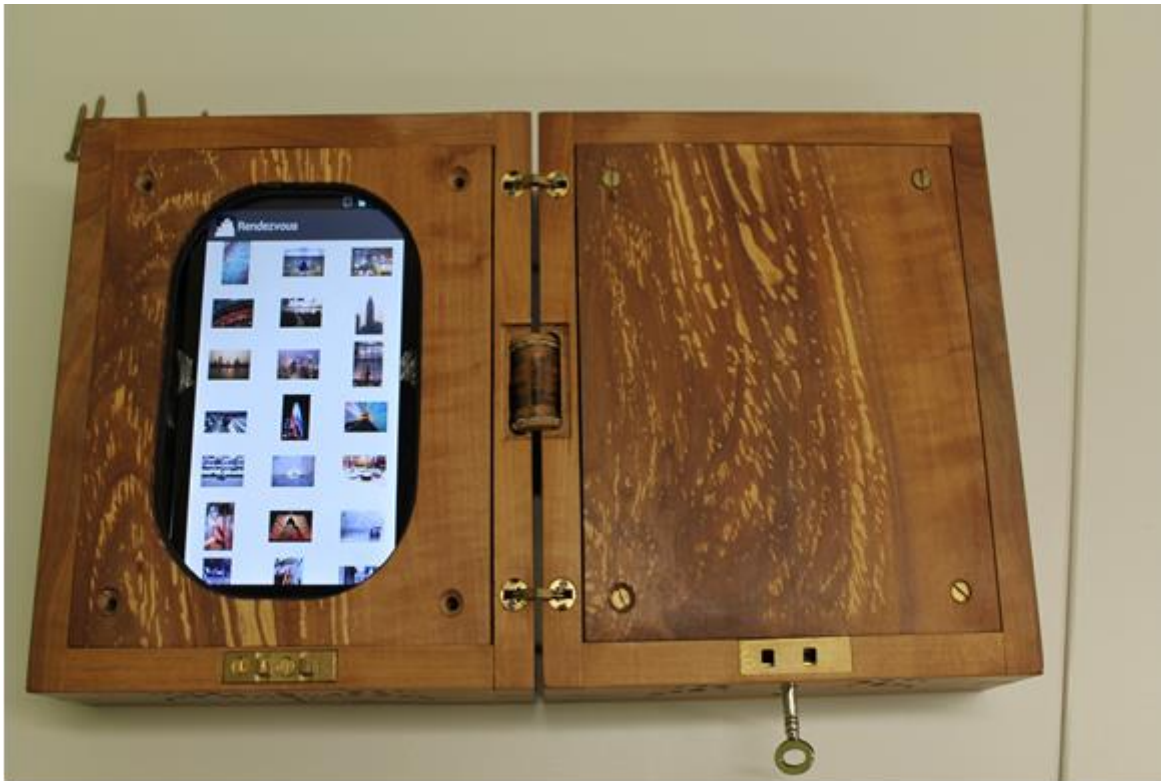
Figure 5-3: The *Rendezvous* Artefact

Rendezvous works as follows (Figure 5-4). Prior to the expected physical separation, the parent who leaves the household locks the box and takes the key with him or her. While being physically apart and most importantly in pre-reunion, each of the family members (father, mother and children) can use the provided mobile-based software application to capture and send digital content to the box that is in the family home. Parents and children can choose to submit photos, video and text messages of their daily life. Every time that something is sent to the box a digital sound—selected from a series of sounds or co-produced by the family members—is played from within the box signifying the arrival of content to the box. Families are encouraged to use their normal means of interaction through their desired communication channels while being physically apart.

While in **separation**, family members use the mobile app or email to send content to the cloud.

Data

Notification

Notification

A predefined ambient sound (from the family members) also notifies that someone sent content

Database

While in **reunion**, family members use the standalone application to view the digital content. They can also upload content captured when in reunion.

Data

Data

Figure 5-4: *Rendezvous* **Architecture**

However, at the same time, all family members can send any content they desire to the box without revealing its nature to the other family members. The eventual return of the parent (upon reunion phase) marks the unlocking of the box since he or she is the only one who has the key. After the first moments of reunion (post-reunion), when the box is opened, the *Rendezvous* application in the tablet (that resides in physical box) initiates automatically and all the collected content from all members of the family is presented either chronologically, per family member (father, mother, child) or randomly. Each of the family members can select how they wish to view the content and, therefore, co-direct discussion that is instigated by the content itself. While the whole family is reunited, the box remains open and prior to yet another separation, the same approach is followed again. Appendix B.7 describes in further detail *Rendezvous'* user interface for both the mobile as well as the standalone application.

5.5.2 Mapping Stimulation of Co-Creation to *Rendezvous*

The first design quality that guided the design of *Rendezvous* was stimulating co-creation of digital content in pre-reunion. The design workshops underlined the necessity for the artefact to support uniform contribution of content by all family members while in pre-reunion and the selective postponement of the display of this content.

Regarding the first attribute, the presence of the different mobile applications enabled parents and children to individually submit their chosen content to the *Rendezvous* box. The individual character of content submission to a material repository paved the way for the uniform contribution of content by all family members. Further, the selective postponement in viewing the content was mapped to the existence of the *Rendezvous* key. The locking of the box, which was timed with the absence of the parent, indicated that the content that was sent to the *Rendezvous* box could not be visible until the return of the loved one. Both attributes were portrayed in the *Rendezvous* artefact to stimulate the co-creation of content in pre-reunion.

5.5.3 Mapping Motivation of Co-Engagement to *Rendezvous*

The second design quality that related to upon reunion was for the artefact to be able to foster the co-engagement of the family members in their first moments of reunion. Along those lines, the design workshops demonstrated the importance of the materialistic representation of engagement and the use of gifts as a metaphor of the upcoming content exchange. These attributes were mapped to *Rendezvous* using the key and the concept of locking and unlocking the box.

The key, within the *Rendezvous* artefact, was more than an object with a functional purpose—to open the box. It had a symbolic meaning that epitomised the significance of engagement of the family members in their reunion through the act of opening the box. Further, the actual locking and unlocking of the box was inspired by the concept of gifting. In most cases, the content of gifts is unknown to the recipient. Similarly, with the locking of the box, the content of what was sent was undisclosed to all family members. For example, only the person who sent the photo knew what it encapsulated

and the message that it carried for the other family members. At the same time, the unlocking of the box embodied the act of offering the gift to the loved ones. In that sense, a new form of gifting occurs upon reunion—one that is influenced by material gifts and includes digital ones. These two specific aspects of *Rendezvous* (key and the locking and unlocking) manifested the quality of motivation of co-engagement upon reunion, which addressed the desire of family members to feel more engaged in their first moments of their reunion experience.

5.5.4 Mapping Inspiration of Co-Sharing to *Rendezvous*

The third design quality highlighted throughout the design workshops was the necessity for the reunion-oriented technology to inspire co-sharing of experiences in post-reunion. To achieve this, it was important for the artefact to be able to afford novel approaches in co-sharing and to foster reflection of being together again. These attributes were mapped to *Rendezvous* through the visualisation of content that the family members experienced after opening the box.

The presence of different ways with which the content was viewed afforded a new approach of co-sharing each member's understanding of what was visualised. For example, the choice of observing the content based on who created it (father, mother or child) allowed for family members to unveil their inner thoughts of the experiences gathered while being apart. Most importantly, the presence of different choices with which the content could be viewed enabled parents and children to discuss their thoughts with each other. By inspiring the nature and structure of the emerging discussions parents and children could reflect on the significance of being physically together again. In that way, *Rendezvous* provided a re-imagination of the co-sharing practices that surrounded the post-reunion phase and inspired new understandings of how these practices could be conducted in a way that encouraged all family members to share their inner experiences.

5.6 Discussion

Study 2 aimed at better understanding the interactional qualities of technologies that support parent–child reunion. The research question that guided this study was:

> **Research Question 2:** What are the interactional qualities of technologies that
> support parent–child reunion?

Section 5.4 described these qualities, which emerged from a series of design workshops with interaction design experts, academic children and academic family members. The six qualities were structured around three overarching design attributes, which related to the three phases of reunion based on the interpretation of reunion by Moss and Moss (1988) and Diamond and Hicks (2008): stimulating co-creation of digital content in pre-reunion, motivating co-engagement upon reunion and inspiring co-sharing in post-reunion.

Current HCI and CSCW research has investigated the co-design process of technologies that support parent–child interactions either while physically separated or in the same physical space (Druin 2009; Isola & Fails 2012; Fails, Guha & Druin 2013; Sas et al. 2014). Study 2 builds upon these works and describes the design rationale—which I interpret as a set of psychological claims that are embodied in an artefact (Lee & Lai 1991; Bietti, Baker & Détienne 2016; Fan, Antle & Cramer 2016)—of the first reunion-oriented technology.

Each of the three subsections below elaborate on how the key findings extend the current literature. Section 5.6.1 discusses the significance of the co-creation of content in pre-reunion by underlining the value that the uniform contribution of digital content and the selective postponement in the display of content add to the design of an artefact that aims to support family reunion. Section 5.6.2 further examines the importance of encouraging co-engagement upon reunion as a fundamental aim of a reunion artefact, which is based on the tangibility of the technology and the strength of the concept of gifting. Finally, Section 5.6.3 highlights the importance of inspiring co-sharing of experiences in post-reunion as a key attribute of a reunion-oriented technology and,

specifically, foreground the gravity of affording novel approaches in co-sharing and fostering reflection on being together again.

5.6.1 The Significance of Co-Creation of Content in Pre-Reunion

The first interactional quality of a reunion technology that resulted from the design workshops was for the envisioned artefact to be able to support the co-creation of content while parents and children were physically apart but close to the eventual reunion. In the current literature, a plethora of efforts from HCI researchers and practitioners have been undertaken in better understanding the design of technology that empowers family members to foster and preserve their sense of family. Regarding the pre-reunion phase, the closest body of work that this study contributes to is the one on co-designing technologies that support the physical separation between family members (Judge & Neustaedter 2015).

One of the key findings of the design workshops regarding the pre-reunion phase was the necessity for the artefact to afford a uniform contribution of digital content by both the parents and children. As discussed in Section 5.4.1, the academic children and parents considered it vital to be able to capture and contribute their own digital content (photos, videos or text) to a central and physical repository while they were in pre-reunion. This process entailed not only a simple click and drop step, which has been used extensively in works focusing in enriching intimacy in family members that are physically apart (Counts & Fellheimer 2004; Kaye 2006; Branham, Harrison & Hirsch 2012; Patil et al. 2016; Wagenknecht 2017), but also the need for each family member to thoughtfully select their own content with or without the assistance of the other one. This was very close to the design of two previous artefacts—eKISS and Lover's Box. In the eKISS system children could capture photos and share them asynchronously with their parents through a picture blog (Dalsgaard, Skov & Thomassen 2007). Conversely, the Lover's Box provided the opportunity to partners—and not children—to collect instances of their daily lives and deposit them in a physical box (similarly to *Rendezvous*, which was heavily inspired by Lover's Box) (Thieme et al. 2011). However, the main difference with those two works was the sense of uniformity that encompassed the contribution of digital content in *Rendezvous*. Both parents and children could contribute content in a two-way manner. In that way, *Rendezvous* aimed

to encourage higher engagement and more democratic interaction in pre-reunion since both parents and children could provide personal views on how their experience while apart but close to their reunion.

An essential facet of the reunion-oriented artefact was the selective postponement in the display of content. Parents and children were encouraged to contribute their own palette of digital photos, videos or texts to *Rendezvous* but they were not able to share it with each other until the upcoming reunion. This intentional delay in the viewing of digital content is an attribute that differs significantly from the way that current works in HCI approach designing synchronous or asynchronous technologies for family interaction. In particular, research that investigates the role of synchronous technologies in supporting parent–child interactions while physically apart highlights the value of instant viewing of the content as a way of fostering the relationship between parents and children, such as video (Ames et al. 2010; Kirk, Sellen & Cao 2010; Follmer et al. 2010; Raffle, Mori et al. 2011; Neustaedter & Greenberg 2012; McClure et al. 2015; McClure & Barr 2017) or through other tangible artefacts (Vetere et al. 2005; Bonanni et al. 2006; Teh et al. 2009; Vetere et al. 2009; Zhang et al. 2016). Further, the works that explore how asynchronous technologies support parents and children while physically distant underline the value of being able to view the content while responding when still in physical separation (Bentley, Basapur & Chowdhury 2011; Raffle, Ballagas et al. 2011). The specific attribute of the selective postponement in the viewing of the content, which characterises a reunion-oriented artefact, extends these works by positioning in the epicentre of the interaction the thoughtful selection of the photos, videos or texts that parents and children create for each other. In that regard, the technology becomes a platform for supporting a more enriching reunion contrary to one that aims to support only the physical distance between the parents and children.

5.6.2 Shifting Focus to Encouraging Co-Engagement Upon Reunion

The second interactional quality of a reunion-oriented artefact, which was a key finding throughout the design workshops, was motivating the co-engagement between parents and children upon reunion. The two qualities that were unveiled during the workshops were the materialistic representation of co-engagement and the use of gifting as a metaphor for the reunion. The first one refers to the importance of the artefact's form

and material in supporting the engagement between the reunited family members. The second one unearths the value of equilibrating the first moments of reunion to the initial stages of receiving a gift (e.g., the eagerness to unpack a gift). The works within HCI and CSCW, which these findings extend, can be traced on the body of literature that investigates the design of tangible technologies for collocated family interactions (Patel et al. 2009; Jacucci et al. 2010; Broekhuijsen, van den Hoven & Markopoulos 2017; Mitchell & Olsson 2017) and the literature that examines the relationship between artefacts and gift-exchange practices (Taylor & Harper 2002; Kwon et al. 2017). These qualities contribute in better understanding the design of a family artefact that brings together the material form with the psychological goal of better parent–child engagement in the first moments of reunion.

Current research in designing technologies for collocated interactions has underlined the merit of creating tangible tools that support specific aspects of face-to-face interactions. In their work on ubiquitous media for collocated interactions, Jacucci et al. (2010) mentioned the effect that the form and the tangible nature of technology have on key facets of collaboration and communication between individuals when they are in the same physical space. They describe CityWall and MapLens—two artefacts that use digital and multimodal content in bringing people together when they are physically collocated. The key findings of their study showcase the enrichment of interactions between individuals as the technology fosters interactions through acts of performance embodied in the everyday life. These insights are supported by the recent work of Broekhuijsen, van den Hoven and Markopoulos (2017) as well as Mitchell and Olsson (2017) who present a series of material and spatial artefacts that enrich collocated interactions by encouraging performance and acts of remembering with the use of photos. Further, in their work on bringing couples closer, Thieme et al. (2011) highlight the significance of the material in advancing feelings of intimacy and closeness as the individuals give meaning to the shape and by relating it to their experience. The quality of the materialistic representation of co-engagement that is important for the design of reunion-oriented technologies speaks to these works by merging the material and tangible factor of technology with the reunion experience—an experience that is very different to the collocated one.

In the context of using gifting as a metaphor of the digital content exchange upon reunion, the closest work that relates to this finding is the study on gift-giving between young mobile phone users (Taylor & Harper 2002). In their work, Taylor and Harper (2002) denote the resemblance that text messaging between teenagers has with the ritualised practices that surround gift-giving. They, particularly, mention the meaning that the exchange of messages has for the teenagers as acts of gift-giving and receiving as well as the significance of saving the message for later viewing has for the individual. On a different note, Kwon et al. (2017) argue that a discrepancy exists between digital and physical gift-giving. The later involves more labour and is always perceived as a gift by the recipient and reflected on and reciprocated compared to the digital gift exchange. Within the design workshops gift-giving was evident primarily through the necessity for *Rendezvous* to support exchange of gifts upon reunion. In that sense, this quality supports the co-engagement upon reunion by introducing a new interaction that is orchestrated by an artefact within the family setting—the digital instance of collocated gift exchange. It extends the previous work on gift-giving, as this added feature of a collocated technology is introduced in the family space with the aim to support the parent–child interaction upon reunion.

5.6.3 Creating Grounds for Co-Sharing Experiences in Post-Reunion

During post-reunion, the reunited parents and children can foster their bonds and establish a more meaningful relationship (Moss & Moss 1988). During the design workshops, family members delineated the worthiness for the technology to support a more constructive sharing of experiences through a novel and reflective manner. For the participants, novel describes the distinct characteristic that makes a reunion-oriented technology different to the already available ones (e.g., photos) and that is appropriated to their needs and unique experience that they are going through. Reflective refers to the opportunity that this technology gives to parents and children to look at their gathered content and reflect upon it not only as an individual but, more importantly, as a family.

Most HCI research lines, which explore the role of technology in sharing experiences within the family setting, have focused on the function of photos (digital or physical) as mediums for exchanging thoughts and emotions between parents and children (Lindley, Durrant et al. 2009). This form of co-sharing can occur either when physically apart or

when physically collocated. The works that relate the most to the design of a reunion-oriented artefact are situated within the collocated space. In particular, in a series of studies on collocated group photo sharing, Patel et al. (2009) and Patel and Clawson (2011) explored the role of mobile technology in capturing and sharing digital content in a synchronous manner between groups of friends and among family members. They highlighted the value of immediacy in the sharing of information when shared between people in the same physical space. Further, Stelmaszewska, Fields and Bladford (2008) in their investigation of how people share their photos using camera phones in a collocated setting, underlined that individuals depict different sharing behaviours depending on who they share the information with and what the value of the photo is for the owner. On another note, Petersen (2007) questioned the novelty of photos for co-sharing experiences and examined the role of more tangible technologies in supporting this fundamental family activity. They designed an interactive furniture that allows collocated parents and children to collectively experience their family history (e.g., what each one has done throughout the day).

Both lines of research (photos and tangible approaches) construct a design space that influenced the thinking around the reunion artefact. However, the distinct nature of reunion alongside the discussions in the design workshops shifted the thinking in a direction in which the design quality of novel approaches in co-sharing is addressed by merging the physical (the lockable wooden box) with the digital content. This is achieved by the asynchronous sharing of the digital photos, videos or audio that parents and children share in post-reunion. In that manner, this quality extends the previous work by creating a new design space in which the asynchronous sharing is linked to the collocated interaction between parents and children.

On another note, the sharing of experiences is also associated with the reflective practices that this brings to the family members when they are collocated. This form of reflection is mostly achieved though the storytelling that is led by the medium (e.g., the photo) and constructed and expressed by the parents and children (Van House 2009). In their seminal work on the significance of the collocated sharing of photos Durrant, Taylor et al. (2009) denoted the value of the narrative around photos as a way of recreating the family past and jointly remembering key family milestones or more

routine activities. In that instance, storytelling is closely aligned with narrative that is enriched with the palette of emotions and feelings of the parent and child. The participants of the design workshops highlighted the unique character of reflection as a platform for further enriching the parent–child bonds through narrative. This was close to the work on retrospective storytelling by (Landry & Guzdial 2006). In their studies, they designed an artefact (iTell) to better understand the role of technology in supporting storytelling about events that occurred in the past among individuals. Similarly, *Rendezvous* is aimed to encourage the reflection between parents and children in post-reunion through the co-sharing of experiences accumulated individually while being physically apart. Thus, a key contribution of *Rendezvous* in the current literature on reflective storytelling is that it is used within the family setting. Consequently, it broadens the design space by introducing a new medium for the sharing of experiences between parents and children that creates opportunities for reflection around the value of being physically together again.

5.7 Synopsis of Study 2 Contributions

The aim of Study 2 was to identify the interactional qualities of an artefact that supports parent–child reunion. All the design workshops that were conducted made progress towards that goal and developed a series of contributions that extend the current works on designing technologies for family interaction in both theoretical and practical ways.

First, the design process of *Rendezvous* foregrounded a new space for designing family technologies that is asynchronous physical collocation. As discussed in Section 5.6, numerous studies have concentrated on designing technologies for synchronous interactions when parents and children are either physically collocated or physically separated as well as asynchronous ones when family members are physically separated. The design of *Rendezvous* contributes to unveiling the necessity to design for fourth space. In this, a technology is focused on supporting asynchronous interactions between physically collocated family members and associates strongly with the nature of the reunion experience and with the transition from being apart to being together. Further, the understanding of the aims of the reunion artefact in all the phases of reunion (pre-,

upon and post-reunion) provided a fertile ground for future technologies who can be created for that experience.

Further, the process of mapping those interactional qualities to an artefact showcases the way that reunion-oriented technologies could be developed by merging the physical with the digital component. An example of this is the relationship between the selective postponement of content, which is captured and submitted using a digital platform, with the locking of the box using the key. Moreover, the involvement of children in the design process enriched the current understanding of the degree of participation and involvement of children in co-designing for sensitive family experiences since reunion does not entail positive but also negative aspects. A final contribution is the practical development of the first reunion-oriented artefact. Even though different tools exist for parents and children to use and appropriate in reunion, *Rendezvous* is the first artefact that is aimed specifically on this parent–child experience.

Overall, this study has contributed to extending the design process for technologies that support an omnipresent yet underexplored family experience—parent–child reunion. It does so by unveiling the need to create artefacts that support a palette of interactional qualities that are not only interwoven in family experiences but also have facets closely linked with each other. For example, each of the phases of reunion is connected to each other and cannot be perceived as a disconnected one. The design of an artefact that supports this experience can potentially assist in rethinking the design of technologies for different family experiences (e.g., divorce).

5.8 A Critique of Study 2

This study yielded unique findings that further enriched the understanding of designing technologies for parent–child reunion. However, there exist three key points that invite further clarification: the selection of only academic families; the distinct sessions in the design workshops whereby the interaction design experts did not engage directly with the participants; and the absence of a formative evaluation of the designed artefact upon its completion.

First, the decision to invite only academic families in the workshops was due to the fact that they were the ones who faced fundamental differences in their reunion experience regarding the limitations of current technologies in supporting their reunion experience (as discussed in Section 4.6). Thus, I decided to request the firsthand advice of academic parents and children, who were also participants of Study 1, in trying to understand the potential design of the technology and how this could better suit their needs and support their reunion. Second, the design workshop sessions were conducted in a way that was not close to the co-design philosophy. In co-design, designers and users work together in envisioning the key attributes of an artefact (Sanders & Stappers 2014). On the contrary, throughout the workshops, the designers did not interact with the families. Rather, they provided potential design avenues that were then used as discussion and ideation prompts with children and their academic families. The reason for this is that the philosophy that guided this study lies in UCD, whereby the whole design process is constructed around the user. As a designer, I acted as the link between the interaction design experts' insights and the users; this ensured that the design discussion was both designer and user driven. Finally, after the artefact was designed, the children did not conduct a formative evaluation session because this was carried out in the last design workshop by the academic families.

The discussion around potential design ideas manifested the attitudes and individual opinions of the participants towards the technology, which was enquired into further in the last workshop with the participation of the four academic families when *Rendezvous* was presented. The three points clarified in that section do not alter the significance of the findings and the key insights gained in the design process of *Rendezvous*. Rather, they exhibit the plethora of approaches that could be followed when implementing this study.

5.9 Conclusion

This chapter presented the findings of a series of design workshops with interaction design experts, academic children and academic families in an effort to identify the interactional qualities of technologies that support parent–child reunion. The workshops yielded six qualities that the artefact needs to have to support this family experience.

These qualities were categorised in three themes, according to the reunion phases, which related to the aims of the designed technology: stimulate co-creation in pre-reunion; motivate co-engagement upon reunion; and inspire co-sharing in post-reunion. The identification of the aims and corresponding qualities as well as the active involvement of the academic families led to the design and development of *Rendezvous*—a physical artefact with a digital component that can be used to support the reunion experience. This study foregrounded a design process that led to the design of a reunion-oriented artefact, which is significantly different to those whose aim is to support physical separation or collocation within the family setting. It could also lead to the design of further reunion-oriented artefacts.

5.9.1 Towards Study 3

The completion of the second study had two implications. First, it provided the groundwork for the development of *Rendezvous*. Second, it acted as the necessary link between the theoretical understandings of the current use of technologies in reunion (Chapter 4) and the role of a reunion-oriented technology in supporting that family experience when used in situ. The latter is the aim of Study 3. The next chapter describes this study, in which academic and mining families used *Rendezvous* for a period of up to five weeks before, during and after their reunion.

Chapter 6: Study 3: Supporting Parent–Child Reunion with *Rendezvous*

6.1 Introduction

The previous chapter identified the interactional qualities of technologies for supporting parent–child reunion. Through a series of co-design workshops with interaction design experts, parents and children from academic families, Study 2 (see Chapter 5) underlined the significance of co-creation, co-engagement and co-sharing as essential attributes of a reunion-oriented technology. These were represented in the design of *Rendezvous*, a tangible artefact with a digital component, which responded to the call for attention to specific threads of the reunion experience that were not well supported by current technologies as discussed in Study 1 (Section 4.6).

This chapter describes Study 3, whose aim is to evaluate the *Rendezvous* artefact through its in situ deployment. Academic and mining families were invited to participate in the *Rendezvous*' field deployment over a period of four to eight weeks depending on each family's reunion cycle. Study 3 highlights the importance of co-creation, co-engagement and co-sharing as essential elements of a reunion technology in supporting this experience by augmenting anticipation in pre-reunion, heightening the initial engagement upon reunion and strengthening the sharing of experiences in post-reunion.

This chapter is organised in seven sections. Section 6.1 provides the introduction to this chapter followed by Section 6.2, which outlines the objectives and research question of Study 3. Section 6.3 describes the rationale of the field deployment of *Rendezvous* including the overall research design, the key demographics of the participants and the key data collection and analysis methods. Section 6.4 discusses the main findings with a focus on answering the study's research question, and Section 6.5 discusses the significance of these findings in relation to the previous HCI work, to foreground the main contributions. Finally, Section 6.6 draws an overall critique of Study 3 and Section

6.7 concludes this chapter by synthesising the key learnings from the field deployment of *Rendezvous*.

6.2 Study 3: Objectives and Research Question

The main objective of this study is to evaluate the use and impact of *Rendezvous* on the reunion experience through a field deployment with the participation of families from two different professional backgrounds: academic and mining. To best address this aim, I used a series of qualitative methods together with quantitative techniques that were structured around each reunion phase. The study addressed the following research question:

Research Question: How does *Rendezvous* support parent–child reunion?

This question brings together the understandings of Study 1 (Section 4.6), which were embodied in the design of *Rendezvous* (Section 5.5). Thus, through the field deployment of this technology, a better understanding is constructed not only about the use of *Rendezvous* in people's homes (e.g., matters relating to adoption and appropriation of the technology) but also about the implications that this use has on the reunion experience and how it addressed the problems identified in the first study (dilution of anticipation, lack of initial engagement and paucity in sharing of experiences).

The next section describes this study's overall research design, the reason for inviting academics and mining families to participate, and the data collection and analysis methods that guided the in-field evaluation of the artefact.

6.3 Study 3 Research Design

In Study 3, a series of qualitative and quantitative techniques were employed (interviews, field observations, questionnaires and behavioural data logs that were captured through software). The interviews and observations were conducted within each reunion phase (pre, upon and post) to construct a deeper understanding of the experience of use of *Rendezvous* throughout reunion. Section 6.3.1 describes the overall research design of this study followed by a justification about the choice of the specific family cohorts as well as the participant demographics (Section 6.3.2). Sections 6.3.3

and 6.3.4 provide a detailed account of the data collection and analysis methods respectively. Approval for the research was granted from The University of Melbourne's ethics committee (see Appendix C.1) and the participants were recruited through a distribution of call for participation (see Appendix C.2).

6.3.1 Overview of Study Design

Field deployment gives a unique opportunity to gather real-life empirical data in a naturalistic manner (Olson & Kellogg 2014, p. 120). The first and foremost goals of field deployments is to evaluate the impact novel research prototypes have on the everyday life of individuals, to assess the degree of addressing the user need that was identified in previous research phases and to inform the design of future systems (Rogers & Marshall 2017).

In the context of Study 3, I decided to follow a semi-controlled study approach in deploying the *Rendezvous* to better understand its impact on the reunion experience. Study 3 is a semi-controlled field deployment since I had built strong rapport with the participants (from Study 1 and 2) and was acquainted with the context of use and the field setting given that I visited the participants' homes before the deployment. Within semi-controlled field deployments, both qualitative and quantitative methods can be used to collect and analyse data. Guided by previous HCI studies that have conducted semi-controlled studies of research prototypes in families' homes (Hutchinson et al. 2003; Dey & de Guzman 2006; Saslis-Lagoudakis et al. 2006; Yarosh, Denise Chew & Abowd 2009; Pedell et al. 2010; Inkpen et al. 2012; Neustaedter, Harrison & Sellen 2012). Interviews, observations, questionnaires and behavioural data logs were used as the main data collection methods. Regarding the data analysis, a thematic analytical lens was used due to its flexibility in allowing for categories to emerge directly from data and its suitability in exploring data sets that are collected using different methods (Braun & Clarke 2006). Table 6-1 provides an overview of the research design of Study 3.

Table 6-1: Overall Research Design of Study 3

Rendezvous Attribute	Reunion Phase	Data Collection Methods	Data Analysis Methods
Stimulating co-creation	Pre-reunion	Interviews and behavioural logs before opening the box	Thematic Analysis
Motivating co-engagement	Upon Reunion	Interviews and observations while opening the box	Thematic Analysis
Inspiring co-sharing	Post-reunion	Interviews and questionnaires after opening the box	Thematic Analysis

The first column in the table presents the main attributes of *Rendezvous* (which were the main findings of Study 2). These were evaluated pre-reunion phase (second column) through the data collection and analysis methods that are showed in the third and fourth column respectively. One of the key challenges of collecting the data was that the qualitative methods had to be conducted repeatedly and be synchronised with the pre-, upon and post-reunion phases to capture the participants' feedback as the reunion experience with the use of *Rendezvous* was progressing. The next section describes the participant demographics alongside the rationale for inviting mining families to participate in this study.

6.3.2 Study 3 Participants

In the two previous studies, I invited family members (parents and children) from two different cohorts: academic and defence. Due to logistical difficulties, only the academic family members continued their participation in Study 2 (Section 5.3.2). Study 3 necessitated the presence of the same families that participated in Study 1 and 2 since they were already accustomed to this research's rationale, had contributed to the design of *Rendezvous* and in deploying *Rendezvous* in their lives a more constructive

and comprehensive evaluation would be created. The academic families of Study 2 had expressed their strong interest in participating in follow-up studies just before the completion of the design workshops. Following this call, four academic families were recruited to participate in Study 3. However, despite my effort to recruit defence families for Study 3, this was not possible due to similar recruitment difficulties as in Study 1. Most importantly, the high-level security clearance required when deploying technology within a home in a military base created an impassable hurdle for these families to participate in Study 3.

I resolved this recruitment challenge after consulting with the local Victoria chapter of FIFO Australia. FIFO is a method that numerous companies (particularly in the Australian mining and gas industry) use whereby they fly employees temporarily to the work site instead of relocating the whole family. From all the different professions that fill in the FIFO criteria, mining families were invited for this study. This is a cohort that has many similarities to the defence families. The parent (in most cases, the father) works for a mining company in Australia and follows on average a roster of 4/1, which means four weeks separated from the family followed by one week off when they are at home with the remaining family members (Taylor & Simmonds 2009). While away, the FIFO parent has access to different communication technologies that they can use to keep in touch with their family members. Further, they work in an environment that is relatively safe (compared to the defence one) but in a strenuous environment under harsh weather conditions and extreme work pressure (Rose Sutherland, Chur-Hansen & Winefield 2017). The invitation to the local FIFO chapter attracted the interest of three families who, after a series of discussions, agreed to participated in the study.

The inclusion of the mining family cohort to Study 3 had two key advantages. First, it enabled those families to experience firsthand the first reunion-oriented technology and in doing so share their experience of use and contextualise its benefits or drawbacks in their own life. Second, and partly related to the previous advantage, it extended the understanding of the effect of *Rendezvous* in the reunion experience since mining families experience reunion differently compared to academic ones. They undergo significant periods of stress over their recurring and short separation, which has significant impacts on the mental health of the whole family and, in particular, the at-

home parent (Rose Sutherland, Chur-Hansen & Winefield 2017). This, in turn, highlights the significance of reunion for these families. Consequently, the deployment of *Rendezvous* in that context generates further insights regarding its support for that type of family cohort.

The participants of Study 3 were recruited from two different family cohorts: academic and mining. In total, there were seven (n = 7) families that participated—four academic (n = 4) and three mining (n = 3). Academic families included at least one family member working in the academic sector, and mining families included at least one member working in mining or related sectors (e.g., oil). In each family, at least three members (father, mother and child) were asked to participate in the interviews and questionnaires. Thus, in total there were 21 participants (n = 21). Table 6-2 shows the participant information per family per cohort as well as the average duration of separation and reunion and the actual time of the *Rendezvous* deployment.

Table 6-2: Demographics of Participants in Study 3

Family	Participants	Profession	Average Duration of Separation	Average Duration of Reunion	*Rendezvous* Deployment (Before and after reunion)
Family 1	F: 52, M: 40, C: 11	Academic	4 months	3 weeks	5 weeks (2 before and 3 after)
Family 2	F: 34, M: 32, C: 10	Academic	2 months	2 weeks	4 weeks (2 before and 2 after)
Family 3	F: 41, M: 38, C: 9	Academic	6 months	3 weeks	5 weeks (2 before and 3 after)
Family 4	F: 38, M: 34, C: 12	Academic	1 month	2 weeks	4 weeks (2 before and 2 after)
Family 5	F: 45, M: 41, C: 9	Mining	4 weeks	1 week	3 weeks (2 before and 1 after)
Family 6	F: 35, M: 34, C: 10	Mining	4 weeks	1 week	3 weeks (2 before and 1 after)
Family 7	F: 30, M: 32, C: 10	Mining	4 weeks	1 week	3 weeks (2 before and 1 after)

All the children from both cohorts were between nine and 11 years old. The academic families had participated in previous studies (family 1, 2 and 3 in Study 1 and family 4 in Study 2) and resided no more than 180 kilometres from Melbourne. It was the first time that the mining families participated in this research. They all resided in rural

western Victoria and knew each other because they were recruited from the local FIFO chapter. In both academic and mining families, the absent parent was the father apart from the mother of academic family 3. Table 6-2 shows the average duration of separation and reunion across the two cohorts, and the *Rendezvous* deployment duration. The deployment duration varied between three and five weeks, depending upon how willing families were to participate in this stage of the research. I decided to deploy the artefact for two weeks while the family was separated and close to the upcoming reunion (pre-reunion phase) followed by the whole duration of reunion (upon and post-phases) to capture as much as possible naturalistic data relating to the reunion experience.

6.3.3 Data Collection Methods

Study 3 followed a semi-controlled approach in the field deployment of *Rendezvous*. When selecting the appropriate data collection methods in in-field deployment studies, it is important to consider certain key factors that must shape the eventual decision: participant time and commitment, implicit or explicit intervention in the life of the participant for the purposes of data collection and the frequency of gathering the data (Olson & Kellogg 2014). It is essential for the researcher to choose methods that provide them with a deep insight of how the artefact is used in situ and, at the same time, do not be a burden to the individual participating.

In aiming to achieve this balance in the data collection for Study 3, a range of qualitative methods were used (interviews, observations and questionnaire) interwoven with a quantitative technique (behavioural data log based on software). Each method or combination of methods was used during each reunion phase (see Table 6-1) to ensure that the key attributes of *Rendezvous* were evaluated promptly. For example, while in pre-reunion and just before the return of the parent, all family members were interviewed about the use of *Rendezvous* while being physically apart and their feelings towards the creation of content as well as the anticipation that they had for the reunion. In addition, the software log files were captured so that a better picture would be drawn about the content created and the interactions with the technology before the reunion.

6.3.3.1 In Situ Qualitative Interviews and Observations

One of the biggest challenges of in-field deployments of research prototypes within the home setting is the selection of an appropriate data collection method that would succeed in gathering the necessary data as well as be respectful to the families' routines and daily life (Tolmie & Crabtree 2008). The most common method that numerous previous research studies have used successfully in collecting data from field deployments is the qualitative interviews entwined with field observations (Dey & de Guzman 2006; Saslis-Lagoudakis et al. 2006; Schatorjé & Markopoulos 2012; Tolmie & Crabtree 2008; Odom et al. 2014). The challenge in collecting the perspectives of individuals with interviews and observations while they use the research prototype over a period is the researcher's repeated physical presence in the premises of the individual's home. The research team needs to keep a fine balance with respect to the repeated visits and the burden that they might occur to the participating family members (Olson & Kellogg 2014). Other studies have proposed, as a way of addressing this challenge, to use interviews only once during the deployment phase—in most cases, at the end of the deployment—while the individuals gather themselves content of their use of the research prototype with other techniques (e.g., video recording; Inkpen et al. 2012) or the use of technology probes as an evaluation tool (Hutchinson et al. 2003). After assessing alternative methods, I decided to conduct a series of qualitative interviews and observations to strengthen the understanding of each attribute of *Rendezvous* within all the reunion phases.

The qualitative interviews were conducted in each of the three reunion phases (pre, upon and post) and were timed in a manner that would suit all the participating family members (father, mother and child). In pre-reunion, the family members were interviewed shortly before their upcoming reunion (one to two days on average) after they had been using *Rendezvous* for approximately two weeks. The aim of this interview was to gain a deeper insight about the effect of *Rendezvous*' stimulating co-creation attribute on the anticipation to reunite. The interviews were conducted online with the father and face to face with the mother and the child. Upon reunion, when the whole family was present—in most cases, the day after the reunion had occurred—and just before opening the box, I visited the family's home and run a short interview with

the whole family—asking questions to each family member in the presence of the others—just before the father unlocked the box with his key. The questions were around the co-engagement attribute of *Rendezvous* that was represented by the key and the central character that *Rendezvous* had in the reunion experience. After the box was opened, and while in the post-reunion phase, I visited the family—in most cases, a week after the reunion had happened since I wanted to give them time to see the created content in *Rendezvous*—and conducted an individual interview with the father, mother and child about their experience of interacting with the content and the effect that this had on their sharing of experiences while in post-reunion. Throughout the visits and the interviews, I also took a series of field notes in which I documented my observations to collect as much data possible. In total, I collected 63 interviews, seven participants x three phases x three interviews/phase. Additionally, I collected 21 observations in total that were structured around each participant in each phase.

Both interviews and observations constructed a thorough picture of how the *Rendezvous* was used in the pre-, upon and post-reunion phases. All the interview questions pre-reunion phase per individual asked alongside the protocol and some key observations gathered in my field notes can be found in Appendices C.3 and C.4 respectively.

6.3.3.2 In Situ Qualitative Questionnaires

Another method that has been used extensively when evaluating a research prototype while it is deployed in the field is the qualitative questionnaire (Rogers 2012). In Study 3, I invited each participating family to complete in situ questionnaires upon the completion of the last interview in the post-reunion phase. The term 'in situ' is not used arbitrarily in that context. Rather, it draws attention to the significance of the location where the questionnaire was conducted. I asked the participants to complete the questionnaire in their homes while sitting around the *Rendezvous* and just before the study was brought to a closure and the prototype was withdrawn from the family setting.

It was important for both parents and children to be able to answer the questionnaire while looking at the artefact and reflecting on the practices that surrounded its use. Consequently, the use of the questionnaire triangulated the understanding of

Rendezvous' impact on each family's reunion experience. The questionnaire started with demographic information and followed with a unipolar rating scale about opinions on the use of *Rendezvous* regarding anticipation in pre-reunion, initial engagement upon reunion and sharing of experiences in post-reunion. Further, a subsequent section asked for the general feedback on distinctive features of the prototype (e.g., the key) and potential technical issues that appeared while in deployment. Many of the questions in the questionnaire were inspired by the interview ones (e.g., the question on the value of the key). This gave an additional perspective to the use of the technology since the questionnaire was completed on average a week after the interview in the post-reunion phase. In total, 21 different questionnaires (n = 21) were collected from the participating families. Appendix C.5 shows the questionnaire used in Study 3.

6.3.3.3 Behavioural Data Logs

In addition to direct and indirect qualitative data collection methods, previous research in HCI has demonstrated the benefits of data logs in understanding the user behaviour when deploying computer systems in situ (Hutchinson et al. 2003; Brown, Reeves & Sherwood 2011; Olson & Kellogg 2014). Behavioural data logs complement the insights generated in field studies (particularly the observations and interviews) by recording the natural interaction between the user and the system through carefully defined metrics that are captured with the use of specific software processes (Rogers 2012; Olson & Kellogg 2014). Example of these metrics include timestamps of content exchange, the type of collected content (e.g., a photo) and the general interaction with the system (e.g., how many times was the screen touched) (Rogers, Sharp & Preece 2011).

In the context of Study 3, behavioural logs were collected at three stages: pre-reunion, upon reunion and post-reunion. First, a series of timestamps indicated who sent what and when to the *Rendezvous* during the pre-reunion phase (or when in physical separation). For example, if a father sent a photo with a text caption, this information would be stored in the *Rendezvous*' server database and then time stamped for future reference. Second, upon reunion when the box was opened and the family members started interacting with the stored content, there would be a record of which photo was opened when and how many times (but not by whom since the *Rendezvous* application

can be opened by anyone once the box is unlocked). Finally, a similar recording occurred during the post-reunion phase up until the *Rendezvous* was withdrawn from the field. During all stages, logs of technical issues were also collected. There were three types of concurrent challenges. First, failures in receiving data from the different users while in physical separation or pre-reunion. Second, minor crashes of the standalone *Rendezvous* application when the box was opened that necessitated my immediate intervention to resolve it and restore the content shared. Last, non-submission of acknowledgements to the sender resulting in confusions among the participants on whether their image was sent to *Rendezvous* or not. Appendix C.6 presents instances of the software logs gathered throughout the deployment period. On a similar note, Appendix C.7 draws attention to indicative charts of all the data collected during the deployment period.

6.3.4 Data Analysis Methods

Upon the completion of the data collection of Study 3, the following data was gathered:

- sixty-three (n = 63) interview transcripts that resulted from interviewing each of the family members (21 in total) in the three reunion phases
- twenty-one (n = 21) observations for each family member that were clustered in pre-, upon and post-reunion observations
- twenty-one (n = 21) questionnaires that each of the parents and children were invited to complete just before the withdrawal of *Rendezvous* from the field
- behavioural Data Logs of up to five weeks, in which the participants' interaction with the system as well as any technical glitches were recorded.

Previous research within HCI has used extensively the thematic coding as an analytical lens for data that is captured in the field using different qualitative and quantitative methods (Brown, Reeves & Sherwood 2011; Dey & de Guzman 2006; Landry & Guzdial 2006; Olson & Kellogg 2014). Thematic coding was used in this study too, in analysing the data from Study 3 given the flexibility of this approach in synthesising the insights produced by triangulating the data collection methods (Braun & Clarke 2006).

6.3.4.1 Description of the Thematic Coding Process

Before commencing the analysis, all the collected data were prepared to identify potential issues with its quality. The interviews, observations, questionnaire responses and log files were clustered according to the reunion phase. Following that, I organised all the data within its phase based on the family member and completed a first passing during which I tried to not only identify potential errors (e.g., in the transcription procedure) but also to get a first sense of the data content.

Guided by the overall approach to conducting thematic analysis (Braun & Clarke 2006), I parsed all the data in each phase and noted the first level codes that seemed important with relation to the research question. I conducted this process iteratively until I was certain that I had reached data saturation. Subsequently, after clustering similar codes into categories, I stepped back and reviewed the codes to identify similarities among different reunion phases. Thus, the analysis of the data resulted in 20 different categories. These were then clustered into six sub-themes based on their relationship with each attribute of *Rendezvous* (co-constructing digital content in an asynchronous manner; postponement in the display of content; the key as a representation of co-engagement; the value of digital gifts in co-engagement; interacting with the content as a basis for co-sharing; and storytelling as a form of co-sharing). The six sub-themes were then organised into three themes that related to each reunion phase. The main findings associated with stimulating co-creation that augments anticipation in pre-reunion, motivating co-engagement that heightens the initial engagement upon reunion and inspiring co-sharing that strengthens the sharing of experiences in post-reunion. These themes are presented alongside each sub-theme and the raw data extract in Section 6.4. Appendix C.8 demonstrates the approach to the data analysis for that study.

6.3.4.2 A Note on the Reporting of the Data

Like Study 1 and 2 (Sections 4.4.4 and 5.3.4 respectively), the data is reported with the use of an indented paragraph and italics to directly quote the raw data excerpts. Moreover, I have changed the names of all participants to protect their privacy. Participants are referred to by a combination of and digits. For example, 'father1' is the father of the first family. 'Interview', 'observation', 'log' or 'questionnaire' are used to

note the kind of source of which the data excerpt is a part. Finally, 'pre', 'upon' or 'post' are used to describe the reunion phase in which this data was captured. For example, (father1, interview, pre, lines) is a quotation from an interview from the father of family1 (academic family) that was captured in pre-reunion phase with the corresponding transcript lines.

6.4 The Use of *Rendezvous* in Parent–Child Reunion

The aim of this study is to evaluate the use of *Rendezvous* and to better understand the impact that each *Rendezvous*' interactional quality had on each reunion phase (pre, upon and post) through a field deployment with seven families (four academic and three mining). The analysis of the interviews, observations, questionnaires, and behavioural data logs yielded numerous insights that were then clustered into three main themes, which associated with each reunion phase (Table 6-3).

Table 6-3: Impact of *Rendezvous* on Pre-, Upon and Post-Reunion

	Pre-Reunion	**Upon Reunion**	**Post-Reunion**
Major Themes	*Anticipation: augmenting anticipation through co-creation (§6.4.1)*	*Engagement: heightening initial engagements through co-engagement (§6.4.2)*	*Sharing: strengthening sharing of experiences through co-sharing (§6.4.3)*
Sub-Themes	• Co-constructing digital content in an asynchronous manner • Postponement in the display of content	• The key as a representation of co-engagement • The value of digital gifts in co-engagement	• Interacting with the content as a basis for co-sharing • Storytelling as a form of co-sharing
Limitations of current technologies as identified in Study 1 (§4.6)	• Lack of anticipation	• Lack of initial engagement	• Lack of sharing experiences • Lack of preparation for the next separation
Rendezvous' interactional quality as identified in Study 2 (§5.4)	• Stimulating co-creation	• Motivating co-engagement	• Inspiring co-sharing

In the pre-reunion phase, the theme of augmenting anticipation through co-creation related to the need to address the lack of anticipation that Study 1 unveiled (see Table 4-2) by stimulating co-creation through *Rendezvous* (see Table 5-2). The deployment of *Rendezvous* in pre-reunion displayed that the act of unknown co-construction of digital content alongside the postponement in the display of this content until the eventual reunion augmented the anticipation in all participating families.

In the upon reunion phase, the theme of heightening the initial engagement through co-engagement associated with the sparseness in initial engagement, which was presented as a finding from Study 1 (see Table 4-2) and instantiated with the motivating co-engagement quality in the design of *Rendezvous* (see Table 5-2). The family members from both cohorts highlighted the significance of the key as a representation of the co-engagement upon reunion. Further, they regarded the unlocking of the box and the digital content created as a series of digital gifts that supported their co-engagement.

In the post-reunion phase, the theme of strengthening the sharing of experiences through co-sharing connected to the paucity in sharing of the experiences that was found in Study 1 (see Table 4-2) and for which the inspiring co-sharing quality of *Rendezvous* was designed (see Table 5-2). With the use of *Rendezvous* in the post-reunion phase, parents and children could found common room in sharing their experiences by interacting with the digital content created as well as by crafting stories that were not only inspired by the content but also by the reflection process that was guided by the photos that were captured and stored in *Rendezvous*.

Sections 6.4.1, 6.4.2 and 6.4.3 provide a detailed discussion of these three themes with a focus on each of the sub-themes. The aim of these sections is to give a clear picture of how parents and children experienced the different threads of reunion with *Rendezvous* over the duration of the deployment.

6.4.1 Augmenting Anticipation in Pre-Reunion through Co-Creation

> *The fact that you can create photos and send them to the box but can't see them until we are together again, that's something special and different (child4, interview, pre, lines 45–46).*

One of the core aims of *Rendezvous*, as described in Section 5.4.1, was to address the observed lack of anticipation during pre-reunion (Section 4.5.1). To achieve this, *Rendezvous* had two main interactional qualities. First, it supported the contribution of digital content by all family members and, second, it ensured the delay in seeing the content until the eventual return of the father. An important theme in Study 3 was the effect that co-creation had in augmenting anticipation while in pre-reunion. The co-construction of digital content from all family members without each one knowing who created what and the postponement in the display of the content enriched the sentiment of anticipation towards the upcoming reunion. The following two subsections describe co-construction and postponement in the pre-reunion phase with the use of *Rendezvous*.

6.4.1.1 Co-Constructing Digital Content in an Asynchronous Manner

One of the overarching findings from the deployment of *Rendezvous* in pre-reunion was the attitude of parents and children towards the process of constructing digital content with and for each other without having a sense of who created what. The use of *Rendezvous* prompted all family members and, particularly, parents and mothers to capture and send content to the box even though they could have shared the same content using different communication channels available to them:

> *It is an interesting one this one. Yeah, I take a photo of something and write down a few words. I know I could instantly share this with Facebook or email with them but there is something different about Rendezvous. It is like everyone creates stuff together but no one knows who created what until I come back and we open the box (father6, interview, pre, lines 73–74).*

> *When I see something nice or something that reminds me of him or is like the family 'logo' I take a photo with the phone and send it to the box. And I am sure that he will be doing something like that. We are not really talking about it when he calls or at least we pretend that we haven't really done anything with the box. At least I do [laughs] (mother3, interview, pre, lines 55–57).*

The quotations demonstrate the conscious decision of not sending the captured content using other communication channels (synchronous or asynchronous). This was not only a novel approach to communicating, but also an indication that family members wanted to foster greater anticipation for the upcoming reunion. Parents and children questioned each other about sharing content with each other using *Rendezvous*, but often refrained from revealing if they had as a playful way of creating more anticipation for the upcoming reunion:

> *I never know when dad has sent something in the box. It is like I sent something and he might also have sent something and then when we talk to each other he will ask me like did you send something? And I be like I am not going to tell you … ha ha (child7, interview, pre, lines 46–48).*

Further, there were many instances during the interviews when parents and children discussed their expectations of each other sharing content, despite their inability to know. For example, as the father from academic family 2 notes below, he would capture and send a photo but at the same time he would forecast that his wife and child would also do so even though there was no way to know that they had done so without discussing it:

> *Well you know that every time I sent the photo I also think that not only will they not be able to see it now, but also that they are possibly creating something now and that, for some weird reason, makes me happy. I want to go back as soon as possible!! [laughs] (father2, interview, pre, lines 66–68)*

Another insight that was constructed through the analysis was the different interpretations of co-construction. After using *Rendezvous* during pre-reunion family members (and particularly mothers) stated that their perception of co-construction had altered. It was still a collaborative activity but one that had a more mysterious character whereby the physically separated father would not really be a part of the discussion until his upcoming reunion:

> *It is like this whole story is a mystery. There lies the box and I alongside [name of son] would sometimes think of what to send to the box for day. And he [the son] would say let's take a photo of this mum. And we will send it but it is absolutely um unexpected that we do this. I mean we could email him or something like that but we prefer to put it in the box. And he does the same too (mother5, interview, pre, lines 81–83).*

I would be at school and take a photo of me in a funny fact. Or of my desk and of some good grade. And write something like 'a day in school'. And I know that once I send it he will not really respond to it because he will see it once he comes back. It is like playing hide and seek! (child4, interview, pre, lines 67–68).

Moreover, the analysis of the software logs in pre-reunion during the observed deployment time depicted that the family members of five cohorts (three academic and two mining) submitted most of the content two days before the upcoming reunion as Figure 6-1 displays. Note that AF and MF stand for Academic and Mining Family respectively.
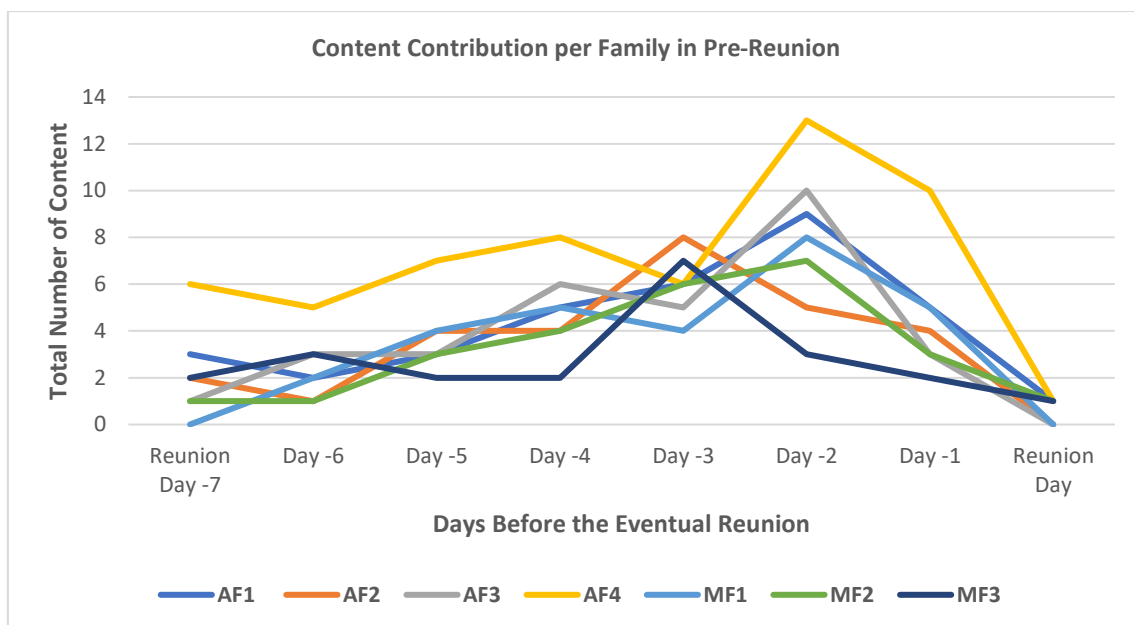
Figure 6-1: Contribution of Content 7 Days Before Reunion

When I questioned the parents and children about this topic, they all noted they needed some time to become accustomed to the use of the technology. Further, they all felt the need to contribute content only some days before the reunion, which in turn depicted how the anticipation augmented.

6.4.1.2 Postponement in the Display of Content

Another finding that related to the theme of augmenting anticipation through co-creation in pre-reunion was the postponement in the display of content. Parents and children were not able to access until the upcoming reunion and only when the box was

unlocked, the digital content or messages that each had created or co-created for each other.

During the interviews with the family members, most of them highlighted the originality of this attribute of *Rendezvous* in terms of augmenting the anticipation during pre-reunion. Particularly fathers and mothers, despite their initial reservations about not being able to share their photos or texts while apart using this new artefact, foregrounded the value of delay in displaying the content submitted:

> *Yeah the nice thing here is not only that all the family captures photos and puts it in the box. It is also that there is a delay in seeing these. This is what makes it more exciting than ever! (father4, interview, pre, lines 55–56).*

> *At first, I really did not like this idea. I mean what if he has sent something that requires our attention? I know that he can also call us but there was this fuzziness about when we will see the photos and other stuff … hmm but you know what while trying it I understood how powerful this is!! (mother4, interview, pre, lines 34–35).*

> *What an awesome idea! I mean we can share anything over the web but capturing and saving this content and moreover delaying seeing it. Um that's just fantastic! It changes the whole reunion (mother7, interview, pre, lines 48–49).*

Specifically, the value of the postponement related to the opportunity that it gave to all the family members to thoughtfully select the photo or the text that they would like to send since they knew that this would be seen later by all family members and potentially would act as a basis for discussion. As the mother of mining family 2 noted, this whole experience of the delay and the postponement gives further significance to the reunion experience:

> *This is something that we have never used before. I mean we would send him emails and he will respond later say that night but really all of us not being able to see the photos until he comes back really creates excitement and anticipation. It takes it to the next level I think! (mother6, interview, pre, lines 61–62).*

Further, most of the children highlighted the value of the delay in displaying the content. The children from mining family 2 and academic family 1 respectively noted not only their readiness to show their parents the content but also the fact that all family members were hypothesising of what was contributed to the box before it was opened:

> *I really liked that dad and mum could not see what I had sent. This meant that when they would see it when dad would come back, it is going to be like wow! He actually thought of us! Ha ha (child6, interview, pre, lines 69–71).*

> *I was like what? Like what does it mean that I cannot see what dad sends? Or what I send? It was so new for me … especially that now we just use text. And yeah it was not only new but like very unexpected. Before dad arrived, everyone was talking about the box and what was in there (child1, interview, pre, lines 53–54).*

Finally, the postponement in the display of content enabled family members to augment their anticipation to reunite by encouraging them to wait for viewing all the content until the upcoming reunion. Despite the novelty of this for most families, they were all eager to open the box and go through the content all together.

6.4.2 Heightening Initial Engagement by Motivating Co-Engagement upon Reunion

> *The key is a symbol of reunion. When he comes back and puts the key in the box … is for sure quite different compared to previously — um those first moments of reunion do matter now (mother1, interview, upon, lines 20–22).*

The second aim of *Rendezvous* was to motivate co-engagement, which addressed the fact that current technologies lacked in supporting the initial engagement upon reunion (see Sections 4.5.2 and 5.4.2). To that extent, *Rendezvous* consisted of a key that was used by the father to unlock the box upon reunion as a way of refocusing the attention to the reunion event. Throughout Study 3, family members experienced an enhanced initial engagement upon reunion because of the existence of the key and what this signified to both parents and children. The key was perceived as a representation of co-engagement because of the relation between the returning parent and the unlocking of the box. Further, when opening up the box, the whole family regarded the viewing of the content as an exchange of digital gifts that brought value in the co-engagement between family

members. The following sections elaborate on the two sub-themes that depict how families experienced the upon reunion phase.

6.4.2.1 The Key as a Representation of Co-Engagement

When the research prototype was introduced to the participating families before the commencement of the field deployment, one of the most common reactions related to the concept of having a key that locks and unlocks the physical box. Parents and children were puzzled about the ownership of the key and on the importance of its existence. However, while in the pre-reunion phase when the box was locked and, most importantly, upon the return of the father (upon reunion phase), the family members became aware of the significance of this material artefact as it allowed parents and children to open *Rendezvous*:

> *I feel so much that I am the person who is responsible for the box. What will happen if I lose the key? Having said that though, I know that at this moment that I opened the box with the key everyone in our family was so into it! (father3, interview, upon, lines 10–12).*

The sense of responsibility for the key is clearly delineated in what the above quotation from the father of academic family 3. He foregrounds his fear of losing the key not only because of the duty that he must keep it in a safe place but also because the possibility of the key loss conveys the inability to open the box. That in turn signifies that an opportunity will be missed for the family to experience the upon reunion phase. At the same time, as he states later, the opening of the box with the key denoted that the whole family could gather around the box during the first reunion moments. This finding was common throughout the interviews with both parents and children. Specifically, family members attributed a specific character to the key as an essential representation of co-engagement whereby it allowed the family members to experience the first moments of reunion as a unique and shared experience:

> *See the box is locked when he is away. Now that he has come back it is opened (with the key that he had). that by itself makes us gather around the box and seeing what has happened … the key as part of the box allows us to come together in a way that we have never done before (mother1, interview, upon, lines 19–20).*

The mother of academic family 1 denotes the salient role of the key in not only operating as a medium for opening a box (which is main role) but as an opportunity that is given to the family members to come together around the box during these first moments of reunion. Further, children described the key in very similar terms and related it to a new experience of undergoing the initial moments of being physically together again:

> *The key is like something that daddy brings back and he opens the box and then um we all see together what is in there. We have never done that (child5, interview, upon, lines 12–13).*

As this quotation reveals, the child from mining family 1 highlights the novelty that the key brings to experiencing the upon reunion phase. This was like the thoughts of the mother of academic family 1 as depicted in the previous quotation. Therefore, there exists a coherent perspective among mothers, fathers and children from both academic families on the new experience of upon reunion phase that is guided with the introduction of the key.

On another note, family members and especially fathers perceived the key as a diode towards stronger family bonds whereby the family members would have the opportunity to come closer together and co-engage upon their return:

> *You know? Every time that I looked at this key while I was away I could somehow see how we will all feel when the box was opened. And I was not mistaken at all!! (father5, interview, upon, lines 14–15).*

In that sense, as the quotation from the father of mining family 1 above shows, the key gains a meaningful character for him and for his family and creates an expectation for a better reunion. This better reunion is achieved through a thread of co-engagement that will occur upon reunion when the father opens the box with the key. Additionally, comparable sentiments to the previous quotations, were also expressed by the mothers of mining families:

> *This key is like a magic key. I must admit that sometimes I look at the box and think of him. And our son. And what each one has gone through. And then I want to open it. But I cannot because he has the key. And I realise once our son opened it when his dad came back that this allows us as a family to come*

> *closer again. Those first moments you know? (mother7, interview, upon lines 24–25).*

The mother talks about the key as having a magic nature—one that specifically gives the opportunity to the family to come closer together upon reunion by co-engaging around the box upon reunion. On a similar level, the mother also highlighted her eagerness to open the box in pre-reunion but cannot do so without the return of her husband upon reunion, which is analogous to what the children in many instances also denoted:

> *I tried once to open the box. But mum said that it is not possible. Only dad can open it. I did not like that but once he came back and I saw the key I got excited! I was the one who opened it!! (child2, interview, upon, lines 28–29).*

Children, especially, were feeling excited for being the ones who opened the box with the key that the father brought. The key thus enabled them to not only experience the first moments of reunion together with all the family but also gave them the opportunity to go through it firsthand in a way that they have not done so before. My observations from the first moments of reunion through the opening of the box also associated with the insights gained from the interviews regarding the perception of the family towards the key. The key was recognised as an artefact that symbolised the upcoming reunion with which the family members experienced new instances of the upon reunion phase that they have not done before. Conclusively, the field deployment of *Rendezvous* demonstrated the significant role of the key in motivating family members to co-engage upon the first moments of reunion.

6.4.2.2 The Value of Digital Gifts in Co-Engagement

Another key finding that related to the role of *Rendezvous* in motivating co-engagement upon reunion was the sensation that many family members had regarding the activity of opening the box upon the return of the loved one. Parents and children, during the interviews, talked extensively about their interpretation of *Rendezvous* as a repository of digital gifts. For them the unlocking of the box upon reunion was a perceived as a gateway to seeing what the other family member had contributed to *Rendezvous* and then exchange it with each other in an action that resembled gifting:

Apart from the key, opening the box the moment that I come back also is like the whole family going through this moment of giving gifts to each other (father1, interview, upon, lines 13–15).

The quotation above from the father of academic family 1 highlights the notion that the research prototype fostered the practice of gift-giving upon the return of the father. Apart from academic families' fathers, mining families too had a similar understanding of the gift sense that *Rendezvous* embodied:

Yeah it is like Santa Claus has come in town [laughs] everyone gathers around and we are ready to see what each one has contributed (father5, interview, upon, lines 21–23).

Family members translated the unlocking of the box upon reunion to a process of gift-giving of digital content, which was co-constructed in pre-reunion, because of the expectation that they had of seeing the photos or texts that were created. This expectation was manifested upon reunion by the excitement and eagerness to see the content and the metaphor of that content as a series of gifts that are digital and not wrapped:

The opening of the box is such a metaphor for us giving gifts to each other. You know since gifts are always wrapped. But in this box, everything is digital (mother2, interview, upon, lines 32–34).

The metaphor that the mother of academic family 2 refers to was a general sentiment of all family members in all the family cohorts. During the opening of the box, I observed that children of both family cohorts were reacting to this action similarly to how they would if they received presents during Christmas, as the child of academic family 3, vividly described:

Daddy is like back and we all sit in front of the box and after is opened I feel like Christmas is back!! And the first messages appear and it like so like gifts that we see. Yeah (child3, interview, upon, lines 14–16).

Mum said that is like giving gifts to each other. Yeah, I think so much that this is true (child6, interview, upon, lines 11–13).

Further, this perception of digital gifts was a new one for both academic and mining families since, even though they had experienced numerous reunions over the last years,

they felt that *Rendezvous* gave them a unique opportunity to refocus on the moment of the reunion through the gift-giving activity:

> *You know we have done this reunion so many times … but now when he comes back and the box opens I feel like we somehow create and exchange gifts. Like a welcome-back gift (mother6, interview, upon, lines 28–29).*

The interpretation of the digital content as a gift-giving and receiving action further enhanced the initial engagement upon reunion for all the family cohorts. The understanding of digital gifts was a sentiment that most family members encountered for the first time, which was afforded and embodied through the *Rendezvous* research prototype.

6.4.3 Strengthening the Sharing of Experiences in Post-Reunion by Inspiring Co-Sharing

> *Everything is different when the box opens. We now talk about the photos that are in there. And what waits for us inside the box, makes us talk more. I mean yeah, we talk about stuff now. Which we haven't done for some time! (father7, interview, post, lines 31–33).*

The final aim of *Rendezvous*, which was described in Study 2 (Section 5.4.3), was to inspire co-sharing in post-reunion to address a limitation of current technologies in supporting the sharing of experiences during that reunion phase (Section 4.5.3). The deployment of *Rendezvous* in Study 3 demonstrated that the interaction with the content not only constituted a novel basis of co-sharing for the family members but also, through this interaction, the emergence of storytelling was obvious as the main form of co-sharing between parents and children in post-reunion. The following sections discuss these two sub-themes further and delineate the different evidence that led to formulating an understanding of how parents and children experience post-reunion with the use of *Rendezvous*.

6.4.3.1 Interacting with the Content as a Basis for Co-Sharing

While in post-reunion and after the unlocking of the box, the first action for all parents and children from both family cohorts was to start interacting with the content. *Rendezvous* afforded four ways to view the content that was created by the family

members: per contributor (father, mother or child), chronologically, randomly and per type (video only, image only or text only). These ways of viewing were selected to give the opportunity to parents and children to share their experiences of reunion by having a common point of reference that could guide their discussions.

While observing the interaction of the participants with the content and following the interviews that I had with each parent and child, I clearly noticed the overall sense of gratification and enjoyment that family members had for the different ways of viewing the content:

> *And then the box opens and we see the photos and what was created and it is so good that we can re-arrange them like in chronological order (father3, interview, post, lines 34–36).*

> *I never expected that I could see what everyone had put in the box in so many ways. I particularly like the one that brings the photos per family member (father7, interview, post lines 12–14).*

> *Yes! I really like that we could see the photos and text in so many different ways! (mother7, interview, post, lines 9–11).*

> *It is like you can see all that stuff in four different ways. And I think that is like looks like all the different photos appear having different meaning (child4, interview, post, lines 5–07).*

The various modes of viewing the content were perceived as an interaction that the current technologies did not offer to the family members. Even though the family members had access to all the content that was captured or even shared while they were apart, there was a tendency for this to be forgotten when they were reunited. Having a central repository of their captured moments apart that could be not only shared but also interacted with in different modes when they were reunited was a novel approach to their reunion experience. Further, the significance of the interaction with the content was that it could further guide the discussions between family members in post-reunion. Following the quotation from the child of academic family 4, the meanings and interpretations of the distributed content (e.g., photos) could then be used as a basis for co-sharing of each family member's experience of being apart and together again. This is also highlighted by the following quotation by the mother of mining family 1, in

which she describes how the interaction with a photo could guide the discussion about the rationale of taking and saving this specific photo and the meaning that it had for herself and her husband:

> *I would sometimes touch a photo and then try to see what my husband was thinking when he created that. And then he would touch my photo and this would be so close to us talking with each other more (mother5, interview, post, lines 15–17).*

The close discussion that could be inspired and guided by the interaction with the photos was a novel experience for all family members. In many cases, children gave a more playful sense to the interactions with the content as the child from mining family 3 vividly describes:

> *And I would look at the photo and then tap it to like show it and then I would want to see how many photos dad did. I will then count them and try to see if I did more or not (child7, interview, post, lines 22–24).*

Even when the photos were viewed in a more playful or competitive manner, there were many opportunities for parents and children to further foster their discussions and, consequently, inspire their co-sharing of experiences.

Moreover, the analysis of the questionnaire indicated a close relation between the impact of the interaction with *Rendezvous* with the guidance of this interaction for each family member to discuss and narrate the meaning of each photo, text or video as Figure 6-2 shows.
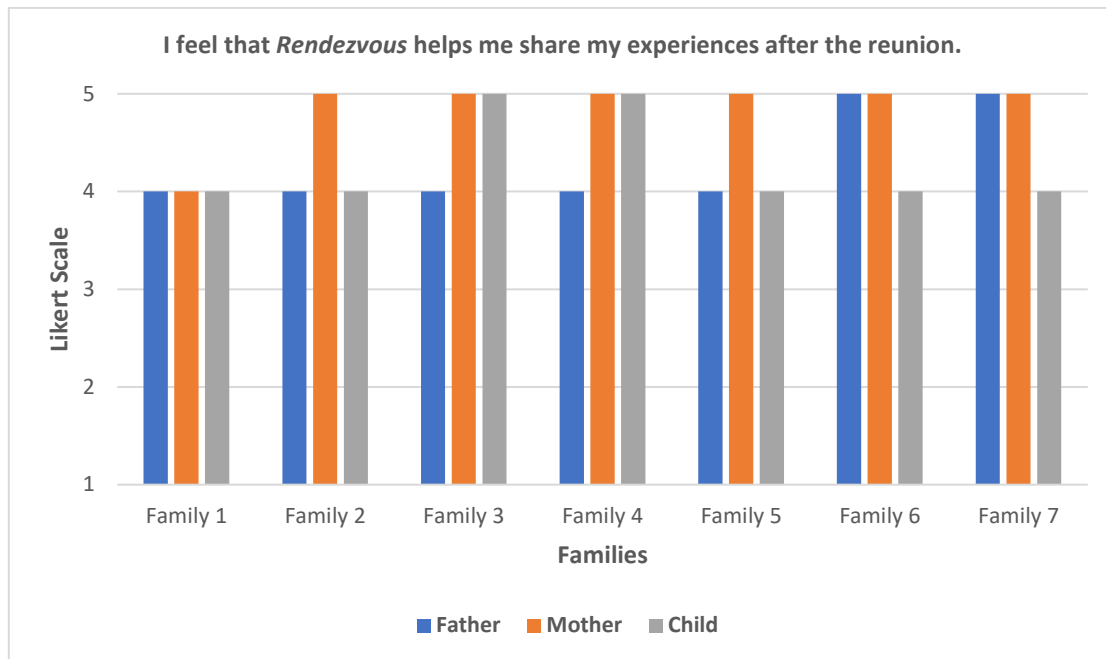
Figure 6-2: Attitudes towards *Rendezvous* in Post-Reunion

Finally, the interaction with the content was one of the most important findings of the deployment of *Rendezvous* in post-reunion because it indicated the significance of this interaction in inspiring the sharing of experience between parents and children in ways that they had never encountered before.

6.4.3.2 Storytelling as a Form of Co-Sharing

Another important finding throughout the deployment of *Rendezvous* associated with the interpretation that parents and children gave to the co-sharing of experiences in post-reunion. Initially, the view that I had towards the 'sharing of experiences' term related to the insights I had gained from the literature review and the initial interactions with the family members, particularly in Study 1 (Section 4.5.3). To that extent, I expected the co-sharing practices around *Rendezvous* to be solely focused on discussions around the key issues that the family identified with the guidance of the photos and/or videos. However, even though the interaction with the digital content created the basis for co-sharing, there was a clear indication towards the practice of story creation through narrative from all the family cohorts in post-reunion that was afforded by the *Rendezvous*.

The family members delineated the significance of the photos and the crafting of stories around the photos as a key opportunity for the whole family to share their views and talk about their experiences:

> *I particularly enjoyed the fact that the photos themselves allow for an opportunity for us, as a family, to discuss and share experiences further. More like the photos are driving our discussions like sharing and creating stories from our life apart and talking about it when we come together (father5, interview, post, lines 44–46).*

This quotation from the father of mining family 1 describes the role of stories around photos in enriching the discussions between parents and children in post-reunion. This view was shared too with the father of academic family 2 who reflected on the whole experience with the artefact, highlighting the importance of *Rendezvous* in affording the creation of stories and, hence, of supporting the discussion between parents and children during reunion:

> *This whole concept with the key, the gifts, the different ways to see the photos creates a new experience. It is as if we have now more opportunities to talk more with each other based on the photos. Like creating stories, you know (father2, interview, post, lines 55–57).*

Further, the mothers of both family cohorts emphasised the novelty of the digital content in augmenting the discussions between the family members through the construction of stories that relate to each member's experience of being apart and together. This collaborative way of sharing experiences with the aid of stories is explained best by the quotation of the mother from academic family 4:

> *It is like we talk about these photos and text and images that everyone has sent in the box. We have never done this before. There might be sometimes that he will show us a photo and we talk about it; but now it is like the whole family discussing about what everyone did while away (mother4, interview, post, lines 42–44).*

Another dimension of co-sharing that the family members denoted while using *Rendezvous* was one that related to the frequency of seeing and discussing about the content repeatedly while in post-reunion:

When we started talking about the photos after seeing them I was not surprised. But I was surprised that we returned again and again over the day and coming days in looking at the photos and talking about them (mother7, interview, post, lines 55–58).

During our interview, the mother of mining family 3 depicted her surprise that the family members would return to *Rendezvous* many times during post-reunion to talk about the content as well as to unpack what this meant for each family member. The unpacking was in many cases directed by the mother and the father and had key similarities to sharing stories or snippets of stories:

Daddy and mummy will always ask questions to men. And I will respond and then ask them questions. Like saying stories to each other (child6, interview, post, lines 20–23).

Ha ha yeah looking at the photos as dad said is like so good because she will ask me what did you mean by that? Or what did you say here? Why did you take this photo? I will then try to talk about if ... It is like when we write a story at school (child2, interview, post, lines 19–21).

In that manner, the sharing of experiences during post-reunion was instantiated through the creation of stories and the discussion between family members of the meaning and significance of these stories. This sentiment was also clearly depicted in the questionnaires in which parents and children highlighted the significance of stories that were guided by photos or other digital content in inspiring co-sharing of their experiences in post-reunion.

6.5 Discussion

The aim of Study 3 was to evaluate the effect of *Rendezvous* on the reunion experience through a field deployment with families. The research question that guided Study 3 was:

Research Question 3: How does *Rendezvous* support parent–child reunion?

Section 6.4 constructed the answer to this question by identifying the influence of *Rendezvous* on augmenting anticipation in pre-reunion; heightening initial engagement upon reunion; and strengthening the sharing of experiences in post-reunion. This study generated the following insights, which highlight the impact of *Rendezvous* in supporting reunion phases (pre, upon and post) that were not well supported by current technologies:

1. *Postponing the sharing of digital content in pre-reunion enables family members to augment their anticipation of the upcoming reunion.* An important contribution of this study is a grounded understanding, through the deployment of the artefact, of the effect that the postponement of sharing digital content has on the anticipation to reunite. In pre-reunion, *Rendezvous* enabled each family member to construct or capture and contribute digital content without being able to see the other member's contribution while they were apart.

2. *Promoting gifting upon reunion heightens the initial engagement.* The findings of this study described the way with which *Rendezvous* heightened the initial engagement upon reunion through the unlocking of the box—an activity that was perceived closely to gifting by all the participating family members. This is a significant contribution of this study since it highlights the role of digital gifting in further enriching collocated family interactions.

3. *Encouraging collocated storytelling with the participation of all family members strengthens the sharing of experiences in post-reunion.* This study demonstrated the ability of *Rendezvous* in motivating discussion around the photos, audio and videos that were shared between the family members after

the return of the father. This contributes to the current understanding of the potential of storytelling in further supporting the family ties.

The following sections explore how each of this study's main insights in each reunion phase contributes to the current body of knowledge. Section 6.5.1 discusses the importance of postponement in sharing digital content in pre-reunion within the context of previous work aimed at supporting parent–child interactions when in physical distance. Section 6.5.2 examines gifting as one of the main interaction activities upon reunion and places this finding in the previous work on technology and gift exchange within the family context. Finally, Section 6.5.3 highlights the significance of storytelling as an activity focused on raising the sharing experiences in post-reunion and places this finding within the current work on storytelling and parent–child interactions.

6.5.1 Delaying the Viewing of Digital Content Augments Anticipation in Pre-Reunion

Previous HCI research has empirically investigated the role of asynchronous communication technologies in supporting different dimensions of the parent–child relationship when they are physically separated (connectedness, intimacy, closeness and awareness) (Markopoulos et al. 2004; Kaye et al. 2005; Brown 2007; Vetere et al. 2009; Inkpen et al. 2012). The findings of this study extend this body of knowledge by drawing attention to the concept of postponement in the viewing of the digital content while in pre-reunion and its impact on the experience of pre-reunion.

This concept is a central feature of *Rendezvous*, which is an asynchronous communication technology and very different with current asynchronous oriented technologies. Specifically, each parent and child contributed captured images, audio and videos to the *Rendezvous* physical box. Family members were not able to view any of this content until the upcoming reunion when the returning parent opened the box with the key. This was quite different to what the participating family members were accustomed to with other technologies. As with every technology used within the household, it is important to allow the participants to give it their own meaning and allow them to use their own ways of adopting it (Brown 2007; Heshmat et al. 2017). All the parents and children used different communication channels to support their

relationship before the deployment of *Rendezvous*. They were highly encouraged to continue to do so—the only difference in their normal communication routine was that they were not able to view the content contributed to *Rendezvous*.

The feature of postponement is inspired by the minimal lightweight family communication and ambient display technologies that have been developed and evaluated in recent HCI work. Kaye et al. (2005) in their work on communicating intimacy between long-distance couples highlighted the richness that even something small like a change in a colour can entail. They note that this artificially constructed and constrained environment of communication gave the opportunity to the partners to reflect, convey their own meanings and further their relationship through common re-interpretation. The presence of postponement in *Rendezvous* did not allow family members to talk about the content that was created since they could not see what was contributed. However, this exact point motivated them to document their thoughts (and therefore give their meanings) and prepare further for the upcoming reunion by looking forward to reuniting. Moreover, in their work on ambient displays that are aimed to support awareness between hospitalised children and their friends as well as between elders and their care network, Wadley et al. (2013) and Consolvo, Roessler and Shelton (2004) foregrounded the meaningfulness that this technology brings to the life of an individual who is enabled to exchange thoughts and sentiments with his loved ones through the change of a colour or through glowing in the dark respectively. *Rendezvous* extends the concept of ambient displays by focusing on ambient sound. Every time that something is sent to the physical box, in pre-reunion, a very light audio notification was played back and a short message was sent to each of the mobile devices. Mothers and children who might have heard the sound were aware that something new was in *Rendezvous*. This minimal communication augmented their experience of pre-reunion through the engagement of other senses (audio notification compared to display).

Another contribution of the postponement in viewing the content was that it enabled family members to think more carefully of the nature of the content that they would contribute. This is novel compared to previous literature. In their work on sharing family experiences through pictures weblogs, Dalsgaard, Skov and Thomassen (2007) wrote of the value of images in mediating family intimacy over a distance. They also

note that in many cases, children would forget to take photos because they were not sure of how they could find something that was of interest to their parents. That was not the case for *Rendezvous*. Parents and children contributed numerous images and other content mainly because of the presence of the postponement characteristic. That content that not only related to their own feelings of distance but also were stimulated by subtle every day cues that reminded them of the habits or of something personal of their loved one.

Recent studies have depicted the significance of asynchronous video in promoting symmetry and closeness between family members. Inkpen et al. (2012), in their study on asynchronous video conversations with the VideoPal system, found that children would still use this mode of communication to enrich their close friendships even though they had access to other tools. The use of *Rendezvous* in pre-reunion was also another mode of communication for the participants. Before the deployment of the prototype, I was not sure how it would be used by the families since they could continue to use any type of technology to communicate. Yet, not only did they use *Rendezvous* but also the fact that the viewing of the content was postponed gave them the opportunity to further look forward to upcoming reunion. In that regard, *Rendezvous* afforded another form for human expression (Harper 2010). The family members expressed their feelings during pre-reunion even though they knew that they were not able to share them until the upcoming family reunion.

The findings of this study in pre-reunion highlight the significance of postponement in the viewing of the content in an effort to address the challenge of augmenting the anticipation for the upcoming reunion. They, most importantly, extend the current work on the experience of use of asynchronous family communication technologies by showcasing the close alignment between postponement and minimal lightweight communication technologies and by depicting the significance of postponement in affording another level of expression between parents and children.

6.5.2 Digital Gift-Giving upon Reunion Heightens Initial Engagement

Gift-giving is one of the most important parent–child activities, which has been extensively studied within the psychology and sociology literature (Cheal 1988; Mauss 1989; Berking 1999). Within HCI, gift-giving has received attention through studies that foreground the similarities between this practice and the use of mobile phones among teenagers (Taylor & Harper 2002); the works on understanding the significant role of gifts as rituals embedded in festive family occasions (Petrelli et al. 2012; Petrelli & Light 2014); and the existence of digital instantiations of gift-giving in addition to physical ones (Nunes, Greenberg & Neustaedter 2009). Further, Kwon et al. (2017) highlighted the different interpretations of digital gift-giving compared to the physical one among family members. The findings of Study 3 build on the existing body of work by focusing on the importance of gift-giving as a core component in the interaction between parents and children upon reunion. This, in turn, heightened the initial engagement among the reunited family members.

While *Rendezvous* was used upon reunion, many family members regarded it as a gift repository. Upon the return of the absent-parent, and before the box was opened, all the family members—and especially the children—exhibited sentiments that resembled the ones that surround the sociology of gifts (Berking 1999). For example, children were eager to open the box and look at the content created by all the family members and to ensure that their parents were close by to look at what was created. The nature of this sentiment is comparable to the principle of reciprocity that characterises gift-giving (Mauss 1989). Children and adults alike would expect to receive an image, video or audio from another family member and, at the same time, would ensure that they have created something for the rest of the family. Further, the opening of the box and the viewing of the content for the first time was similar to the unwrapping of a gift in terms of the personal meaning that was given to its content and the reciprocity that entailed that exchange (Cheal 1988). In that regard, the use of *Rendezvous* entailed a close alignment with the previous sociological work on physical gifting.

Recent HCI studies have explored the concept of gift exchange in an effort to better understand the social practices that surround the use of technology and identify future design opportunities (Taylor & Harper 2002; Kwon et al. 2017). In their study on the

use of mobile phones by teenagers, Taylor and Harper (2002) illustrated the close resemblance between the activities around the mobile phone and the practice of gift-giving. One of their findings, which related to the gifting character of the *Rendezvous* content, was the value that the teenagers gave to text messages because of the memories that they evoked. To a similar extent, the parents and children when seeing the content upon reunion for the first time, highlighted the significance that the specific image, audio and video had not only for them but also for the whole family. They would state that they intend to save the content for future reference because of the significance that it had for them. Thus, the way that the *Rendezvous* content was regarded closely aligned and re-enforced the findings from Taylor and Harper (2002). However, a distinct contribution that the use of *Rendezvous* added was the focus on gift-giving in the centre of the interaction between family members during the first moments of reunion. In Taylor and Harper's (2002) study, the gift-giving was used as a metaphor to better understand the use of mobile phone whereas in Study 3 the gift-giving was the actual activity that the parents and children engaged in during the first instances of reunion. In a more recent study on digital gift-giving Kwon et al. (2017) mentioned that individuals did not perceive the digital gifts that they received as an act of gift-giving, which resulted in not feeling obligated to reciprocate the gift. That was contrary to what he deployment of *Rendezvous* within the family setting demonstrated whereby the viewing of the content when timed with the return of the loved one (upon reunion) had similar expressions of reciprocity, exchange and appreciation to physical gift-giving.

Another contribution of situating gift-giving in the centre of the interaction upon reunion was the opportunity given to the family members to experience their first moments of reunion in a more augmented manner. All the parents and children during the interviews denoted that through the opening of the box and the gift-giving connotation that was given to this activity, they felt much more engaged than in previous first moments of reunion. In that sense, the reunion event itself was augmented and the participants attributed a more celebratory character to it. Recent work on festive technology that was explored by Petrelli et al. (2012) through a series of design workshops with participants aimed to augment existing practices surrounding Christmas. Their findings indicated that there exists a shortage in technologies, which can capture and augment significant and memorable events with the collective

participation of all the family members. In their work, participants proposed—among other possible design avenues—the utilisation of gifts as platforms for further enrichment of the family bonds during Christmas. Further, in a more recent study, Petrelli and Light (2014) explored the role of technologies in augmenting family traditions (such as Christmas). One of their take-home messages was that family participants concentrated on the 'here and now' of the traditional event. The use of *Rendezvous* upon reunion through the ritualistic gift-giving practice that surrounded it, augmented that 'here and now' by motivating all family members to be engaged actively in the first moments of reunion.

The gift-giving character of the digital content not only contributed to heightening the initial engagement of the family members upon reunion, but also drew attention to the digital nature of gift exchange. Apart from physical gifts, parents and children created digital content that was regarded as gifts upon reunion. In fact, all the content that was created by family members for their loved ones was digital photos, videos or audio. This finding extends previous work on the role of digital and physical (print) possessions that are created by/for family members (Nunes, Greenberg & Neustaedter 2009). In their work on the use of physical memorabilia alongside digital photos, Nunes, Greenberg and Neustaedter (2009) touched upon the challenge of digital gift-giving within the home when all family members are collocated. They created the Souvenirs prototype whose aim was to link specific physical memorabilia with digital photo sets to enrich the engagement of all the family members in sharing. In opposition to that, the gift exchange that *Rendezvous* afforded was conducted based only on digital content—without the existence of anything physical—when the whole family was physically collocated. By repositioning the focus on the collocated digital gift-giving the family members could further heighten their initial engagement upon reunion.

The use of *Rendezvous* enabled family members to experience more positively and augment their first reunion moments. The findings of Study 3 upon reunion extend the current HCI studies on the relationship between mobile phone use and the practice of gift exchange by foregrounding the gift-giving as the activity itself compared to a lens through which one could interpret the social character of technology. Further, these insights build on previous work on understanding the role of technology in supporting

festive family occasions and highlights the influence of *Rendezvous* in augmenting the 'here and now' of the first reunion moments. Finally, it extends the literature that concentrates on digital and physical instantiations of gift exchange through drawing attention to the collocated and digital nature of the gift exchange that was afforded by *Rendezvous*.

6.5.3 Supporting Collocated Digital Storytelling in post-Reunion Strengthens the Sharing of Experiences

The presence of stories has always encompassed the parent–child relationship (Chalfen 1987). The telling of stories and the dialogue that surrounds them promotes learning, sense-making and further strengthens the ties between the family members (Engel 1995). Guided by the sociological and psychological interpretation of parent–child storytelling, HCI researchers have explored the role of digital storytelling—which describes the practice of using digital tools to share stories—between family members who are physically separated or collocated (Balabanović, Chu & Wolff 2000; Frohlich et al. 2002; Crabtree, Rodden & Mariani 2004; Durrant, Frohlich et al. 2009; Vutborg et al. 2010; Bonsignore et al. 2013). Of particular importance for Study 3 are the works that investigate the practices that surround the use of digital storytelling when family members are situated in the same physical space using material artefacts (Frohlich et al. 2002; Laundry 2008; Patel et al. 2009; Bhömer et al. 2010; Patel & Clawson 2011; Thieme et al. 2011). The findings of this study extend these works by foregrounding the significance of collocated digital storytelling in facilitating and, particularly, augmenting the sharing of experiences when parents and children reunite.

After the return of the parent and the opening of the physical box, each family member had access to the digital content created. All parents and children who participated in the study would sit around *Rendezvous*, hear the audio or watch the video or image that the other produced for them and engage in discussion. These talks were guided mostly by the parents and they did not follow a specific protocol—the parents asked their own questions driven by the digital content. In certain occasions, children also initiated discussions based on their personal or their parents' content. The visualisation software of *Rendezvous* displayed the images, videos or audio in chronological and random order and per individual to whom the content was addressed. In that way, *Rendezvous* ensured

that all the family members would be able to use any way possible to share their experiences through the telling of stories informed by the content constructed.

The first contribution of this study, in the post-reunion phase, is the focus on the use of different forms of collocated digital storytelling—photo, video and audio—that are available to the family members when the *Rendezvous* physical box is opened. Since the shift of interest of the HCI community towards digital storytelling, most studies have concentrated on the role of digital photos only (influenced primarily by the work of Frohlich et al. [2002]) or video or audio as storytelling digital mediums. In one of the first works on HCI on family storytelling with digital photos Balabanović, Chu and Wolff (2000) designed and deployed StoryTrack—a system that allowed family members to record and share stories (either in the same or different physical space) stories between each other through photos. Their findings indicated that the discussion between parents and children, when they were collocated, was primarily photo driven. That was similar with the *Rendezvous* deployment. All participating parents and children shared their interpretations of specific photos as they engaged in a dialogue with each other. Subsequent studies of collocated digital storytelling have also centred on photos. Patel et al. (2009) studied the effect that mobile photo-sharing applications have on user engagement when people are in the same physical space. The deployment of their prototype (Mobiphos) demonstrated the added external experience that their participants felt when interacting with the technology. In a similar fashion, Lucero, Holopainen and Jokela (2011) evaluated a prototype that enabled individuals to share stories based on digital photos that they were passed around with mobile phones. The novel interaction mechanism that they introduced drew attention to the collocated sharing of the experiences of each participant. *Rendezvous* extends these studies by foregrounding the combination of audio, video and photos given the opportunity to the family members to augment their experience sharing.

Another contribution of this study is that the use of *Rendezvous* allowed parents and children to reflect on their relationship while sharing experiences in post-reunion. The dialogue that they engaged in overtime and that was driven by the presentation of the photo, video or audio gave them an opportunity to unpack their feelings and thoughts. Recent HCI work has explored the significance of recorded content in supporting

'retrospective storytelling' (Landry & Guzdial 2006, p. 1)—that is, storytelling that elicits thoughtful reflections of past events. Studies investigating the role of technology in supporting romantic relationships have also highlighted the value of dialogue among partners as a reflection mechanism (Thieme et al. 2011; Branham, Harrison & Hirsch 2012). In particular, Thieme et al. (2011)—whose work has deeply inspired the physical form of *Rendezvous*—designed and evaluated the Lover's Box: an artefact whose aim is to promote reflection within couples on their relationship. The couples created individual video messages with the help of a media artist and then shared the content with each other. This study's findings indicated the meaningfulness that each participant gave to the message shared while reflecting on the current state of the relationship. Further, Branham, Harrison and Hirsch (2012) found similar results on their enquiry into ways supporting mutual reflection for collocated partners. Their conclusions denote the existence of a space for designing and evaluating technologies that enrich the reflection between collocated partners. The deployment of *Rendezvous* adds to this body of work by emphasising on the importance of storytelling as an important medium for experience sharing that also allows parents and children to reflect on their relationship.

Supporting collocated digital storytelling in post-reunion has given the opportunity to family members to strengthen their sharing of experiences. This was an important concern of the families in Study 1 (Section 4.6.3). The findings of Study 3 in post-reunion extend previous HCI literature on collocated digital storytelling by focusing on the value of video, audio an, photos as the main forms of interaction between the reunited parents and children; and highlighting the role of the storytelling practice in a collaborative reflection of the family's bonds.

6.6 A Critique of Study 3

This study highlighted the principal role of *Rendezvous* in supporting the reunion experience of parents and children in two family cohorts. Even though Study 3 generated numerous novel results, there exist a series of key issues that were documented throughout the duration of this field deployment.

First, the interventionist nature of the field deployment was one of the key challenges throughout this study. The explicit collection of data with the repeated interviews and

visits that were timed to capture every reunion phase were regarded in some cases as too obtrusive by some family members. There were a couple of occasions in which the fathers requested to carry on with the interviews as soon as possible upon reunion, as they felt that this was a special moment for the family and could not understand why I had to be present at the second day of their return. This is a general difficulty that HCI research studies who conduct semi-controlled evaluation studies have extensively noted (Olson & Kellogg 2014).

Further, I did not run a use survey of the research prototype that would further unveil specific facets of *Rendezvous*. The reason for not proceeding with this technique was the presence of the questionnaire in which I tried to capture as much of the experience of the use of *Rendezvous* as possible (see Appendix C.5) Moreover, even though the prototype was working adequately prior to the deployment, there were numerous occasions that it did not capture the data properly. In these cases, I was contacted by the family members and resolved the issues immediately. That was one of the biggest obstacles that appeared in Study 3, which is not unknown within the current works in field deployment of prototypes (Brown, Reeves & Sherwood 2011). In addition, another difficulty—that was also apparent in Study 1 and two—was ensuring that the children would be engaged with the interview questions. In some instances, children responded laconically, which in turn required my prompt to further articulate their thought. To address this well-known issue within research involving children (Fails, Guha & Druin 2013), I employed similar techniques to recent research, which included encouraging the child to express their opinions and inviting the assistance of the parent in contextualising the questions that I was asking. Finally, the novelty of *Rendezvous* alongside the conscious effort and labour required by all participants might pose difficulties in sustaining engagement and active participation over longer periods of time. This study focused solely on one reunion as its aim was to construct an initial understanding of the ways *Rendezvous* supported reunion.

Thus, the main challenges that were faced throughout Study 3 included the robustness of the prototype, the interventionist nature of field deployments, the recruitment challenges as well as the sustained engagement with *Rendezvous* over longer periods of

time. Nonetheless, this study yielded significant insights on how parents and children experience reunion through a reunion-oriented artefact.

6.7 Synopsis of Contributions and Conclusion

The aim of this chapter was to evaluate the use of *Rendezvous*: the first reunion-oriented technology. The evaluation was conducted through a semi-controlled field deployment study with parents and children from two cohorts—academic and mining. The analysis of the interviews, observations, questionnaires and behavioural data logs highlighted the significance of *Rendezvous* in augmenting the anticipation in pre-reunion through co-creation, in heightening the initial engagement by motivating co-engagement upon reunion, and in strengthening the experience sharing by inspiring co-sharing in post-reunion. In many regards, the deployment of the research prototype structured a complete answer to the study's research question and identified potential future directions through a constructive criticism of the study's implications.

The discussion of the findings indicated the way in which they extend the current understanding when evaluating and designing technologies that intend to support parent–child interactions. Study 3 has also brought the thesis to a closure since the field trial of *Rendezvous* evaluated not only the use of the artefact but, most importantly, the degree to which this prototype addressed the main reunion problems raised in Study 1 (dilution of anticipation, sparseness in initial engagement and paucity in sharing of experiences) for which each quality was identified through the design process in Study 2. The next chapter reflects on the whole thesis and discuss its contributions through an analytic examination of each study's answer to its research question.

Chapter 7: Discussion and Conclusions

7.1 Introduction

The previous chapter presented Study 3, which evaluated the *Rendezvous* artefact through a deployment with academic and mining families. The aim of this chapter is to present the thesis' overall contributions and discuss their significance in relation to previous work. This thesis, being the first one to concentrate solely on parent–child reunion within HCI, generates three main contributions. Firstly, the thesis identifies key limitations of current technologies in supporting parent–child reunion. Secondly, it highlights the importance of asynchronous technologies in enriching parent–child reunion. Thirdly, it denotes the value of materiality and temporality as key features of reunion-oriented technologies.

This chapter commences with a recapitulation of the thesis' research questions (Section 7.2), followed by a discussion of this research's significant contributions (Section 7.3). Section 7.4 addresses the limitations of the overall research process whereas Section 7.5 reflects on the future directions. Finally, Section 7.6 draws this chapter to a close by synthesising all the insights from this research.

7.2 Recapitulation of the Thesis' Research Questions

Chapter 2 included a review of related work on technology, family interactions and family reunion, and demonstrated the lack of current knowledge on technology for parent–child reunion. Reunion is an experience composed of three phases: pre, upon and post (Moss & Moss 1988). The pre-reunion phase extends over the last moments of physical separation up until the eventual reunion. Upon reunion includes the first minutes of physical collocation. Post-reunion is the period that commences immediately after the first moments of being together again until the next physical separation occurs. Reunion is a temporal phenomenon that often occurs periodically. Figure 7-1 shows an overview of the periodic nature of reunion as it was interpreted in this thesis following (Moss & Moss 1988).
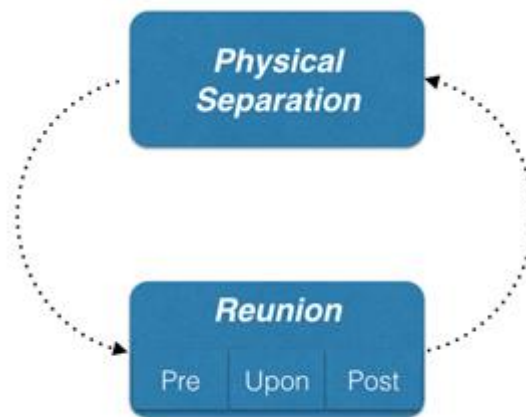
Figure 7-1: An Overview of Reunion's Phases and Their Relationship with Separation

The transitions between reunion and separation affect the parent–child bonds (Clark & Taylor 1988; Stafford & Merolla 2007; Rose Sutherland, Chur-Hansen & Winefield 2017). Previous work has investigated the role of digital technologies in enhancing dimensions of parent–child relationship in separation (Applewhite & Mays 1996; Diamond & Hicks 2008; Neustaedter, Harrison & Sellen 2012; Gewirtz & Youssef 2016). However, there is little understanding of how current technologies are used by parents and children when they reunite. Further, there is little knowledge on the limitations of these technologies in supporting the pre-, upon and post-reunion phases. Moreover, no previous work has thoroughly explored the attributes of a reunion-oriented technology and evaluated its impact on the reunion experience.

7.2.1 Main Research Question

Guided by the literature gaps around digital technologies and parent–child reunion (Section 2.4), this thesis asked the following research question:

> **Main research question:** What is the role of technology in supporting parent–child reunion?

The main research question is divided into three sub-questions, one for each of the three studies of this thesis (Section 3.3). The answer to the main research question highlighted three important findings. Firstly, current technologies do not adequately support the

anticipation to reunite in pre-reunion or the sharing of experiences in post-reunion. Secondly, there exists the need to design reunion-oriented technologies that aim to stimulate co-creation in pre-reunion, motivate co-engagement upon reunion and inspire co-sharing in post-reunion. Thirdly, a reunion-oriented technology can support reunion by augmenting anticipation in pre-reunion, heightening the initial engagement upon reunion and strengthening the sharing of experiences in post-reunion. Table 7-1 shows the research questions that drive the studies of this thesis alongside the answers that construct the overall response to the thesis' main research question.

Table 7-1: An Overview of the Answers to the Research Questions

	Study 1	**Study 2**	**Study 3**
Research Question	How are current technologies used in parent–child reunion?	What are the interactional qualities of technologies that support parent–child reunion?	How does *Rendezvous* support parent–child reunion?
Answer	Current technologies lack in supporting: • the anticipation to reunite in pre-reunion • the initial engagement upon reunion • the sharing of experiences in post-reunion	Technologies that aim to support reunion need to: • stimulate co-creation in pre-reunion • motivate co-engagement upon reunion • inspire co-sharing in post-reunion	*Rendezvous* supports parent–child reunion by: • augmenting anticipation • heightening initial engagement • strengthening experience sharing

7.2.2 Research Question 1: Use of Current Technologies in Parent–Child Reunion and Their Limitations

Research question 1: How are current technologies used in parent–child reunion?

The answer to research question 1 was assembled by the insights gained through the observations and interviews with the defence and academic family members (Section 4.5). Even though the findings depicted the diverse ways with which current technologies are used by parents and children in reunion, the finding also highlighted certain limitations. These limitations are organised according to reunion phase (pre, upon and post). Firstly, current technologies do not adequately support the anticipation to reunite. Secondly, they are insufficient in enriching the initial engagement upon reunion. Thirdly, they do not strengthen the sharing of experiences between parents and children in post-reunion. The nature of these limitations highlighted the impact that specific communication technologies have in the domestic domain. The findings suggest that the use of always-on communication technologies (e.g., continuous video) can influence how reunion is experienced. This creates an opportunity to further investigate the design of technologies that focus on supporting parent–child reunion.

7.2.3 Research Question 2: Designing *Rendezvous*

Research question 2: What are the interactional qualities of technologies that support parent–child reunion?

The answer to research question 2 was constructed through a series of co-design workshops with interaction design experts and academic family members (Section 5.4). The findings indicate three essential qualities for reunion-oriented technologies, which were instantiated in the design and development of *Rendezvous*. During pre-reunion, parents and children can send photos and videos of their daily life to the artefact using the corresponding mobile application. However, they cannot view the digital content until the return of the parent who holds the key to the box. Upon reunion, the family members can unlock *Rendezvous* and view the contributed content. After it is opened, and while in post-reunion, parents and children are encouraged to share thoughts on the

content and reflect on the significance of their reunion. The asynchronous nature of *Rendezvous* responds to the requirements that the design process yielded. Since it is the first reunion-oriented artefact, it is essential to investigate the effect that this technology has on the experience of reunion by family members.

7.2.4 Research Question 3: Evaluating *Rendezvous*

Research question 3: How does *Rendezvous* support parent–child reunion?

The answer to research question 3 was constructed through the field deployment of *Rendezvous* with academic and mining families. The use of the artefact over a period of one to three weeks generated three answers to the above question (Section 6.4). First, *Rendezvous* augments the anticipation to reunite by postponing the display of the content in pre-reunion. Second, it heightens the initial engagement upon reunion by shifting the focus of the family to the return of the parent. This is achieved through the act of unlocking the physical box and celebrating the return like the opening of a gift. Third, it strengthens the sharing of experiences in post-reunion by encouraging collocated storytelling around the content.

This study also displays the merit of asynchronous technologies in supporting parent–child reunion. The deployment of *Rendezvous* validated the initial assumption that Study 2 yielded regarding the specific qualities that a reunion-oriented technology needs to afford. Further, the third study exhibits the significance of materiality and temporality with respect to technologies that focus on supporting parent–child reunion. The next section unpacks all the contributions of this thesis driven by the insights from each of the studies.

7.3 Contributions

This thesis makes three main contributions. Firstly, it highlights the key limitations of current technologies in supporting the three main dimensions of the reunion experience (pre, upon and post). Secondly, it signifies the benefit of asynchronous technologies— an overlooked area for family technology design and evaluation in the context of parent–child reunion. Thirdly, it emphasises the importance of materiality and temporality as key constituents of reunion-oriented technology design and evaluation.

Sections 7.3.1, 7.3.2 and 7.3.3 discuss each of the significant contributions and illustrate how they extend previous literature.

7.3.1 Contribution One: Highlighting the Necessity to Support Parent–Child Reunion

The first contribution of the thesis is the identification of the limitations of current technologies in supporting parent–child reunion. Previous work has investigated how digital technologies can enrich the parent–child ties when physically separated (Neustaedter, Harrison & Sellen 2012). However, there is little knowledge of the role of current technologies in supporting the experience of reunion. By applying Moss and Moss's (1988) sociological model of reunion this thesis highlights specific limitations that current technologies have in supporting that family experience (Section 4.4). These relate to the anticipation to reunite in pre-reunion, the initial engagement upon reunion and the sharing of experiences in post-reunion.

7.3.1.1 The Need to Support the Anticipation to Reunite in Pre-Reunion

The main limitation of current technologies about pre-reunion is the diminishing of the anticipation to reunite (Section 4.6.1). Previous sociological literature has emphasised the value of anticipation in the overall reunion experience (Wood, Scarville & Gravino 1995; Ramirez, Skrbiš & Emmison 2007). As described in Section 4.5.1, the academic and defence family members that took part in Study 1 used both synchronous and asynchronous communication technologies to connect while being physically apart (Table 4-1). The use of these technologies eased the reunion preparation by supporting essential parent–child interactions while in separation and when in pre-reunion.

However, it also affected the anticipation for the upcoming reunion, which was relevant to all the academic families that took part. This occurred because of the presence of synchronous communication technologies (e.g., video-based communication) that offered rapid and continuous interaction close to the upcoming reunion. The parents and children from these families mentioned that oxymoron impact from the extensive use of video-based chat (Section 4.5.1). It not only enriched their interaction with their loved one while apart (see Neustaedter 2010; Kirk, Sellen & Cao 2010; Kaye 2011;

Neustaedter & Greenberg 2012; McClure et al. 2015) but also deducted from their sense of anticipation for the upcoming reunion. The frequent contact with synchronous communication tools that supported visual cues gave the impression to the family members that the other member was always there, which was comforting and re-assuring at times. Nevertheless, it lessened their anticipation of reunion given that there was no delay in communicating.

This thesis' finding broadens the current work on domestic media spaces (Judge & Neustaedter 2010; Judge et al. 2011; Heshmat et al. 2017; Neustaedter et al. 2017), which highlighted the importance of always-on video communication. The always-on video for the academic families resembled the presence in absence, which has been associated with frequent video communication technology use (Schroeder 2006). When academic family members used asynchronous technologies, they experienced that their sense of anticipation was not lessened to the same extent as when they used synchronous ones. For example, as noted throughout section 4.5.1, it was not uncommon for the at-home parent of these families to feel that that the absent parent is easily reachable through email, video communication or text message. Even though this was positively accepted as a welcoming product of communication technologies, they mentioned that their anticipation to reunite was affected in terms of their eagerness towards the reunion. Naturally, they were happy to be physically together again but they explained that they would have liked to experience what the anticipation meant for the whole family as if it was the first time.

That anticipation to reunite has been addressed indirectly in previous works. The closest body of literature that has touched upon this concept is that related to families who separate periodically due to work-related reasons (Modlitba & Schmandt 2008; Yarosh & Abowd 2011) as well as personal ones (Yarosh, Denise Chew & Abowd 2009; Odom, Zimmerman & Forlizzi 2010). These works mentioned the eagerness that children felt when waiting to reunite with their parents. The difference in how anticipation was perceived between the different family cohorts relates not only to the ease of accessing different communication technologies but also the frequency of their use. Thus, this thesis extends the previous work by treating the anticipation to reunite as having a direct relationship with the frequency of communication technology use.

In the context of the design and evaluation process, current research efforts do not consider the anticipation to reunite as a vital constituent of the technology (Saslis-Lagoudakis et al. 2006; Dalsgaard, Skov & Thomassen 2007; Brush, Inkpen & Tee 2008; Vetere et al. 2009; Bales, Li A & Griswold 2011). This thesis, through the design and development of *Rendezvous*, demonstrates how that dimension of reunion is part of the design and evaluation during the pre-reunion phase (Sections 5.4.1 and 6.4.1). This thesis does not advocate against the use of always-on video-based communication technologies. Rather, following the work of Harper (2010), it features the opportunities of using communication technologies that are more 'reunion sensitive'—that is, technologies that are focused on the experience of reunion. Therefore, it further adds to the already existing palette of communication mediums available for every individual to express their thoughts and emotions. The next section discusses the limitations of current technologies with respect to the initial engagement upon reunion.

7.3.1.2 The Need to Support the Initial Engagement Upon Reunion

Another limitation of current technologies with reference to the upon reunion phase—which is the period spanning the first minutes of reunion—is the lack of support for initial engagement. Recent sociological work has foregrounded the significance of the upon reunion phase in enabling the family members to commence their process of reunification (Clark & Taylor 1988; Bernhard, Landolt & Goldring 2005; Peterson 2006; Ramirez, Skrbiš & Emmison 2007; Gewirtz & Youssef 2016).

During the first study of this thesis, some of the families (all the defence and one of the academic) used collocated technologies (e.g. the absent parent of the first academic family mentioned that he used his mobile phone to record the moment when the children were opening the door for him since he would like to keep this memory and return to it while he was away) upon reunion to demonstrate and capture their family interactions (Section 4.5.2). They took photos and videos using primarily their mobile phone cameras to record their moment of reunion. They also exchanged gifts as a way of celebrating the reunion of the family. However, the remaining academic families did not use any types of these technologies. The reason this occurred was twofold. The first is the prevalent use of different communication technologies (e.g. the at-home parent of the third academic family shared that in many cases the children will prefer to be with

friends compared to welcome their absent parent upon his return at home. When she asked them to share why they prefer doing that they responded by reminding her that they have been talking to him every day for the last days.) while apart that was discussed in the previous section. Second, current collocated technologies are not designed to heighten the initial engagement upon reunion. As discussed in Section 6.4.2, *Rendezvous* achieved this through one of its specific qualities—the key that opens the box upon reunion.

Photos and videos are among the most common collocated technologies used to capture moments of family life (Frohlich et al. 2002; Durrant, Frohlich et al. 2009; Lindley, Durrant et al. 2009; Van House 2009; McClure et al. 2015; Blasko & Murphy 2016). They act as mediums of reflection, interpretation and sharing of experiences between the family members (Dalsgaard, Skov & Thomassen 2007; Thieme et al. 2011; Branham, Harrison & Hirsch 2012; Broekhuijsen, van den Hoven & Markopoulos 2017). However, as the findings of this thesis demonstrate, these technologies do not focus adequately on the first moments of reunion since their temporal character can discount the magnitude of the upon reunion dimension of reunion. An example is the momentary recording of a family photo or video that does not salute the significance of the reunion. It can be forgotten or overlooked. The collocated technologies that previous work has designed and deployed in an effort to support face-to-face interactions are a first step towards enriching the initial moments of reunion (Patel et al. 2009; Bhömer et al. 2010; Jacucci et al. 2010; Lucero, Holopainen & Jokela 2011). However, their context of use is different to the one that this thesis investigated since they do not concentrate on the reunion experience. Rather they focus on the interactions between family members when they are in the same physical space, which is different to the reunion experience.

This disconnect is partly addressed by the studies on family divorce who have attempted to describe the first moments of reunion in the context of work-separated and divorced families (Modlitba & Schmandt 2008; Yarosh, Denise Chew & Abowd 2009; Odom, Zimmerman & Forlizzi 2010). Nevertheless, this work does not explore the relationship between collocated technology use and the upon reunion phase. In that sense, this thesis extends earlier work by stressing the necessity to consider the limitations that current

technologies have during the first moments of reunion. It also underlines the importance of specific qualities of reunion-oriented technologies (Section 5.5.3) in heightening the initial engagement during pre-reunion (Section 6.4.2).

7.3.1.3 The Need to Support the Sharing of Experiences in Post-Reunion

The last limitation of current technologies concerns the post-reunion phase and the sharing of experiences. This post-reunion phase is the most important one; during this stage, parents and children can reconstruct and strengthen their bonds (Moss & Moss 1988; Stafford & Merolla 2007).

The defence family members used technologies after their reunion to share their experiences through videos, photos or playful activities in their effort to reaffirm their family ties (Section 4.5.3). However, none of academic families used these technologies (Section 4.6.3). This was mainly because of the prevalence and use of various synchronous and asynchronous communication technologies by academic families while they were physically separated. It was clear that current technologies in that context did not inspire the co-sharing of their experiences. Their content and the practices that surrounded the presentation of this content were not inviting to the participating academic family members (especially the children).

This limitation extends the current work on the role of collocated technologies in sharing experiences between family members in two ways (Lindley, Durrant et al. 2009; Patel et al. 2009; Bhömer et al. 2010; Lucero, Holopainen & Jokela 2011). Firstly, it brings into focus the importance of the motivation and inspiration that the content needs to have for the family members to take part (Sections 5.4.2 and 5.4.3). Secondly, it highlights how content that is created before reunion can support the sharing of experiences in post-reunion (Section 6.4.3). Previous work has explored how parents and children interact around content that has been created by both when they are together or apart (Frohlich et al. 2002; Cole & Stanton 2003; Durrant, Frohlich et al. 2009; Nunes, Greenberg & Neustaedter 2009; Patel et al. 2009; Bietti, Baker & Détienne 2016; Broekhuijsen, van den Hoven & Markopoulos 2017; Wagenknecht 2017). These works have centred on the presentation of photos and the support that the

technology has on enriching the processes of making and telling of the stories around these photos.

On the contrary, the design of *Rendezvous* (Section 5.4.3) entrenched certain concepts (e.g., the postponement of content and promoting whole family participation) that resulted in encouraging the collocated storytelling among the family members (Section 6.4.3). These concepts were also present in recent work on technologies that support reflection among partners (Thieme et al. 2011; Branham, Harrison & Hirsch 2012) but they did not include the participation of children. They also did not explore the influence of the artefact on the sharing of experiences in the same manner that *Rendezvous* did in the post-reunion phase given the different context of use. These limitations of current technologies in post-reunion emphasised the importance of the practices that surround the sharing of contributed content, which include storytelling, when in the post-reunion phase.

7.3.2 Contribution Two: The Merit of Asynchronous Technologies in Supporting Reunion

Another important contribution of this thesis is the identification of asynchronous technologies in supporting reunion. Chapter 2 (Section 2.4) emphasised the lack of current research on technologies that support parent–child reunion. Most of the previous work focuses on enriching parent–child ties while in physical separation (Neustaedter, Harrison & Sellen 2012; Judge & Neustaedter 2015). Table 7-2 shows the prior research which is most closely aligned to this thesis. The literature is organised according the use of technology in either physical separation, collocation or reunion. This thesis contributes to a previously overlooked area (asynchronous technologies for reunion) through the design and deployment of *Rendezvous*—the first reunion-oriented artefact.

This thesis extends earlier work by underlining the importance of asynchronous technologies in augmenting the anticipation to reunite, heightening the initial engagement upon reunion and strengthening the sharing of experiences in post-reunion (Section 6.5). Specifically, this thesis builds on the recent work in dynamic family structures (Modlitba & Schmandt 2008; Odom, Zimmerman & Forlizzi 2010; Yarosh & Abowd 2011) and the work on parent–child interaction in divorced families (Yarosh,

Denise Chew & Abowd 2009; Odom, Zimmerman & Forlizzi 2010). It does so through the design and evaluation of *Rendezvous*, the first asynchronous reunion-oriented technology (Sections 5.4 and 6.4).

Table 7-2: Studies of Synchronous and Asynchronous Technologies Used for Parent-Child Separation and Parent-Child Reunion

	Synchronous Technologies	Asynchronous Technologies
Parent–Child Separation	Judge et al., 2010; Judge and Neustaedter, 2010; Judge et al., 2011; Raffle et al., 2011c; Yarosh and Kwikkers, 2011; Neustaedter and Greenberg, 2012	Bentley et al., 2011; Inkpen et al., 2012; Odom et al. 2014)
Parent–Child Reunion	Modlitba and Schmandt, 2008; Yarosh & Abowd 2011	*Rendezvous*
Parent–Child Collocation	Balabanović et al., 2000; Dalsgaard et al., 2007; Yarosh et al., 2009; Vutborg et al., 2010	Landry & Guzdial 2006; Nunes, Greenberg & Neustaedter 2009; Patel et al. 2009; Jacucci et al. 2010 Thieme et al., 2011; Branham et al., 2012

One of the key findings of this thesis is the value that the delay in viewing the digital content sharing has on augmenting the anticipation to reunite while in pre-reunion (Section 6.5.1). Most of the preceding work has suggested that family communication technologies need to afford explicit (mostly video-based) synchronous interactions, which are referred to as always-on technology (Judge, Neustaedter & Kurtz 2010; Judge & Neustaedter 2010; Judge et al. 2011; Raffle, Revelle et al. 2011; Yarosh & Kwikkers 2011; Neustaedter & Greenberg 2012). Other work has investigated the role of asynchronous modes of communication when parents and children are physically apart (Bentley, Basapur & Chowdhury 2011; Inkpen et al. 2012). The postponement of content in *Rendezvous* (Section 5.4.1) is similar to the notion of slow technology (Hallnäs & Redström 2001; Odom et al. 2012, 2014). That concept highlights the necessity for technology to support reflection by magnifying the 'moments of mental

rest' rather than aiming for 'efficiency in performance' (Hallnäs & Redström 2001, p. 4). Inspired by that work, Odom et al. (2014) deployed Photobox with three families and had similar findings to the deployment of *Rendezvous* regarding the value that postponement brings to anticipation and strengthening of family relationships. The central difference between this work and this thesis is that in the latter the focus is to support the reunion experience. Nevertheless, Odom et al.'s (2014) work substantiated the findings of this thesis regarding the merit of asynchronous technologies in supporting reunion.

Another characteristic of *Rendezvous* that highlights the merit of asynchronous technologies in supporting reunion is the heightening of the initial engagement through the asynchronous digital gifting (Section 6.5.2). Earlier work has described that individuals associate the content exchanged with asynchronous communication means (e.g., text messages) with digital gifts (Taylor & Harper 2002; Raffle, Revelle et al. 2011; Inkpen et al. 2012). Moreover, other works have described how family members perceive video or audio messages that they receive while they are apart as instances of gifts (Raffle, Ballagas et al. 2011). Further, Kwon et al. (2017) mentioned the need to rethink how digital gift-giving is mediated among individuals while they are apart given that it involves less labour compared to physical gift-giving and can result in less reciprocity. In all those cases, the nature of digital gift-giving and receiving is part of an interaction that occurs while in separation. This thesis extends the previous work by highlighting the value of a technology that supports asynchronous digital gift-giving when family members reunite. Through the design of an artefact that promotes asynchronous digital gift-giving upon reunion (Section 5.4.2), this thesis forefronts the importance of the asynchronous space for supporting the parent–child reunion.

A final finding that supplements the specific contribution of this thesis is the value of *Rendezvous* in strengthening the sharing of experiences after the reunion has occurred (Section 6.4.3). Previous work has mentioned the value of asynchronous technologies in supporting sharing experiences between parents and children when they are collocated. That occurs mainly using pictures and videos that are surrounded by digital storytelling practices (Balabanović, Chu & Wolff 2000; Dalsgaard, Skov & Thomassen 2007; Modlitba & Schmandt 2008; Yarosh, Denise Chew & Abowd 2009; Vutborg et al.

2010). Other works have also depicted the importance of asynchronous technologies in supporting the collocated sharing of experiences through photos (Landry & Guzdial 2006; Nunes, Greenberg & Neustaedter 2009; Patel et al. 2009; Jacucci et al. 2010). In all these works, the technology afforded the asynchronous contribution of content that was shared among family members in the same physical space. In that sense, the *Rendezvous*' quality of co-sharing in post-reunion (Section 5.4.3) did resemble the previous work and in particular the work on Lover's Box and the Diary for Two (Thieme et al. 2011; Branham, Harrison & Hirsch 2012). However, the context was very different (supporting reunion) compared to supporting the reflection of the relationship that these works discussed. Thus, the asynchronous nature of *Rendezvous* aided in developing a more tangible understanding of the potential for asynchronous technologies to support parent–child reunion.

7.3.3 Contribution Three: Materiality and Temporality as Key Design Considerations for Reunion-Oriented Technologies

The third contribution of this thesis reveals the value of materiality and temporality as key design considerations of technologies aimed to support the reunion experience. It extends previous work that investigated the role of physical and tangible artefacts in supporting closeness, presence, intimacy, and sharing of experiences as key attributes of the parent–child relationship either while in physical separation (Vetere et al. 2005; Modlitba & Schmandt 2008; Raffle, Ballagas et al. 2011; Raffle, Mori et al. 2011; Isola & Fails 2012) or when in physical collocation (Feltham, Vetere & Wensveen 2007; Petersen 2007). Further, it builds on recent work within HCI that has investigated the concept of temporality when understanding the role of long-term use of artefacts in specific contexts (Fabre & Howard 1998; Reddy, Dourish & Pratt 2006; Irani, Jeffries & Knight 2010; Huang & Stolterman 2011; Lundgren 2013; Huang & Stolterman 2014; Light & Petrelli 2014).

7.3.3.1 The Importance of Materiality in Supporting Reunion

Materiality within interaction design and HCI research has received significant attention in the last few years, as this discourse is adopting a growing practice orientation agenda (Kuutti & Bannon 2014). The main corpus of studies on material artefacts within HCI

have centred on understanding the social life that surrounds them and the role of material properties in home practices and inspired processes of making (Jacucci & Wagner 2007; Jung & Stolterman 2012; Rosner 2012; Giaccardi & Karana 2015). This thesis espouses Giaccardi and Karana's (2015) line towards materiality, which constitutes of not only the objects that encompass materials but also the properties and embodiments through which these materials are experienced.

The design process of *Rendezvous* (Section 5.4.2) highlighted the necessity for a reunion-oriented artefact to embrace materiality to support the dimensions of reunion that were not well addressed by current technologies (Section 4.6). The findings of *Rendezvous'* deployment depicted the role of its materiality (in that case, the presence of the key and the lockable component) in augmenting the anticipation to reunite and heightening the initial engagement upon reunion (Section 6.4). These are supported by earlier work on technologies that aimed to support romantic relationships and research studies focused on enriching the parent–child ties. In particular, the work of Thieme et al. (2011)—through the design and deployment of the Lover's Box—depicted the noteworthiness of materiality and physicality as core constituents of technologies that aim to support a romantic relationship. Similar to the work of Gaver et al. (2010), their findings indicated the effect that the materiality of technological artefacts has on enriching the family ties, which was similar to the outcomes of Study 3 (Section 6.5).

In the specific context of parent–child interaction, the findings of this thesis support earlier work on tangible technologies aimed to strengthen the parent–child relationship when being together or apart. Specifically, the works of Vetere et al. (2005), Feltham, Vetere and Wensveen (2007) and Nunes, Greenberg and Neustaedter (2009) have discussed the role of tangibility and materiality in the design of artefacts that mediate essential interactions between parents and children over a distance. Further, the work of Petersen (2007) noted the value of material artefacts in further enriching the parent–child relationship when in the same physical space by promoting collaboration and playful engagement. *Rendezvous* invited and promoted the co-engagement upon reunion and co-sharing in post-reunion through each family member's interactions with the digital and physical material properties of this artefact (Section 6.4.3). These interactions with *Rendezvous'* content aided the processes of meaning-making (through

telling as well as sharing stories) and constructed individual understandings of the reunion experience for everyone.

This thesis extends all the earlier strands of research on materiality by highlighting the role of materiality as a key design consideration for reunion-oriented technologies. Through the design and deployment of *Rendezvous*, this thesis confirmed the former works' findings about the significance of materiality by displaying how this artefact's material components further enrich reunion during the pre-, upon and post-phase (Section 6.4).

7.3.3.2 The Significance of Temporality in Supporting Reunion

Temporality has been one of the primary philosophical debates of recent times in which various schools of thought have tried to construct an interpretation of time that either has a non-ending linear path or is built by the culmination of three dimensions—future, past and present (Heidegger 1967). This thesis is inspired by the latter approach to temporality in what Heidegger (1967) defines as the future, past and present forming a unity and have finite nature.

In HCI and interaction design, temporality has attracted noteworthy research interest in recent years. Reddy, Dourish and Pratt (2006) called for a focus on the temporal aspects of information and communication technology use by defining three temporal features (trajectories, rhythms and horizons) in their effort to understand work on healthcare information management. Researchers answered that call by investigating trajectories of experience (Benford & Giannachi 2008), examining the role of time in lifespan technology (Massimi et al. 2011) and understanding temporal challenges in email use (Huang & Stolterman 2011) and identifying methods that support the capturing of temporal aspects of long-term use experience (Huang & Stolterman 2014). In the context of family life and home, there have been only a handful of works that highlight the importance of temporality in informing HCI and these focus on festive technologies—technologies that aim to support festive events that recur over time (Petrelli et al. 2012; Light & Petrelli 2014; Petrelli & Light 2014).

Reunion, as demonstrated throughout this thesis, is a temporal experience in that it occurs recurrently and has a periodical nature following a physical separation (Ramirez, Skrbiš & Emmison 2007; Stafford & Merolla 2007). The first study of the thesis unveiled the effect of temporality on the reunion experience. It also explored the relationship between the use of technologies during reunion and the temporality of that experience by presenting the dimensions of anticipation, initial engagement and sharing of experiences as principal constituents of that experience (Section 4.6). Further, the design of *Rendezvous* aligned to the temporal aspects of reunion (pre, upon and post) and considered those when identifying the key interactional qualities of the reunion-oriented artefact (Section 5.4). Finally, the field deployment of *Rendezvous* had a strong temporal component in line with the nature of the reunion experience, which embraced the past, present and future individual understandings of reunion by each family member (Section 6.4).

To that extent, this thesis extends earlier work on temporality, technology and family by depicting the importance of considering temporality when designing artefacts aimed to support parent–child reunion. This adds to earlier work on festive technologies by expanding our understanding of the similarities between temporality in that context and the one in reunion (Petrelli et al. 2012; Light & Petrelli 2014; Petrelli & Light 2014). This includes the common themes of anticipation for Christmas (which is the predominant festive occasion that has been investigated from recent research studies) with the anticipation for reunion that *Rendezvous* was designed for and eventually creates. In addition, the work of Light and Petrelli (2014) on festive technologies highlighted the importance of presence among the family members and tangibility of the gifts shared as key components of temporality, which is similar to the findings of this thesis in terms of the importance in heightening the initial engagement upon reunion through digital gifting and strengthening the sharing of experiences in post-reunion through digital storytelling.

The findings from the deployment of *Rendezvous* disclose the temporal nature of the interaction between that artefact and the individual family member, which particularly in post-reunion, invited the reflection of the experience by all family member through sharing stories that were prompted with the use of *Rendezvous*. That connection

between self-reflection and the temporal character of reunion aligns with the concept of temporal anchors in user experience research, which demonstrated the necessity for the presence of anchors as a way of collecting and grounding temporal aspects of long-term user experience (Huang & Stolterman 2014). Finally, the delay in the viewing of the digital content until the upcoming reunion that *Rendezvous* encouraged has key commonalities with how recent work on slow technologies treats time and temporality (Hallnäs & Redström 2001; Odom et al. 2012; Orehovački et al. 2013; Odom et al. 2014). The deployment of *Rendezvous* foregrounded similar learnings to the previous work that centred on the augmentation of the anticipation in pre-reunion and the heightening of the initial engagement upon reunion. This validated that work by demonstrating the significance of slowness in viewing the content as a key constituent of temporality when designing family artefact. Nevertheless, it did so in a completely new context.

7.4 Limitations and Recommendations

The research presented in this thesis has given new and innovative insights on the role of technology in supporting parent–child reunion. Detailed critiques have been provided in each of the chapters for the three studies of this thesis (Sections 4.8, 5.8 and 6.6). I discuss them again here to evaluate the overall research process, present the challenges faced highlight the limitations of the contributions developed in this thesis and, where applicable, provide recommendations on how to address them.

7.4.1 Limited Number of Available Participants

Throughout this research, I had significant difficulties in recruiting participants. In total, I recruited nine families (27 participants) for Study 1, four families (12 participants) for Study 2 and seven families (21 participants) for Study 3. The challenges in recruitment were mainly because of the nature and sensitivity of the reunion experience as well as the necessity to involve families who were experiencing periodic reunions. During Study 1, the recruitment was particularly difficult because of the challenges around involving defence families. Numerous authorisations from the local defence organisation had to be obtained prior to the commencement of the study, which made the continuing involvement of these families prohibitive

To mitigate limitations relating to participant numbers, data from a range of sources was included (such as field notes from visits in the Melbourne airport at study 1, qualitative interviews with the parents and children in all studies as well as data logs from the use of *Rendezvous* in study 3). Moreover, I adjusted my recruitment approach in study 2 and study 3, where I focused on academic families and invited another family cohort (mining) to participate in this study. This ensured that an initial understanding of the role of technology in supporting reunion was formed, which was the primary aim of this thesis.

7.4.2 Participant Bias

There was a gender bias with the participants in my research. In all but one families who participated in this thesis the absent parent was the father. Furthermore, all families had a nuclear configuration – two parents and their children – which impacted the generalizability of the findings.

However, my thesis was not an exploration into gender and family structure, and how they impact the relative engagement of family members with reunion, and so having a skew in participant and family demographics affects the applicability of my findings if attempting to widen the implications of my research. In future studies, it would be useful to explore the effect of gender and non-traditional families (e.g. single parent or same-sex families) on parent-child reunion using reunion-oriented technologies while expanding the knowledge generated by this thesis.

7.4.3 Single Analyst

The analysis of this research was conducted by a single researcher. Ideally, a second analyst/coder adds credibility to findings and strengthens confidence in conclusions drawn when analysing qualitative data, however, this analyst triangulation is not always logistically possible – as in the case of this research. Miles and Huberman (1994) argue that multiple researchers should be involved in the analysis to member-check the coding schemas used and to cross validate the findings are they emerge. To address the challenges of a single analyst, colleagues or peers could be involved to review the research process.

While I carried out the analysis independently, I also pursued to invite other researchers into the stages of the analysis process. First, my supervisors guided me through the all phases of the analysis, from the preliminary analysis during data collection to writing up the conclusions. During all studies both of my supervisors, helped me to interpret excerpts from interview transcripts. Further, I discussed my activities in the field and my interpretations of the data with both of my supervisors on an ongoing basis. Additionally, I shared my research with multiple colleagues in my research group and with various HCI scholars during my overseas studies in the UK. Moreover, I gave 16 formal presentations at conferences, workshops, lectures and doctoral colloquia, which further enabled me to strengthen the consistency of the process. The discussions with the audience helped me to interpret the data in diverse ways to develop a crisper understanding of the challenging role of technology in supporting parent–child reunion. Finally, the peer reviews for the publications arising from this thesis also contributed to my interpretation of the data. All these interactions with other scholars aided my analysis significantly, and they also served as an examination of my analytic process.

7.4.4 Challenges in Balancing Immersion in the Field and Analytical Distance

Throughout the thesis, my aim was to immerse myself in the settings. Therefore, I employed a series of qualitative methods to capture nuanced understanding of parent-child reunion and technology. At the same time, I also endeavoured to distance myself from the field to ensure a more critical analysis of the findings as they emerged and guarantee the credibility of the findings.

However, balancing the immersion to the field with the analytical criticism of the data had many challenges. First, the development of the perspective of an insider was not straightforward because of my prior experience with reunion—particularly in the defence family setting as I was a member of a defence family. The inclusion of academic and mining families did give me a richer understanding of that experience. During Study 1, I developed an initial understanding of the limitations of current technologies that academic family members faced regarding reunion. Even though being a member of a defence family prepared me for the findings from the defence family participants, the insights gained from the interaction with the academic families was new. The inclusion of that family cohort in all the studies of the thesis enabled me

to gain a higher level of expertise and build a sense of rapport and trust with both the parents and children. Thus, in Study 2 and 3, I felt very comfortable with each of the academic families as well as the mining ones. This meant that I could direct the design work and the interviews more on the specific dimensions of reunion that *Rendezvous* aimed to support.

While immersing myself into the field was essential, I had also to keep a critical lens on the data analysis. To achieve this, I tried to start with a more removed perspective on the current limitations of technologies in supporting parent–child reunion at Study 1. I found this particularly challenging with respect to the defence families because I could identify with their experience as I am a member of a defence family. Further, I included my personal feelings and perspective in all field notes and interviews notes to remain aware of how my personal perspective influenced my observations and interactions in the field. In turn, I could then critically evaluate the data. There were instances (particularly in Study 1 and 3) in which I saw the emotional stress involved in reunion. For example, on certain occasions, academic and mining family members would show annoyance towards each other for either not interacting during the reunion (Study 1) or not sharing enough based on the contributed content when *Rendezvous* was deployed (Study 3). Consequently, the range of unanticipated events during fieldwork highlights the importance of social support through supervisors and colleagues. Finally, on starting the analysis of the data during the fieldwork, I carried out the final rounds of coding so that I could take a more critical and reflective stance.

7.4.5 Limitations on the Applicability of Findings

The generalisability and applicability of findings is one of the key components when evaluating the quality of research (Glaser & Strauss 1967; Miles & Huberman 1994; Rogers & Marshall 2017). The main aim of this thesis was to examine the role of digital technologies in supporting parent-child reunion. Throughout this research, the findings were contextualized with respect to established literature, particularly the theoretical understandings of parent-child reunion and the earlier research on synchronous and asynchronous technologies while in physical separation. The practical findings of this thesis are for researchers and interaction designers who are interested in better

understanding how parent-child reunion can be experienced through reunion technologies that embrace materiality and temporality.

These findings were grounded in specific settings and were focused on the family type (e.g. academic) compared to the characteristics of the separation that influence parent-child reunion. This was primarily because I aimed to generate an understanding on the role of technology in supporting parent-child reunion that applies to distinct types of family cohorts that are gender and structure biased as well as culturally and location bounded. However, parent-child reunion is experienced by numerous other types of families including non-traditional families (e.g. same sex and traditional families) as well as multicultural and interracial families. Thus, the participation of the academic, defence and mining families in studies 1, 2 and 3 constrain how applicable the findings are for other family settings.

I contrasted the findings from this thesis with other studies of similar settings to highlight their applicability and show how they extend earlier work or divert from it (for example the work on dynamic families Odom, Zimmerman & Forlizzi (2010)). Furthermore, I used member-checking to discuss the emerging findings with each study's participants to ensure their trustworthiness. Moreover, I applied the insights learned from Study 1 to design the artefact in Study 2 with the same family cohort (academic families), which I then deployed in a different setting to ensure the findings' credibility. Additionally, I emailed different study participants drafts of the reports on each study and asked for their comments, which I then incorporated in the writing process.

Despite the variations across family settings regarding work-related parent-child reunion, the findings from this thesis have implication for other forms of reunion (e.g. the periodic and extended family reunions) and also for non-reunion related communication. For example, it is still useful for designers who are interested in exploring delay, anticipation, sharing and engagement into other settings that promote alternative kinds of communication and interaction compared to the current trend of synchronous communication (Hallnäs & Redström 2001; Odom et al. 2012, 2014). Regardless of this, future studies are required in order to determine whether the findings

are applicable across a range of reunion settings with different cohorts from diverse backgrounds.

7.4.6 Technology Design and Deployment Limitations

The reunion oriented technology that was built in study 2 (*Rendezvous*) was designed using the outcomes of study 1 and deployed in study 3 to evaluate its role in supporting parent-child reunion. This process demonstrated the importance of asynchronous technologies as well as materiality and temporality as key considerations when designing for parent-child reunion. Furthermore, a functioning reunion prototype has been a useful communicative tool for discussing my findings and collecting feedback. Nevertheless, there were a series of challenges and limitations relating to the design and deployment of *Rendezvous*.

The design of *Rendezvous* was bounded by the experiences provided by the academic families and interaction design experts who participated in study 2 and who were guided by the insights of study 1. It was also informed by previous research (Thieme et al. 2011). The limitations that related with that reunion prototype associated with the number of keys, settings options for notifications and bounded by the type of content that participants could share. For example, there was only one key that the absent parent would take with him. It would be interesting to explore how two keys (one for the absent parent and the other for the at-home family members) would affect the reunion experience and the sense of anticipation. Moreover, there was only one option for notifications that was linked to the *Rendezvous* box. An audio cue was enabled every time that someone contributed content. Other types of notifications in addition to a text message, especially for the applications used to contribute content would further increase the understanding on how the delay and anticipation were experienced by all family members particularly if they could be turned on or off per the preference of families. Finally, parents and children could share only photos, videos or texts. Allowing for audio only content or sharing the location information of the contributed content (for example as a component of a map visualization) would give the opportunity to examine in detail additional ways with which the reunion was experienced through *Rendezvous*.

A working reunion technology deployed in a realistic setting also meant participants could appropriate the technology in unexpected ways, something not possible to explore without a functioning technology. For example, in study 3 one of the children mentioned that they asked their grandfather to take a photo and post it on behalf of them. This was not an intended use of *Rendezvous* as it was initially meant to be used by parents and children only. Acknowledging this appropriation was useful for identifying opportunities for future reunion technologies that would support possibly a reunion between extended family members.

One of the major challenges I faced during the deployment of *Rendezvous* was the numerous technical issues. Even though it is not uncommon to experience difficulties when introducing an innovative technology in the field, the field trial of *Rendezvous* demonstrated the workload required for deploying in a realistic setting rather than just producing a technology concept. I addressed these issues by working together with the participants in identifying the best ways to help them as well as by collaborating with colleagues of the research team who helped me significantly in solving most of the malfunctions. Other researchers attempting to work through a design process through to deployment and evaluation need to be aware of the additional ground work required to ensure the technologies are functioning as desired. This is of particular importance in designing for parent-child reunion, where non-functioning software might cause issues for individuals who are already feeling sensitive due to being apart from their loved one.

Another challenge faced during the deployment phase was balancing the novelty of the reunion technology with the findings from study 3. *Rendezvous* was an unfamiliar technology for all academic and mining family members who were more used to utilizing technologies while in physical separation compared to reunion. I noticed significant engagement with the technology throughout its deployment as discussed in study 3. However, it was used only for a brief period of time which was sufficient for this thesis given that it captured the nuances of the influence of that technology on parent-child reunion. Future efforts would need to examine whether the continuous use of *Rendezvous* or of a similar reunion-technology over a longer period of time alongside the effort and labour required to contribute content would influence the participants'; engagement and the overall reunion experience.

Despite the challenges and limitations faced during the design and deployment of that reunion technology, this thesis demonstrated the significance of designing technologies aimed to support parent-child reunion. Nevertheless, future studies are mandatory in order to determine the implications of *Rendezvous* or other reunion technologies when used longitudinally and by diverse users who have access to additional modes of contributing content as well as are able to employ new forms of interaction.

7.5 Opportunities for Future Research

The findings suggest numerous opportunities for future work. These include the extension of *Rendezvous* to support new forms of interaction, the opportunities for longitudinal studies with different family cohorts, widening the celebration of reunion from a family to a community event with the use of online community tools as well as applying the design qualities of *Rendezvous* to other contexts.

7.5.1 Extending *Rendezvous* to Support and Enrich New Forms of Interaction

The reunion-oriented artefact, *Rendezvous*, supported the parent–child reunion by augmenting the anticipation to reunite in pre-reunion, heightening the initial engagement upon reunion and strengthening the sharing of experiences in post-reunion. *Rendezvous* offered family members the opportunity to contribute content while in pre-reunion by sending photos, videos and text. It also allowed family members to see the contributed digital content by ordering the content in diverse ways (chronologically, according to family member and randomly).

There are many opportunities for the improvement and enrichment of the experience of use. First, a clear extension to *Rendezvous* is the inclusion of text of more than 140 characters as well as of audio only posts. In the current version, text longer than this threshold was not supported because of complications in the development. Second, recent strands within the HCI community have explored the role of novel technologies (e.g., Microsoft Kinect or Oculus Rift) on augmenting socio-physical interactions (Paay et al. 2009; Harper & Mentis 2013). A plugin for *Rendezvous* could be developed to allow for the content that is in the physical box to be displayed on a television. Then through Kinect or other similar devices, parents and children could situate themselves in

the digital photos that they contributed and in a playful manner, augment their sharing of experiences and their storytelling practices beyond the usual narrative around photos (Frohlich et al. 2002). Third, *Rendezvous'* content could be sent to each extended family member's mobile phone or other device (such as a television) to include them in the reunion experience. Finally, *Rendezvous* could also be translated to a purely digital artefact in which each of its qualities are mirrored in a family-based game that enriches reunion, similar to the recent work on location-based family storytelling (Procyk & Neustaedter 2014).

The strength of *Rendezvous* is that its features are easily extensible and adjustable to potential future technological avenues that all exist within the reunion experience and aim to support this family event.

7.5.2 Longitudinal Study of Use

The field study of *Rendezvous* was a short one due to time and participant constraints. It included only one reunion that was experienced by the parents and children. To gain a deeper understanding of the long-term usefulness and impact that this reunion-oriented technology has on family reunion, it is important to conduct a longitudinal study. This could last for months so that at least two to three reunions could be studied. This would provide interesting insights into how parents and children appropriate and adapt the artefact and the extent to which *Rendezvous* supports reunion over time. The value of temporality was foregrounded as one of this thesis' contributions and a long-term deployment would provide fertile ground for further substantiating this important insight. Further, a longitudinal study of use would allow for an iterative design process in which user feedback on usefulness and additional needs could guide the refinement of the interaction design. Finally, it could encourage the involvement of other family members who reside in different geographical locations as well as the participation of families who experience similar challenges with their reunion.

7.5.3 Widen the Celebration of Reunion to a Community of Families

In the current structure, this research focuses on supporting reunion one family at a time. Each of the academic and mining families in Study 3 used *Rendezvous* in their

homes where they used the content to support their reunion process. This was a sensible decision not only because reunion is such a personal experience but also because this research was one of the first that aimed to support this overlooked yet important family event. An approach that could further the support of reunion is to employ community-based tools that enable communities of families to share their reunion experience. For example, a web-based community in which families from all over the world can share their opinions on their captured reunion moments through *Rendezvous* might be a way for celebrating this experience in a collective manner.

People who do not know each other could interact and explore how other families experience reunions based on what content they share, in what way and what stories they talk about in post-reunion. This expands the notion of creating a reunion-oriented prototype or artefact to creating a reunion-oriented platform in which people from all around the world can interact and investigate ways with which they can further enrich their own personal family experience. Furthermore, *Rendezvous* or a similar platform could facilitate asynchronous anticipatory communication for diverse kinds of relationships such as extended family members (e.g. grandparents and cousins). They can also be used in other kinds of reunion events as in the case of annual reunions.

However, in designing this platform, it is important to consider privacy and security of the content exchanged. This transition could broaden the attention to the reunion experience and in supporting it, family members would have access to a range of different tools.

7.5.4 Apply Design Qualities of *Rendezvous* to Other Contexts

One of the key components of *Rendezvous* was the delay in viewing the content that was contributed by all family members while they were physically separated. This affected the overall anticipation towards the upcoming reunion as well as influenced the engagement upon reunion and sharing of experience in post-reunion (as described in section 6.5).

Extending these qualities to other contexts or using *Rendezvous* in completely different settings compared to this research creates new opportunities for designers and

researchers who are interested in investigating alternative kinds of communication and interaction amongst physically separated individuals. For example, HCI practitioners involved in better understanding the role of communication technologies in mediating connectedness could be inspired by and employ delay and anticipation as key ingredients of asynchronous technologies while investigating their role within the 'always-on' and synchronous ecosystem of communication. In turn, this could inform the design of new communication technologies that further enrich, mediate and strengthen the family and individual relationships as well as expand the current design space.

7.6 Concluding Thoughts

This thesis has generated a clear understanding of the role of technology in parent–child reunion and extends earlier work within the family and technology discourse. This reunion experience, which occurs periodically due to work-related reasons, entails numerous challenges for each family member and particularly children. It is essential for families to have a healthy reunion that can support and further enrich their ties. This can be achieved through ensuring that each dimension of reunion (pre, upon and post) is well supported by the close and meaningful family interaction.

Through a series of studies with academic, mining and defence families, this thesis explored how current technologies are used within reunion (Study 1), examined the interactional qualities of digital technologies that support parent–child reunion (Study 2) and evaluated *Rendezvous* (Study 3)—the first reunion-oriented technology. The first study indicated that current technologies lack in supporting the anticipation to reunite in pre-reunion, the initial engagement upon reunion and the sharing of experiences in post-reunion. Guided by these insights, the second study foregrounded the importance of designing reunion-oriented technologies that stimulate co-creation of digital content in pre-reunion, motivate co-engagement upon reunion and inspire co-sharing in post-reunion. These findings were instantiated in the design of *Rendezvous*, which is a physical artefact with a digital part. The use of *Rendezvous* during the third study showed that it augmented the anticipation to reunite in pre-reunion, heightened the

initial engagement upon reunion and strengthened the sharing of experiences in post-reunion.

This thesis' contributions are threefold. First, it identifies the key limitations of current technologies in supporting parent–child reunion. Second, it highlights the merit of asynchronous technologies in supporting this experience. Third, it draws attention to the significance of materiality and temporality as key design considerations for technologies aimed to support reunion. These contributions extend the current body of knowledge by unveiling the necessity to design and evaluate technologies that support parent–child reunion—an under-explored yet omnipresent family experience.

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Zimmerman, J & Forlizzi, J 2014, 'Research through design in HCI', in JS Olson & WA Kellogg (eds), *Ways of knowing in HCI*, Springer, New York, NY, pp. 167–189, viewed 12 June 2017, <http://link.springer.com/chapter/10.1007/978-1-4939-0378-8_8>.

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Appendix A: Material for Study 1

This appendix presents all material for Study 1 (discussed in Chapter 4). This includes the plain language statement, call for participation, indicative field notes that were taken throughout the observations, the interview guide for Study 1 and excerpts from the interview transcripts.

Appendix A.1: Plain Language Statement for Study 1

The following document presents the plain language statement for the first study of the thesis, which was approved by The University of Melbourne's ethics committee and was referred to in Section 4.4.1.

THE UNIVERSITY OF MELBOURNE

DEPARTMENT OF INFORMATION SYSTEMS

Research Project Description (Plain Language Statement)

PROJECT TITLE:	REUNITING DISTRIBUTED FAMILIES WITH TECHNOLOGY
INVESTIGATORS:	Mr. Kostas Kazakos (k.kazakos@pgrad.unimelb.edu.au)
	Prof. Steve Howard (showard@unimelb.edu.au)
	Dr. Frank Vetere (f.vetere@unimelb.edu.au)
STUDY LEVEL:	Ph.D.

What is the purpose of the project?

The overall aim of this thesis (project) is to develop a deep understanding on technology's role in reuniting distributed families. Families who experience the ongoing cycle of physical separation and collocation are of particular importance. This study will explore the needs of the family members that reunite after a period of time and investigate possible grounds for novel use of technology in this context. It will contribute to our understanding of distributed family reunion and the ways that technology could be used in order to understand as well as enhance this experience.

Why and how was I selected?

We invite you to participate in the research project because you experience the phenomenon of reunion continuously. Your family has at least one member that is often physically separated from you. We found you through personal contacts or through your response to our advertisement flyer.

What will I be asked to do?

If you agree to take part we ask you to participate in three tasks:

- One interview: We will meet for an interview where we will ask you questions about your experiences and understanding of reunion, your use of current communication technologies, and your perception of future technologies that can be used during reunion. We may take photographs, record video or audio, and take notes of what we talk about. The interviews will be carried out at a time and place of your choice and last between 45 and 60 minutes.

How will the data be used?

This study will form part of Mr. Kazakos's Ph.D. thesis. Once the thesis has been completed, a brief summary of the findings will be available to you on application at the Department of Information Systems. The results may also be written up in the form of reports to be presented at conferences and published in academic journals. Presentations may contain photos or videos if explicit agreement is expressed.

The outcomes will also have practical implications for the design and development of new technologies that facilitate the families' reunion.

How will my confidentiality be protected?

We intend to protect your anonymity and the confidentiality of your responses to the fullest possible extent, within the limits of the law. Due to the small number of participants there is a possibility that people could be identified by contextual information. To preserve your anonymity, we will use code names for participants in all written work. No individual person will be identifiable in written reports or audiovisual material without the expressed agreement of the individuals concerned.

As required by the University, data gathered as a result of this project will be held in locked cabinets in the Department of Information Systems, and destroyed using confidential waste disposal techniques five years after the date of last publication of results arising from this research.

HREC # 1033632.1

1

Will participation prejudice me in any way?

Please be advised that your participation in this study is completely voluntary. Should you wish to withdraw at any stage, or to withdraw any unprocessed data you have supplied, you are free to do so without prejudice. At the same time, please be advised that – due to the small number of participants in this study- there is a minimal risk of being identified upon publishing the results of this study to the research community. However, in order to mitigate this minimal risk proper measurements have been taken such as use of pseudonyms as well as use of IDs instead of your name. As researchers it is our responsibility to ensure that your identity is not revealed.

Why should I participate?

You will receive a certificate from AMAZON or BORDERS (value: AUD 25) to acknowledge your contribution. The certificate can be used for purchasing books or other material per your will.

We know that your time is limited and valuable and that we can offer you very little in return for your help, but your support will make a great contribution to the work of a Ph.D. student.

Where can I get further information?

Should you require any further information, or have any concerns, please do not hesitate to contact Mr. Kostas Kazakos on +61 4 355 01326 or k.kazakos@pgrad.unimelb.edu.au . Should you have any concerns about the conduct of the project, you are welcome to contact the Executive Officer, Human Research Ethics, The University of Melbourne, on ph: +61 3 8344 2073, or fax: +61 3 9347 6739.

How do I agree to participate?

If you would like to participate, please indicate in the email reply to the advertisement (k.kazakos@pgrad.unimelb.edu.au or kkazakos@kazakos.info) that you have read and understood this information and agree to the accompanying consent form. The researchers will then contact you to arrange a mutually convenient time for a first meeting.

Thank you for your support.

Appendix A.2: Call for Participation for Study 1

I circulated the following advertisement to the local Melbourne defence and academic community through their weekly newsletter. The call for participation was referred to in Section 4.4.1.

Appendix A.3: Sample Field Notes from Study 1

In Study 1, I gathered numerous field notes throughout the preparatory study and the visitations to the family's homes. Here I provide an indicative set of those observations following their reference to Section 4.4.2. These observations have been transcribed from my personal thesis journal.

Preparatory Study Activities Field Notes

"Saturday 06th February 2010 – 8:25 am

I arrived today in morning in the International Terminal to continue my observations. I am struggling to understand what reunion is comprised of. Yes, Moss and Moss have talked about the three phases. But how are these manifested in the interactions that are unfolding in front of me? It is my second time in the airport and I am just starting to realize that reunion is a deeply complicating experience to document and understand in a practical sense. I am seeing quite a few individuals waiting. I see a father and his child looking at the main prompt with anxiety and a worry in their eyes. The child is clearly excited and the father is holding him in his arms while walking around the two main doors of the arrivals. I assume this is what pre-reunion might look like. There is a unique trend with everyone around me who is waiting for a loved one (a friend, a partner or a family member). Their eyes are constantly looking to the main screens – looking forward to seeing when the plane of their loved on has arrived. They almost look like they are so eager!! Are they all in pre-reunion? Is this what pre-reunion looks like? If that is the case then I wonder when was the last time that they communicated with their loved one. I can see some locomotion around. The same father and child are hastily walking towards the door. I think they have spotted the mother since I see the father hugging a lady and kissing her. Needless to say, how excited the child is. The mother is kissing and hugging the kid. I cannot really hear but I assume that there is a dialogue between them OK, now I think that they have entered in the upon reunion phase. Lots of touching, hugging. I wonder what the post-reunion phase looks like. Well, now I see that the lady is taking a photo with here mobile phone number (a selfie). So many questions! I wish I can just go and ask them. That would be weird however. Wow, the doors have opened and it is as if everyone that I am observing has entered in the upon reunion phase at once! I cannot stop by wondering what they are discussing, saying! I can see though quite a lot of phones out and photos taken. Some of the family members are holding flowers and there is one that is holding a sign. I wish I could take photos – but nope that is not allowed. Well, that is for today. Let's see how the next weekend goes. As I write up this journal entry I cannot stop but thinking that reunion is not a one-time experience. It has a beginning, middle and an end. Technology is present throughout. It is as if this celebratory interaction between individuals, particularly upon the first moments of reunion, is captured and cherished! Let's see what the next weekend will look like."

Observations during Study 1

"Friday 2nd July 2010 – 6:10 pm – Defence family 4 visit

Today's visit was a tough one. I visited a defence family's residence in Black Rock. There are three members in this family – father, mother and a nine-year-old child. The family on average has been physically apart for 7 months at a time and reunite approximately for a month as they mentioned. The father works in the Australian Navy and he literally arrived at home on Tuesday. The discussion started primarily with general questions about the family members and the duration of reunion/separation as well as how many personal or communal communication devices they home at home. The father and mother have each a mobile phone and there is also a laptop and a tablet with Skype. Then I asked them about their thoughts on how these technologies help in their day to day life while they are collocated and, most importantly, just before the upcoming reunion. They did mention that they are used mostly for awareness and coordination as well as keeping in touch and synchronized about household activities and tasks relating to the little girl. Then I asked about how the last moments of being physically together are for them (before they are actually separated). There was a silent response. I could see that this was a very sensitive topic for them and particularly for the mother who was tearing up. They both mentioned that the preparation of being away is a challenging one and it never stops being difficult. When I queried further on how they use their communication technologies while they are physically separated the father mentioned that they mostly use a mobile phone but this is only possible when he is close to a port and when he is off duty since it is not allowed to use external communication tools (e.g. ones that are not part of the approved list) when they are on duty. The mother was silent again and note that she feels that this can aggravate their relationship. The child did mention that she misses her father and that makes her sad sometimes. However, closer to the upcoming reunion they all noted that they are feeling excited even though they cannot really communicate to the degree that they wish until he actually get off the ship. The first moments of reunion are full of emotional and physical interactions. The child jumped in and mentioned that sometimes her father brings her a gift from a place that she has never visited before which makes her excited! She will also always run to the door and count the hours for his return! The next day of the reunion it takes time for the family to catch up but their day to day life comes to normality slowly. The father mentioned that he finds it sometimes hard to synchronize but as the time passes he finds it much easier. The child highlighted how she enjoys the physical presence of her father and how she does not want him to leave again in 3 weeks. The mother feels that she is the pillar of the family and she will do everything to make sure that while they are physically together they discuss, communicate and connect as a family.

While leaving the residence I started realizing how different is the reunion experience for defence families compared to the academic ones. In the later I observed that the family members have 'accepted' that the presence of communication technologies assists them while they are physically apart to connect and communicate (which is great!) But they truly feel that when they are in reunion, they are not really connecting and preparing for the separation. Could this be the anchor pillar for my research? How can I help and motivate family members to really be together when they are reunited?"

Appendix A.4: Interview Guide for Study 1

This section provides a sample of the interview questions that all the participating family members were asked during Study 1. The interview questions were referred to in Section 4.4.3.3 of the thesis.

Reuniting Distributed Families with Technology

Interview questions

General Information (learning about the participants)

1. How many members does your family have?
2. What is your profession?
3. Do you have children? If yes, how old are they?
4. How old are you?
5. Do any other members of your extended family (parents, parents in law etc) live in close proximity to you?

Physical Collocation (use of communication technologies before separation)

1. Could you please describe a normal day when all the members of your family are present?
2. How do you keep in touch throughout the day? (phone, email, etc)
3. How often do you communicate with them?
4. What is the content of your communication? Saying hello? See what the partner or children are doing?
5. Would you change anything in the communication technologies that you use (during physical collocation)?

(Moments) before Physical Separation

1. Which of the family member leaves most of the time?
2. For how long? How often?
3. How do you say goodbye? Is it only verbal? Emotional?
4. What thoughts do you have/how do you feel when you are saying goodbye?
5. Could you please describe to me the first moments of separation?

While Physically Separated (use of communication technologies)

1. What are your feelings when he/she is away?
2. Do you use some kind of communication technology to keep connected?
3. What kind of communication technology do you use while your loved one is away?
4. How often would you say that you use it?
5. Do you feel that the communication technology you use is sufficient?
6. What would you change?

7. What are the basic principles that a technology as above need to have so that you feel close to your loved one?
8. Would you say that the communication technologies that you use manage to aid you in the sharing of experiences (that occur to each other while you are away)?

(Moments) Before Reunion

1. How do you feel days before your loved one comes back? (same question can be asked to the person who comes back for the partner)
2. Would you say that you increase or not the frequency of the communication technology use (just) before meeting your partner/parent?

Reunion (physical collocation after separation)

1. What is reunion for you? How would you interpret it?
2. How do you feel when the loved one comes back?
3. Is the sentiment stronger/same with what you felt moments before reunion?
4. What is the first thing that you do? The first words that you use?
5. Do you exchange gifts? (Does your daddy/mommy bring any gifts)?
6. How long does it take you to feel "connected" once the loved one is back?
7. Do you share experiences or events that have passes by while your loved one is away?
8. If yes, how do you do it? (Go over photos, discuss, watch visual)?
9. Do you think that the time your loved one is away influences the actual reunion process?
10. Are you aware of any technologies that support family or individual reunion?
11. Do you think that a technology is needed to support the reunion?
12. If yes, what are the basic attributes of this technology?
13. Would you use it? How?

Appendix A.5: Excerpts from Interview Transcripts on Study 1

This section provides an excerpt sample of the interview transcripts for academic family 6. The interview transcripts have been used throughout were referred to in Section 4.4.3.

Q: How long have you been together with your wife in this lifestyle?
A: I guess from 2008, approximately three and a half years

Q: How has the physical reunion changed over the time was it the same?
A: No, it was totally different. uhmm well i think in the beginning i was very uhmm uncertain i guess how the relationship would progress as we kept separating whereas we have reached a point now which is quite secure so the way we come together is a bit more stable now i feel like it is kind of like it is part of life whereas before i think i was still worried about in how the relationship would progress.

Q: Would you say that you have become used to this kind of transitions occuring in your family life?
A: uhmm yeah i mean i don't mind this phrase used to as to expected this way eventually i think i come to deal with it a bit better and uhmm i think that we are still hoping of solution you know of kind of being all together again but i understand that for this time until later it might have to be like that. yeah

Q: When Alex is back what is the first thing that you do as a family?
A: Uhmm well I think it has changed through well every time is a bit different depending the time of the year whether she is coming on holidays or whenever she is coming back, like we've had times in the past where you know she would come back on a day i am free and she knows she will arrive in the morning and then we will have the whole morning together you know we will be able to sit down you know we have breakfast together or lunch together or something like that uhmm ans usually it is towards the end of school when jaureen can and we can catch up but this time probably the first time it's happened i had to start work again this year because my Masters is finishing you know so i looked for work end of last year and started working so it happened my full day happened to be on the time when she arrived it's the first time that i am away the whole day when she arrived in the morning and i am not here; so you know it is she had to take the bus back and she has done that before but it was because she did not want me to wake up early in the morning but usually when i can i am always in the airport to meet her.so it is a bit different i did not talk to her until the evening and even then this time around, we know that this trip is a working trip it's kind of like she has to be here to work and also we have a renovation happening so we are getting things together this trip is a bit different we would have at least a day together and then we will always have family and uhmm we would definitely have meals together as a family but definitely when jaureen comes from school. not that we have dinners together every day anyway but [laughing] at least the both of us you know we try to have some time, yeah

Q: As the time passes while your partner is here do you feel that she will be leaving again?
A: uhmm yeah we do..again in the year there are two trips that are very short and two trips that are very long the shorter trips have a different feeling than the longer trips like the shorter trips we know that the transition is very short so we do expect the leaving as part of what is going to come up very soon and we feel that ten twelve dates is not enough to resettle and to go back to the routine because we only have one two weekends and you know not enough to get into a routine routine but for the longer trips we don't think so much

Appendix A.6: Data Analysis for Study 1

This section provides an excerpt sample of the analysis for all academic families. This analysis was referred to in section 4.4.4.

Parameters for data analysis							
Duration of separation							
Access to rich forms of communication technologies while in separation							
Frequency and richness of keeping in touch							
Type of technology used							
Censoring, danger conditions							
Time-zone difference							
	Academic children	**Defence Children**		**Academic Fathers**	**Defence Fathers**	**Academic mothers**	**Defence Mothers**
Perception of reunion	Reunion as a routine	Reunion as an important event (elation, excitement, gifts, anticipation)			Reunion as being physically together	Being together again	Reunion as a pre, post, during
Feelings while in separation	Lonely, bored, mostly negative	Intense feelings of separation (landline, email)		Frustrating experience of being away	Not knowing what is going on back home	Trying to manage everything	Sole organizer and communicator (link) among other family members
Most common technology used	Abundance of ways to keep in touch (mostly asynchronous text messages, online social networks, skype)	Not many ways to keep in touch		Easiness to keep in touch (online video, mobile, SNS)	Angry for censorship, time difference (landline, txt messages)	Feeling close (mobile phone, online video)	Feeling alone (landline, email, SNS)
Deficiency of current technology	Visual aspect of communication techno	Cumbersome use of technology		Technical issues especially with online video (unefficient three way communicatio, cannot feel/smell the person)	Cumbersome use of technoloy	Not happy with the interface	Uneasiness to get in touch with each other due to cumbersome communication, privacy, censorship
"Unknown" Attributes of reunion	Virtual and physical aspect of coming together	Reunion as a ground for covering up the lost space		Looking forward to engage in narrative upon reunion	Reunion is thinking about separating again(tensions arise)	Reunion as a continuation of separation (not a big thing)	Reunion brings stability and the stage for wellbeing

Below is the synthesis of the main insights following the analysis in NVivo:

Appendix B: Material for Study 2

This appendix presents all material for Study 2 (Chapter 5).

This includes the plain language statement, call for participation, and material from the design workshops. Also included is the interview guide for Study 2 and excerpts from the data analysis process.

Appendix B.1: Plain Language Statement for Study 2

The following document presents the plain language statement for the second study of the thesis, which was approved by The University of Melbourne's ethics committee and was referred to in Section 5.3.1.

Plain Language Statement

Project Title:	Designing technologies for work-related periodic reunion
Investigators:	Konstantinos Kazakos, Steve Howard, Frank Vetere
Ethics Id #:	HREC 113520.1

What is the purpose of the project?
The aim of this project is to understand the relationship between periodic family reunion and technology-mediated separation. We will use the results of this study to design a technology to augment the experience of reunion prior to yet another with a focus on the interactions between parents and children.

Why and how was I selected?
We invite you to participate in this research project either because you are an interaction design expert or because your family is experiencing the phenomenon of work-related periodic reunion. In the second case, your family has at least one member that is regularly separated from you. You were recruited through either an email or printed call for participation or via word of mouth.

What will I be asked to do?
If you agree to take part we will ask you to participate in a two hour design workshop. We will conduct a design workshop in the Interaction Design Lab, located at the department of Computing and Information Systems (CIS). You will be asked to design a potential technology that you believe will ameliorate the experience of periodic reunion. After doing so you will be asked to engage in a discussion with all the participants in regards to the designs that have been created.

How will the data be used?
This study will form part of Mr. Kazakos's Ph.D. thesis. Once the thesis has been completed, a brief summary of the findings will be available to you on application at the Department of Computing and Information Systems. The results may also be written up in the form of reports to be presented at conferences and published in academic journals. Presentations may contain photos or videos if explicit agreement is expressed. The outcomes will also have practical implications for the design and development of new technologies that facilitate the families' reunion.

How will my confidentiality be protected?
We intend to protect your anonymity and confidentiality of your responses, within the limits of the law. Due to the small number of participants there is a possibility that people could be identified by contextual information. To preserve your anonymity, we will use code names for participants in all written work. No individual person will be identifiable in written reports or audio-visual material without the expressed agreement of the individuals concerned. As researchers it is our responsibility to ensure that your identity is not revealed. As required by the University, data gathered as a result of this project will be held in locked cabinets or in secure data servers. The data will be destroyed using confidential waste disposal techniques (for physical materials) five years after the date of last publication of results arising from this research.

Will participation prejudice me in any way?
You participation in this study is completely voluntary. Should you wish to withdraw at any stage, or to withdraw any unprocessed data you have supplied, you are free to do so without prejudice. Your participation, or choice to withdraw, will not prejudice you in any way.

Why should I participate?
We know that your time is limited and valuable and that we can offer you very little in return for your help, but your support will make a great contribution to the work of a Ph.D. student. As a token of gratitude you will receive a gift voucher from AMAZON (value: AUD $25). The voucher can be used for purchasing books or other material.

Where can I get further information?
Should you require any further information, or have any concerns about the project, please contact Mr. Kostas Kazakos on +61 4 355 01326 or kkazakos@student.unimelb.edu.au. Should you have any concerns about the conduct of the project, contact the Executive Officer, Human Research Ethics, The University of Melbourne, on ph: +61 3 8344 2073, or fax: +61 3 9347 6739

How do I agree to participate?
If you would like to participate, please reply to kkazakos@student.unimelb.edu.au that you have read and understood this information and agree to participate in study. The researchers will then contact you to arrange a mutually convenient time for a first meeting.

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unimelb.edu.au

Appendix B.2: Call for Participation for Study 2

I circulated the following advertisement through the university newsletter and local family community organisations. The call for participation was referred to in Section 5.3.1.
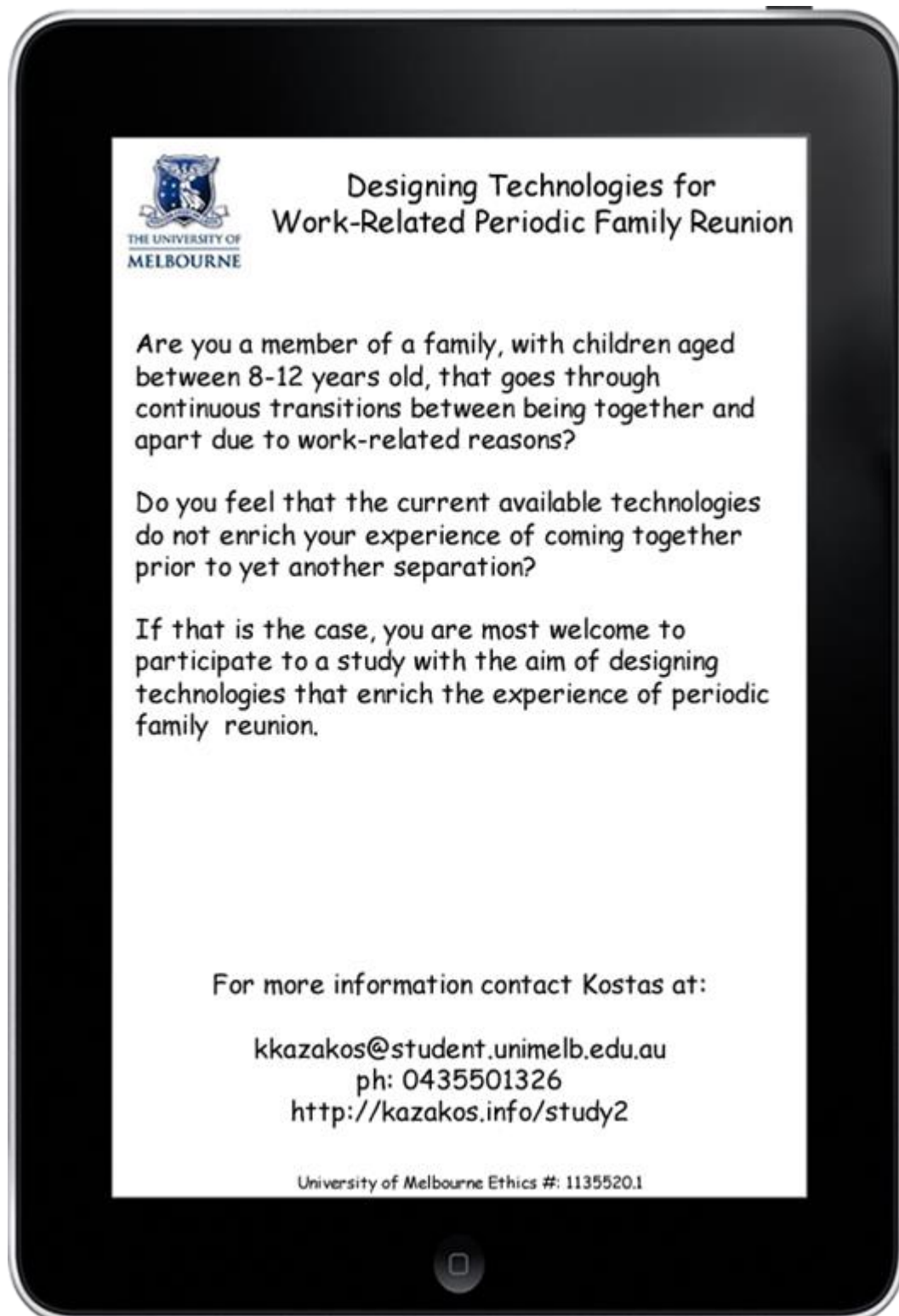
Appendix B.3: Interaction Design Experts Workshop in Study 2

The first design workshop for the reunion-oriented artefact was the one with interaction design experts (as discussed in Section 5.3.3).

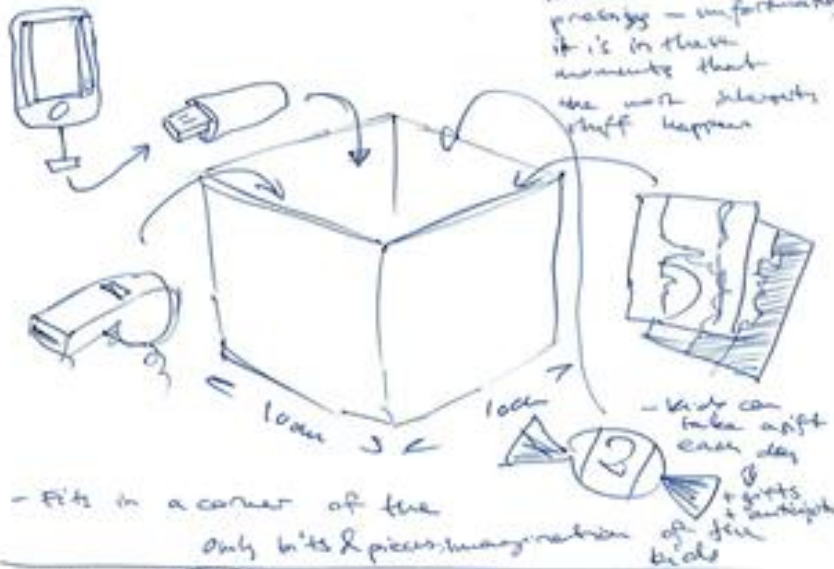Below is a snapshot of the workshop conducted at IDL at The University of Melbourne.

The image below is a design from two different members of that workshop that was used as an inspiration the *Rendezvous* artefact.
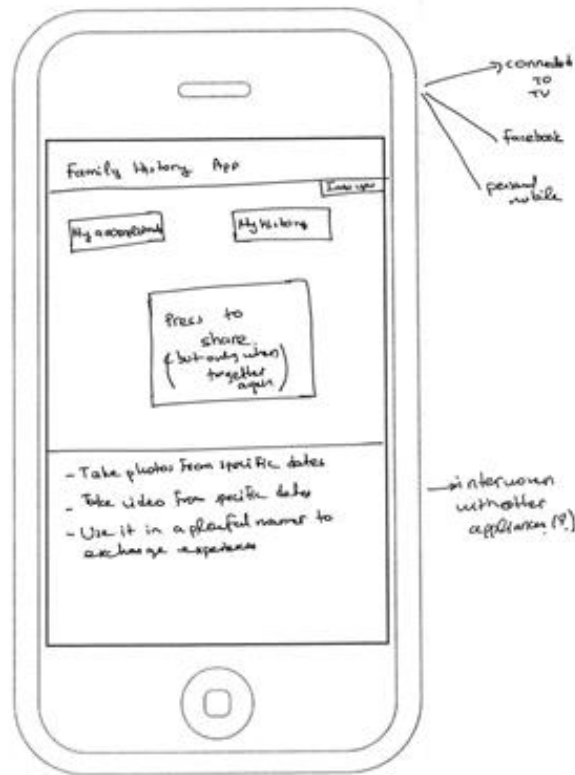
Appendix B.4: Children's Workshop Design Sketches in Study 2

The second design workshop organised towards the reunion-oriented artefact was the one with academic children (as discussed in Section 5.3.3.3). Below there is one indicative images that encapsulate how children envision the role of technology in their reunion experience. This image was referred to in Section 5.4.1.2.
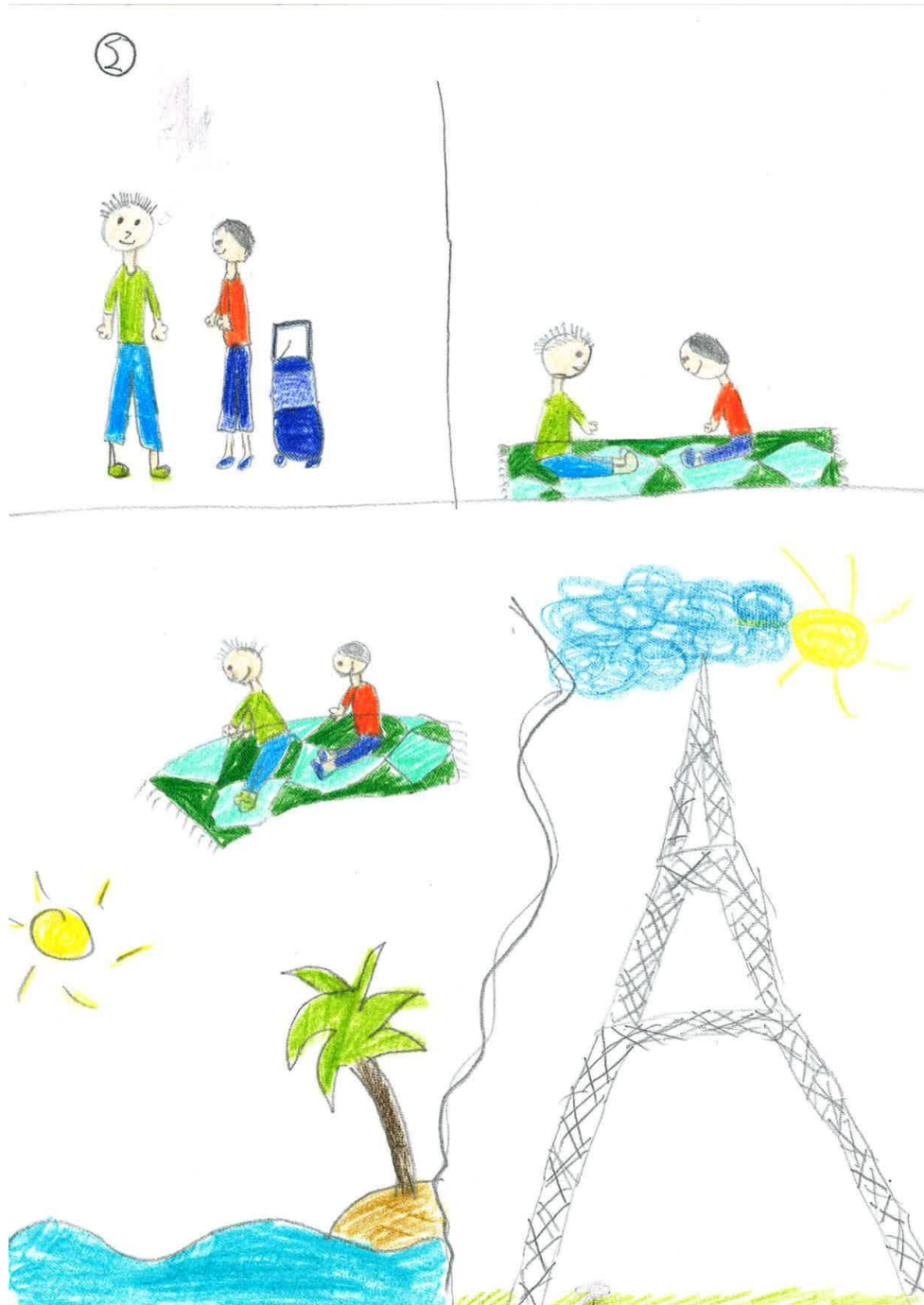
Appendix B.5: Excerpts of Interview Questions for Study 2

Throughout the second study of this thesis all participants were asked a series of interview questions to identify the interactional qualities of technologies that support parent-child reunion, which lead eventually to the design of *Rendezvous.* These questions were based on the designs that were elicited during the three workshops. Below is an indicative sample of these questions alongside fieldnotes collected with clarifications from participants that were referred to in section 5.3.3.4.

The following designs fulfill the criteria that are set for the design of technology. Explain also which requirement fulfills and for what reason:

A. Design 01: Monopoly game
. Description:
    . This is a different version of monopoly, where each player is prompted to share an experience which associates with what they had done while separated. The purpose of this game is to share each other's life through the use of the classical monopoly "template". This might be an interesting approach to engage all family members in a form of "serious gaming" that can contribute towards enriching the family bonds. The players essentially share through monopoly facts about their lives being away. This game can either be developed in physical form (board game) or in an interactive form. The advantage of the interactive form is that the game can be twisted to embed digital content that the players took while apart.

. What criteria fulfills:
    . Ensures the *continuity* of the family bonds through play, is used for *experience sharing* as the comments made while playing can probe the discussion, *augments the experience of reunion* in the sense that the family comes together and reunites in a playful manner and it is a design that is easy to use since it is a well known board game.

. Questions/Disadvantages:
    . What happens if the game causes tension? The children fight with the parents etc?What happens after the game finishes? Will they play it again? Cumbersome to develop and for which platform should you do so?

A. Design 03: The reunion gift box
. Description:
    . In this design the idea of gifting was raised. A common parent-child interaction upon reunion is expressed through gifting. Children are awaiting for gifts and separated parents buy some sort of gifts for them. What if there is a box that can enclose either a physical content and digital content too. Parent and child have the box and upon reunion they exchange gifts. But they do not only exchange the physical content but also the digital one. In fact, the latter can be exchanged automatically as long as one gift box is in the vicinity of the other. The digital content must be put before the reunion meeting by the parent and the child in their individual boxes. This is an interesting idea since it uses the "gifting" aspect of reunion. This idea can also be twisted in that it embeds the notion of "treasure hunt". The

parent hides the box and the child has to find it. This augments even more the anticipatory aspect of reunion.

. What criteria fulfills:

. It ensures the *experience sharing* through the ritualistic character of exchanging a gift, it is based on the *anticipation to reunite* aspect of reunion, it augments the experience of reunion by introducing an augmented "version" of an already well used interaction and it is interwoven in the transitional life since the parents and children capture experiences while separated and reflect on them upon reunion. However it does not prepare the family members for another separation and the duration of gifting is limited (some hours at best).

. Questions/Disadvantages:

. Can it be used easily? Would children be interested in seeing the digital content? What if the content is a child's favorite music that was recorded together with the father? Maybe the family members can prepare for another separation by using the box while they are together and recording music etc and re-exchanging the reunion box prior to another separation.

.

. C. **Design 10: The Storyteller App**

. Description:

. The application proposed in this design runs in a tablet and is divided into two areas. The "when you were…" and the "I was..". The idea that is essential for this application is that parents and children upon reunion would like to know what each one was doing while they were not together. In that sense, the application can be used as "When you were having dinner at the Paris restaurant, I was studying for my exam" or "when you were studying, I was having a meeting". However, the media depicted would only be photos (no text based at all). This will help the storytelling process between the parent and the child. This design also supports the planning of the next separation since . If that is developed for a tablet it can be mounted on the favorite family spot like the fridge or the living room. By reconstructing the past separation and discussing about it upon reunion, the members are prepared for the next separation.

Appendix B.6: Indicative Data Analysis Sample for Study 2

The wealth of data that was collected throughout the second study of this thesis was analysed using affinity mapping, which resulted in a series of interactional qualities and requirements that the reunion artefact had to fulfil. The screenshot below presents that criteria and assorted designs produced throughout the second study. These were referred to in section 5.3.4.1.

Criteria	Design01	Design02	Design03	Design04	Design05	Design06	Design07	Design08	Design09	Design10	Design11	Design12	Design13	Design14	Design15
Designs															
Experience Sharing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Anticipation to reunite		X	X		X		X	X							
Augment the experience of reunion	X	X	X	X	X		X	X		X	X			X	X
Prepare together for another separation		X (second version)	X							X	X				X
Interwoven in transitional life	X	X (second version)	X				X	X	X	X	X			X	X
Functional, simple and easy to use	X		X	X	X	X			X	X (?)	X	X	X	X	X
Ensures continuity of family bonds	X		X					X		X	X		X	X	X

Enriching the content with experiences of reunion while the family is together → prepare for another separation

Appendix B.7: *Rendezvous'* User Interface

One of the *Rendezvous'* components is its user interface that has different forms for its standalone version (that is situated in the physical box) and the mobile one (that is used by parents and children to send content to the standalone one while in physical separation or during in pre-reunion). Below is a set of screenshots on the user interface that were referred to in section 5.5.1.

Mobile *Rendezvous* Application (Android)
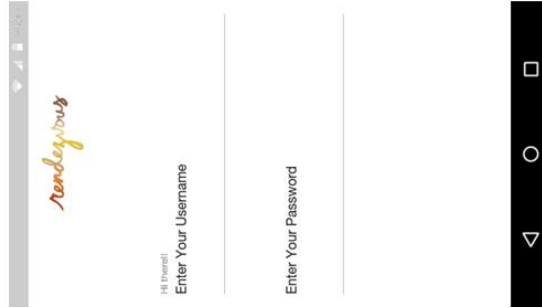
(i) User logs in with their username and password

(ii) Takes photo

(iii) Sends selected photo to the standalone version of *Rendezvous*

(iv) Confirms the selection of photo and submits to the standalone version of *Rendezvous*

Standalone *Rendezvous* Application

Presentation of content (random)

Presentation of content (per family member)

Presentation of content (chronologically)

Appendix C: Material for Study 3

This appendix presents all material for Study 3 (Chapter 6).

This includes the plain language statement, call for participation and material from the field trials of *Rendezvous*. It also includes the interview guide for Study 3 and excerpts from the data analysis process.

Appendix C.1: Plain Language Statement for Study 3

The following document presents the plain language statement for the third study of the thesis, which was approved by The University of Melbourne's ethics committee and was referred to in Section 6.3.

Plain Language Statement

Project Title:	Understanding the Role of Technology in Parent-Child Reunion
Investigators:	Konstantinos Kazakos, Steve Howard, Frank Vetere
Ethics Id #:	HREC 1135520.1

THE UNIVERSITY OF MELBOURNE

What is the purpose of the project?
The aim of this project is to better understand the experience of technology-mediated parent-child reunion.

Why and how was I selected?
We invite you to participate in this research project because you and your immediate family (husband/wife and children) experience continuous transitions between reunion and separation due to work-related reasons. Your help will help the research team to better understand the experience of periodic parent-child reunion. You were recruited through either an email or printed call for participation or via word of mouth.

What will I be asked to do?
If you agree to participate you will be asked to keep an artefact designed for this study, which is called "Rendezvous", for a period of four to eight weeks (pending on the individual separation/reunion transition cycle). Rendezvous is a lockable physical box that has a digital tablet in one of its compartments. While you are separated from your loved ones, the box is locked and you can send (through email or through a mobile phone application) any digital content that you wish to do so in the box. When reunited the box is unlocked and you can see the content that was sent while in separation. You will be asked to engage with the box and be involved in a series of short individual interviews while in separation and when reunited. The researchers will have access to the digital content of the box throughout the duration of this study to ensure moderation and privacy of the sensitive information.

Are there any risks to me and my family?
The reflection of the digital content when your family reunites might augment the feelings of loss and separation between your family members. We would like to ensure you that should this occur, it is absolutely normal. In any potential scenarios where you feel discomfort you are encouraged to contact any of the research team members who have extensive experience in sensitive family studies involving technology during the last decade. We have also in effect a protocol should negative sentiments during the study arise that we will employ upon your agreement. We would like to clarify that we have also access to the University of Melbourne and Relationships Australia family counseling services in case you would like to discuss further any other issues. However, we would like to reassure you that the experience of the research team members is significant since they have been involved in numerous related studies throughout the last decade. Finally, should any individual family member wish to do so, are free to withdraw from the study at any time.

How will the data be used?
This study will form part of Mr. Kazakos's Ph.D. thesis. Once this study has been completed, a brief summary of the findings will be available to you. The results may also be written up in the form of reports to be presented at conferences and published in academic journals. Presentations may contain photos or videos if explicit agreement is expressed. The outcomes will also have practical implications for the design and development of new technologies that support parent-child reunion. Upon completion of the study all family members will be provided with a summary of the findings.

How will my confidentiality be protected?
We intend to protect your anonymity and confidentiality of your responses, within the limits of the law. Due to the small number of participants there is a possibility that people could be identified by contextual information. To preserve your anonymity, we will use code names for participants in all written work. No individual person will be identifiable in written reports or audio-visual content as we will make sure that your face is obscured. As researchers it is our responsibility to ensure that your identity is not revealed. As required by the University, data gathered as a result of this project will be held in locked cabinets or in secure data servers. The data will be destroyed using confidential waste disposal techniques (for physical materials) five years after the date of last publication of results arising from this research.

Will participation prejudice me in any way?
You participation in this study is completely voluntary. Should you wish to withdraw at any stage, or to withdraw any unprocessed data you have supplied, you are free to do so without prejudice. Your participation, or choice to withdraw, will not prejudice you in any way. Any individual family member can withdraw at any time they wish to do so.

unimelb.edu.au

Why should I participate?

We know that your time is limited and valuable and that we can offer you very little in return for your help, but your support will make a great contribution to the work of a Ph.D. student. Furthermore, this study will help you (parents and children) to better understand your reunion experience through the use of Rendezvous. As a token of appreciation for your involvement in this study you will receive a gift voucher from AMAZON (value: AUD $25). The voucher can be used for purchasing books or other material.

Where can I get further information?

Should you require any further information, or have any concerns about the project, please contact Prof. Steve Howard on +61 42 057 988 or showard@unimelb.edu.au or Konstantinos Kazakos on +61 43 5501 326 or kkazakos@student.unimelb.edu.au . Should you have any concerns about the conduct of the project, contact the Executive Officer, Human Research Ethics, The University of Melbourne, on ph: +61 3 8344 2073, or fax: +61 3 9347 6739.

How do I agree to participate?

If you would like to participate, please reply to kkazakos@student.unimelb.edu.au that you have read and understood this information and agree to participate in study. The researchers will then contact you to arrange a mutually convenient time for a first meeting.

Appendix C.2: Call for Participation for Study 2

The following advertisement was circulated through the university newsletter and local family community organisations. The call for participation was referred to in Section 6.3.

THE UNIVERSITY OF
MELBOURNE

Understanding the Role of Technology in Parent-Child Reunion

Are you a member of a family, with children aged between 8-12 years old, that experience periodic reunions and separations due to work-related reasons?

Do you feel as something is missing from your family reunion experience?

If that is the case feel free to participate in a study about better understanding the role of technology in the experience of parent-child reunion.

For more information contact Kostas at:

kkazakos@student.unimelb.edu.au
ph: 0435501326
http://kazakos.info/study3

University of Melbourne Ethics #: 1135520.1

Appendix C.3: Excerpts of Field Notes in Study 3

During the visitations to the participating families' homes I collected a series of field notes that contributed to my reflection process of the progress of field trials as well as acted as the analytical lens for the data that was gathered throughout this study. An indicative excerpt of my observations is provided below and was referred to in section 6.3.3.1. This observation was transcribed from my thesis journal.

"Sunday 01st September 2013 – 9:25 am – Post Reunion visit

Today's I visited the house of academic family 4. They had just reunited yesterday and I was eagerly looking forward to talking to them! The first thing that they told me once they welcomed me at their home was the Rendezvous had made them so much more aware of their reunion experience (or lack of). The child walked me to her room were the box is located and mentioned that she saw all the photos that her father had sent and the text messages. She was really happy to have opened the box with the key that her father had upon his return. The father told me that he was anticipating to see his family and also to see what is in the box since he did not remember what he had sent. Upon reunion, both parents mentioned that the box was opened after they had dinner and chatted a bit – even though their daughter was constantly reminding them of its presence! The mother also anticipated the return of the loved one and seeing what is in the box as well as how her daughter perceived the images, text when they opened the box as a kind of gifts from her father [need to query on this more] Well I guess that what I put together below comes to reality! It is so cool to see how this academic family is reminding me of the defence family when talking about reunion! Before the deployment of Rendezvous they all felt that it was yet another reunion. But now it looks like they are enjoying it!

,,
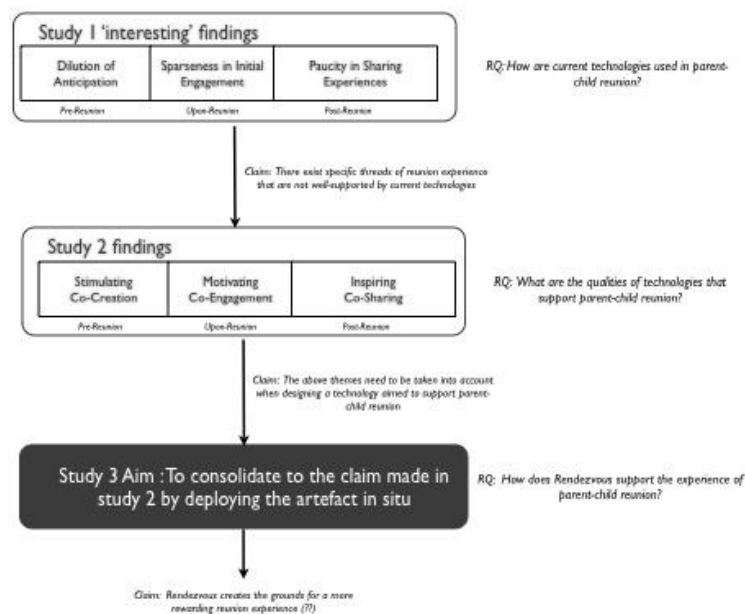
Appendix C.4: Excerpts of Interview Questions in Study 3

While seeing what occurred with the participating families and their interaction with *Rendezvous* I also conducted a series of interviews with the father, mother and child. These questions were centralized on the pre, upon and post reunion phase and aimed to generate clearer insights, compared to the observations, of *Rendezvous'* impact on the reunion experience. The questions per phase are presented below. They were referred to in section 6.3.3.1.

Pre-Reunion

1. Have you sent anything to Rendezvous? If yes, was it photos, videos or audio? If not, why do you think that you did not send anything?
2. What did you feel when you sent it?
3. What are your thoughts about not being able to see the content in the box even though you can send anything?
4. Do you feel more anticipation to see your father/mother/wife/husband?
5. Do you feel more anticipation to look in what is in the box?
6. What do you think will be inside the box from each family member?
7. [to the collocated parent and child] What do you think of the sound played in the box?
8. What do you feel for not being able to unlock the box until your parent/husband returns?
9. Would you describe to me how you would put content in the box? Did you collaborate with (father/mother/child) to do that? If yes, how?

Upon-Reunion

1. What did you feel when the box opened?
2. What was your first reaction?
3. Would you say that you feel more engaged with the unlocking of the box compared to its absence?
4. Show me which picture/video you liked more. Why is that? What did it remind you?
5. Which photos/videos do you think that you would like to save for the future?
6. Do you feel as if the opening of the box was similar to gift giving for you?

Post-Reunion

1. Have you used the rendezvous to look over the video/audio/photos captured by each family member?
2. What were the discussions like when you looked at the content? Were there any discussions at all? Or everything was the same as without the box?
3. Have you put more content in the box now that you were together?
4. Do you think that the functions of the box have allowed you to have a better reunion?
5. Which functions did you like most of the box?
6. Did you enjoy the way that the sharing of experiences based on the content happened?
7. Do you think that the box has made your interaction as a family more different compared to previous reunion? [If yes] in what ways has that happened?
8. Are you feeling more prepared for next separation?
9. Has the box made a difference while you were in reunion?

Appendix C.5: Excerpts of Questionnaire in Study 3

In addition to the observations (fieldnotes) and interview questions I also asked each family member to complete a questionnaire that further informed the insights generated from this study. Below is a snapshot of the questionnaire that was referred to in sections 6.3.3.2 and 6.6.

Questionnaire
_____

Thank you for participating in this study. If you have any questions regarding the completion of this questionnaire please let the PhD researcher know.

INSTRUCTIONS FOR COMPLETING THE QUESTIONNAIRE

Feel free to respond to the questions below. Only one questionnaire per family is required.

1.1 How many members does your family have?

 3 ☐   4 ☐   more than 4 ☐

1.2 How often do you separate?

 Once/week ☐   Once/two weeks ☐   Once/month ☐   more ☐ _____

1.3 How long do you separate for?

 2+ weeks ☐   4+ weeks ☐   8+ weeks ☐   more ☐ _____

1.4 How often do you reunite?

 Once/week ☐   Once/two weeks ☐   Once/month ☐   more ☐ _____

1.4 How long do you reunite for?

 2+ weeks ☐   4+ weeks ☐   8+ weeks ☐   more ☐ _____

1.5 How often do you communicate while in separation?

 Every day ☐   Every two days ☐   Once per week ☐   other ☐ _____

1.6 Which of the following technologies do you use to keep in touch?

 Email ☐   Mobile ☐   Facebook ☐   other ☐ _____

1.7 Do you feel anticipation for the reunion?

 Yes ☐   No ☐   Please explain

_____

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1.8 What is it like when you meet the loved one for the first time (the actual moment of reunion)?

_____
_____
_____
_____
_____
_____
_____
_____
_____

1.9 What do you do during the first week of reunion?

_____
_____
_____
_____
_____
_____
_____
_____
_____

2.0 Do you prepare for the next separation in some way?

Yes ☐ No ☐ Please explain

_____
_____
_____
_____
_____
_____
_____
_____
_____

2.1 In your opinion, are there any benefits that _Rendezvous_ adds to your reunion experience?

Yes ☐ No ☐ Please explain

_____
_____
_____
_____
_____
_____
_____
_____
_____

2.2 Please score the following statements from 1 to 5. Insert an 'X' at the corresponding score

	1 (I do not agree at all)	2 (Slightly agree)	3 (Somewhat agree)	4 (Mostly agree)	5 (Completely agree
I feel excited when sending content to *Rendezvous* particularly since I cannot see it until the upcoming reunion.					
I have found myself feeling more eager to see my family now compared to before (when I did not have a *Rendezvous*)					
I felt really excited when I opened *Rendezvous*					
I feel that looking at a photo or video in *Rendezvous* is similar to gift giving.					
I feel that *Rendezvous* helps me share my experiences after reunion					
I feel that *Rendezvous* allows me to celebrate reunion more than before					
I feel that *Rendezvous* has made a difference for my reunion experience					

Thank you very much for your support.

Appendix C.6: Behavioural Log Structure and Metrics in Study 3

During the field trial of *Rendezvous,* I collected behavioural data that was generated from two scripts written in Python (a high-level programming language used for general-purpose programming). One script was assigned to the *Rendezvous* application in the box and the other to the Android application that was used by the family members. Each of those scripts aimed at producing a string of information that related to the sender, the type of the content (image, video, text), the size of the sent file and a time-stamp for both the *Rendezvous* box and the standalone Android application. All the information was saved to a local database host. The behavioural log was referred to in section 6.3.3.3.

For example, if father 1 sent an image of size 567KB at 10:06 PM Eastern Australian Standard Time on Sunday 01 Sep 2013 from the mobile application then the result of the script query would output:

```
"('F1', 'Image', 0.55, 220600, 09012013)"
#Father 1 sent an image of size .55MB at 10:06PM on 01 Sep 2013
```

## Appendix C.7: Indicative Charts of Data Collected During the *Rendezvous* Deployment

In this section of Appendix C, I provide graphs that construct a high-level picture of the use of both the mobile and the standalone *Rendezvous* application throughout the deployment. The aim of these graphs is to give the reader a more nuanced understanding of how parents, children and mothers of academic and mining families engaged with *Rendezvous* during the pre, upon and post reunion phase. Even though this data is referenced throughout sections 6.4 and 6.5, there is an explicit citation of Appendix C.7 in section 6.3.3.3.

The two graphs below show the type of content that was sent to *Rendezvous* by each family type during pre-reunion as well as the total content contributed per family type based on the data log output.
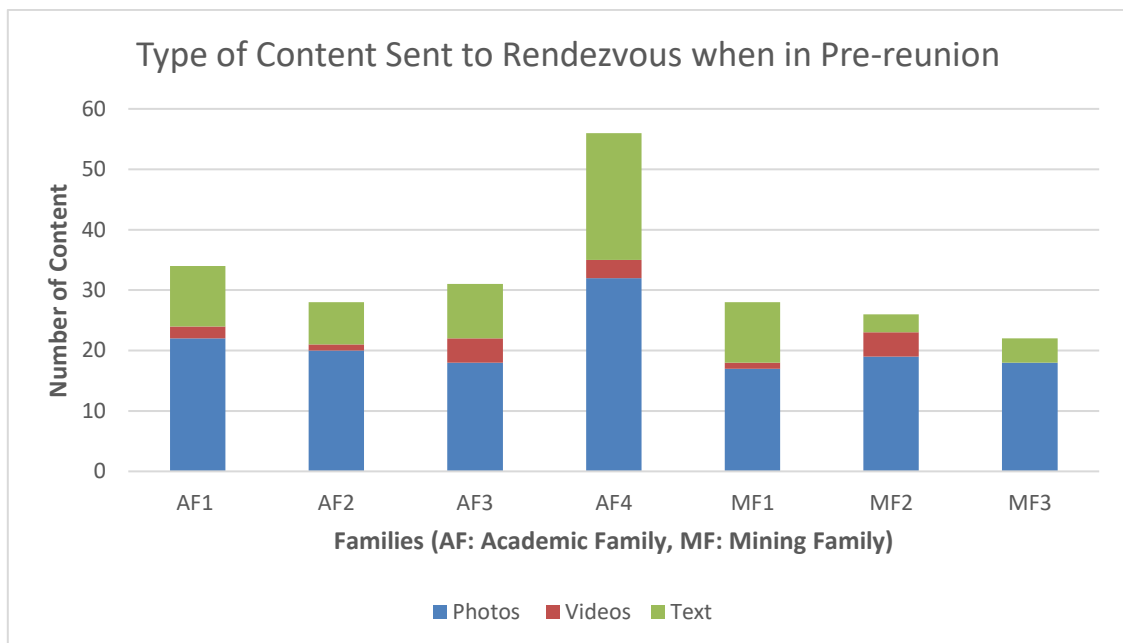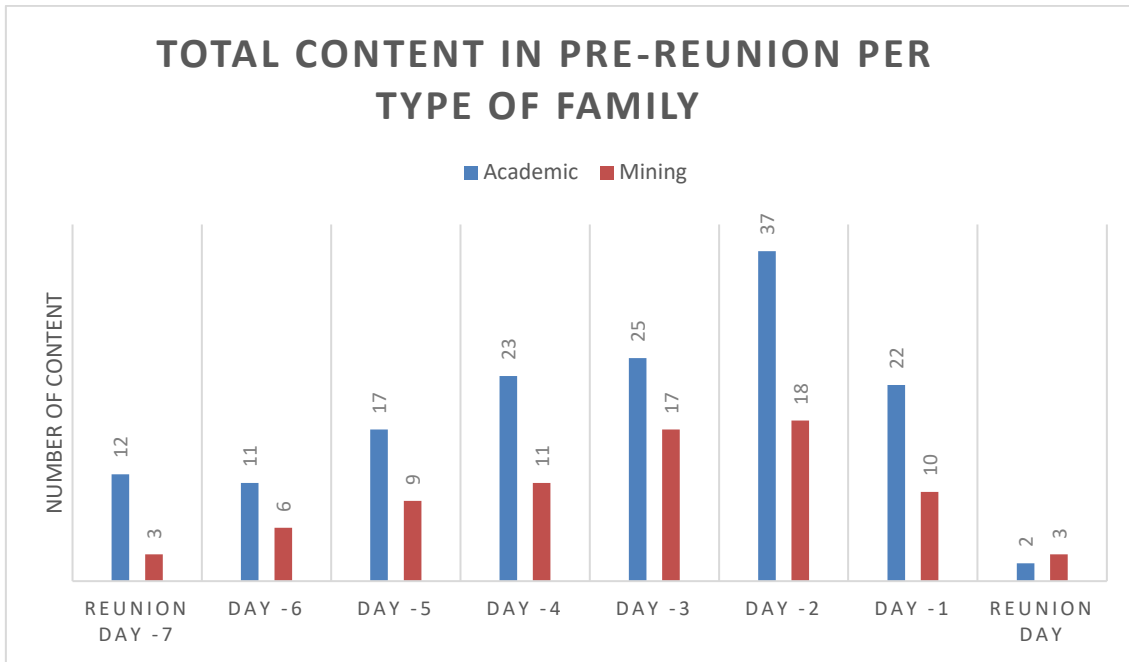
Finally, the graph below presents the distribution of content that was submitted by all family members a week before the eventual reunion.
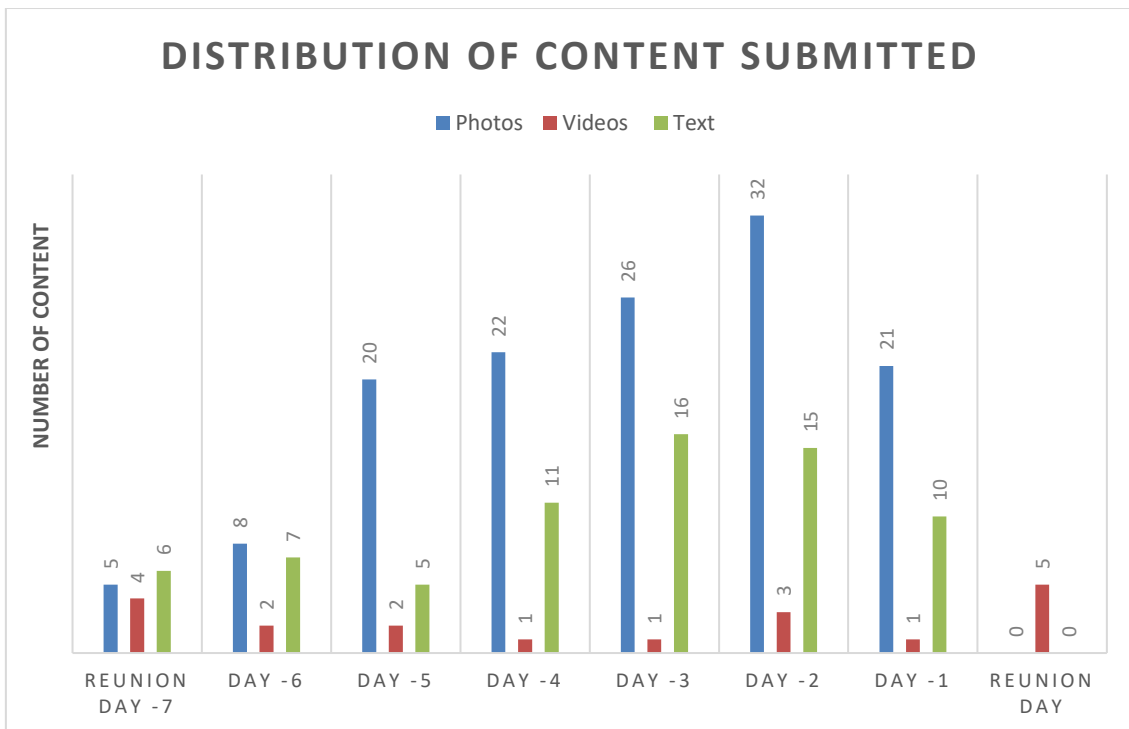
Appendix C.8: Coding of Data Collected in Study 3

The synthesis of the data that was collected (observations, interviews, questionnaires, behavioural data logs) was analysed using a thematic analysis approach. The different data collection methods generated a series of codes that resulted to the three main themes that respond to the main research question as described in section 6.3.4.1.

Below is a screenshot of all the main codes generated in all reunion phases organized per family and per percentage of coverage (where 100% is coded to 5.00) in the collected data.

	Affirmation	Meaningful Choice	Intimacy	Together	Excitement	Anxiety	Strengthen	Progress	Sharing	Engagement	Anticipation
Family 1 (AF1)	3.72	3.52	3.81	3.62	3.86	4.04	3.27	3.45	3.78	4.15	3.92
Family 2 (AF2)	3.69	3.47	3.79	3.60	3.84	4.02	3.22	3.41	3.76	4.11	3.85
Family 3 (AF3)	3.51	3.21	3.70	3.58	3.82	4.09	3.10	3.42	3.73	4.04	3.78
Family 4 (AF4)	3.49	3.20	3.69	3.54	3.80	4.09	3.09	3.42	3.69	4.01	3.77
Family 5 (MF1)	3.32	3.02	3.57	3.59	3.76	4.19	3.05	3.50	3.83	3.94	3.69
Family 6 (MF2)	3.32	3.02	3.57	3.59	3.77	4.19	3.07	3.50	3.82	3.94	3.69
Family 7 (MF2)	3.32	3.02	3.57	3.59	3.77	4.19	3.07	3.50	3.82	3.94	3.69

Green, light green is photos
Red, pink is text
Yellow, orange is video

Appendix D: Thesis Publications

Appendix D includes all the publications that have arisen from this thesis. This appendix was referred to in the thesis' preface.

Publication 1:

Kazakos, K 2013, 'Understanding the role of technology in parent-child reunion', in *Proceedings of the 2013 conference on computer supported cooperative work companion*, ACM, New York, NY, USA, pp. 61–64, DOI: 10.1145/2441955.2441972.

Understanding the Role of Technology in Parent-Child Reunion

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Abstract
The aim of this research is to better understand the role of technology in parent-child reunion. This work involves three phases: a qualitative fieldwork study exploring the use of current technologies in supporting reunion; a design study that develops a technical intervention whose aim is to support parent-child reunion; and an evaluation study that further explores the theoretical and practical implications of the use of the reunion technology when deployed in real-life settings. This thesis extends previous work on supporting parent-child interactions within the contemporary family life.

Keywords
Parent-child reunion; technology; design; user experience

ACM Classification Keywords
H5.2. [Information Interfaces and presentation (e.g., HCI)]: User Interfaces.

Introduction
Reunion is the process of coming together that "*encompasses a flow of past memories, present reality and the future with the aim to ensure the family continuity and stability*" [5]. Numerous families face periodic transitions between reunion and time apart due to work-related or personal reasons. In the

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Figure 1. Rendezvous closed and open. It can be located anywhere in the home. Notice the key and the tablet.

university) and residing away from their familial home. Defence families are those who have at least one parent in the military and are subject to deployments.

Through an iterative coding process [2] I framed reunion as a pre, upon and post experience. Following this, I identified three threads of the reunion experience that are not well supported by current technologies [4]. Firstly, the anticipation to reunite, which is a characteristic of the pre-reunion phase, was experienced to a less extent in the academic families partly due to the ease of access to different communication technologies. Secondly, even though both families had similar technologies available for use while in reunion (e.g. photos), academic family members did not take advantage of these technologies in upon and post-reunion phase. Finally, the current technologies did not embrace the preparation for next separation that is vital for this type of families.

Study 2: Designing for parent-child reunion
Based on the findings of the first study I conducted a series of design workshops with interaction design experts, parents and children. The aim of the workshops was to elicit design ideas of future technologies whose aim is to better support parent-child reunion within this specific family type. I chose to include in the workshops only members of academic families, as they are the ones who not only have access to different communication technologies while apart but also because they exhibited less interest in reunion and at the same time were concerned for their participation in this experience.

The outcome of the workshops was Rendezvous, a wooden box comprised of two main components: a key

and a digital tablet in one of its compartments (Figure 1). Just before the next separation the parent who is departing locks the box and takes with him/her the key. While in separation all family members can send any digital content they consider of value to the box using the mobile application or through email. However, while the box is locked they cannot access the content. Every time something is sent to the box both the at-home family members and the parent who is away are notified either through an ambient sound (from the box) or through a notification (from the mobile application). This aims at increasing the anticipation to reunite. When the family reunites, the parent who has the key opens the box and the Rendezvous application in the tablet initiates, presenting all the digital content gathered while in separation and, thus, fostering the sharing of experiences. Finally, while in reunion both parents and children can store content in Rendezvous, which they have to take before the box is locked and thus preparing for the next separation.

Study 3: Field Study of Rendezvous
In the last study I will deploy Rendezvous with eight academic families over a period of three to four months. My intention is to ask from the participants of study 1 and study 2 to participate in the field study. The effect of Rendezvous to the reunion experience will be evaluated through a series of interviews, questionnaires, observations and home visits at the reunion phase.

Status of Work
As depicted in table 1, the first study has been completed resulting in a theoretical understanding of the current use of technologies that support reunion

presence of young children, these transitions may weaken parent-child bonds and jeopardize family wellbeing [1]. The collaborative practices surrounding family reunion give opportunities to family members to enrich and strengthen their ties. Parents and children can engage in rich and meaningful collocated interactions through, primarily, narrative and playful family activities [1].

Previous research has explored the role of synchronous and asynchronous technologies in mediating essential interactions between parents and children who are separated by distance and time [3]. More recent studies have investigated the lives of 'dynamic' or 'atypical' families – be they divorce or work-related separation – with the aim to map opportunities for technologies that address the challenges of this distinct family type [6–8]. Even though these nascent works have touched on the reunion experience, unveiling its significance for parents and children, less is known about the multifaceted role of technology in parent-child reunion.

In my dissertation, I investigate the role of technology in the experience of parent-child reunion. Throughout my research I employ a series of qualitative, design and evaluation methods that lead to a deeper understanding of the current and future practice of the reunion experience. This research extends the previous work on supporting parent-child interaction within families who experience periodic transitions between being together or apart due to work-related or personal reasons.

Research Questions
My key research question is: *What is the role of technology in parent-child reunion?* The following sub-questions help me focus my research:

1. How are current technologies used to support parent-child reunion?
2. What are the qualities of technologies that support parent-child reunion?
3. How do parents and children experience reunion through Rendezvous?

Research Approach
My thesis is comprised of three stages (Table 1): an exploratory, a design and an evaluation study.

Stage	Aim/Method	Status
1	Explore reunion/ Qualitative fieldwork	Completed
2	Design for reunion/ Design workshops	In Progress
3	Evaluate reunion technology / Field Study	Proposed

Table 1. Studies comprising this thesis alongside the aim/method and status per study.

Study 1: Exploring reunion and technologies
In the first study of this thesis, I used a qualitative approach to explore how current technologies are used to support parent-child reunion. I conducted a series of semi-structured interviews, interwoven with participant observations, with the parents and children of two types of family cohorts: defense and academic. Academic families are those who have at least one parent working in an academic environment (e.g. a

[3]. Study 2 is still in progress, as I am finalizing the Rendezvous software. Lastly, study 3 is still under design and has not commenced.

Expected Contributions

Overall, my thesis will extend our understanding of the role of technology in parent-child reunion. In the course of this research I expect to: better understand the current practice of the reunion experience (study 1), build a technology that addresses the envisioned practice of reunion (study 2) and to deploy within the family setting the first reunion-oriented technology, called Rendezvous (study 3). The Rendezvous deployment study will help the community understand how a novel form of domestic computing can support a significant yet overlooked family experience.

Benefits of Participating in the DC

The attendance at the CSCW doctoral colloquium will provide me with the opportunity to improve my thesis' understanding through an enriching discussion with peers and participants. Furthermore, I would appreciate any feedback relating to the structure of study 3 and the eventual closure of the thesis. A further issue I would like to draw attention to is the applicability of this thesis' findings in context different to family oriented studies. Finally, in the course of my participation I am hoping to gain further clarification on enriching the methodological interpretation of the data in order to better contribute to the CSCW community.

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Publication 2:

Kazakos, K, Howard, S & Vetere, F 2013, 'Revisiting the relationship between reunion and technology-mediated separation in periodically transitioning families', in *Proceedings of the 2013 conference on computer supported cooperative work*, ACM, New York, NY, USA, pp. 1157–1168. DOI: 0.1145/2441776.2441907.

Revisiting the Relationship between Reunion and Technology-Mediated Separation in Periodically Transitioning Families

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ABSTRACT

Reunion is one of the most important facets in the lives of periodically transitioning families - families who experience repeated transitions between being together and apart due to work-related or personal reasons. Even though the role of technology in mediating essential family interactions has been a l ongstanding focus within HCI and CSCW, the experience of periodic family reunion and its relationship with technology use while apart is little explored. To address this gap, we conducted a f ield study with nine families from two different professional backgrounds - defence and academic. Through a comparison between the two cohorts, our findings generate a qualitative understanding of the experience of reunion and describe specific aspects of this experience that are influenced by technology-use while apart. We discuss the complexity of this relationship and reflect on the role of technology in shaping the experience of periodic family reunion.

Author Keywords

Periodically transitioning families, family reunion, computer-mediated communication, separation, parent-child interaction

ACM Classification Keywords

H.5.3. **[Information Interfaces and Presentation (e.g. HCI)]**: Group and Organization Interfaces.

INTRODUCTION

Reunion is the process of people coming together after time apart that *"encompasses a flow of past memories, present reality and the future"* [16]. One of the main characteristics of the contemporary family life is the periodic transitions between reunion and time apart due to work-related and personal reasons [17]. In the presence of young children, these transitions may weaken the parent-child bonds and jeopardize the family wellbeing [5,21].

Recent research has explored the role of technology in mediating family interactions [1,10,11,13,23]. Early research investigated the relationship between online and offline interactions across different settings, including domestic, creating different views on the nature of these relationships [2]. More relevant to our work, studies have focused on understanding the life of dynamic or 'atypical' family structures – be they divorce related or work-separation – as an effort to map opportunities for designing technologies that are appropriated to the life of the families' communication needs [5,9,12,13]. Even though all of these works investigate the complicated interaction between being physically together and apart they only address the experience of reunion superficially. We fill this gap by asking, how does technology-mediated separation in families affect the experience of *reunion*?

Through a field study with nine families, we generate a qualitative understanding of the experience of periodic family reunion and its current relationship with technology use while apart. Our findings suggest that specific aspects of the reunion experience are influenced by the nature of technologies and the interaction mediated when families are physically dispersed. This work builds on the recent work of Turkle who mentioned that even though parents and children might be physically *together* they might feel *alone* [22]. Our contribution in this paper is twofold. Firstly, we present empirical findings that lead to a qualitative understanding of the experience of reunion with defence and academic families. Secondly, we use this understanding to provide a rich account of the current nature of the relationship between the experience of reunion and that of technology-use while apart.

In the remainder of this paper, we review the current work on reunion and mediated communication as well as present our field study findings. We discuss those findings and reflect on the role of technology in shaping the experience of reunion.

RELATED WORK

Reunion and periodically transitioning families

Studies within sociology and psychology have identified single instance reunion as a prescheduled meeting of family

members who have been physically dispersed and is associated with annual familial or cultural events (e.g. family gatherings over Christmas dinner, annual family coming togethers) [19]. The basic attribute of single-instance reunion is its annual periodicity alongside the ritualistic and celebratory nature of interactions amongst the reunited family members. Examples of rituals in reunion include the exchange of gifts, the planning and enjoyment of the first family dinner and the sharing of experiences that occurred while family members were apart.

Periodic-reunion, which is the focus of this paper, refers to the cyclic family event that follows some type of physical separation particularly due to work-related or personal reasons [3]. In this paper, we call these families 'periodically transitioning families'. This type of reunion occurs across families of different professional backgrounds (defence, mining, business etc.) as well as immigrants, divorced and incarcerated families. Wood et al. [24] explored the role of reunion within defence families and showed the importance of narrative, play and reflection in enriching the family bonds when in reunion.

Moreover, in a comparative study between mining and defence families Kaczmarek et al. [12] highlighted the role of reunion in fostering the family togetherness after a separation. They noted that even in cases where reunion was surrounded with negative sentiments – mainly due to the unwillingness of the returning parent to engage in conversations – the physical presence of all the family members was a positive element that assisted in the resolution of these differences. Campos et al. [3], conducted a naturalistic observation study of dual-earner families focusing on what occurs when the family reunites at the end of a day. This is an extreme facet of periodic reunion that, however, manifested the different aspects of this experience in the contemporary family life. Works within the transnational context as [14,20] have, also, provided insights on the challenges that the parent-child reunion faces when it occurs periodically and potential solutions aligning with the use of narrative and collective engagement to enrich collocated family activities during reunion.

Periodic family reunion in HCI and CSCW
Outside of the sociological and psychological research context there has been little attention on periodic family reunion. Most of the recent work has focused on mediating essential parent-child interactions [10] through the use of synchronous or asynchronous tools to support closeness, intimacy, play as well as awareness [1,10,11,13,23]. However, recently there has been a shift in better understanding the role of technology within families who periodically separate due to work-related or divorce reasons, where reunion was recognized as an important finding [15,18,25,26].

In their work with travelling parents, Modlitba and Schmandt conducted a series of interviews with toddlers and their parents in order to identify potential design opportunities that support separation [19]. This work depicted the need for future systems to take into account the asymmetry of needs for communication technologies among parents and children. At the same time they found that many of the children would anticipate the eventual return of their parent even when keeping in touch at a distance. Following on this work, Yarosh and Abowd explored the perceptions and strategies employed by parents and children of work-separated families for coping with periodic separation [25]. They suggested that different facets of work-related separation should be taken into account when designing technologies to support separation and identified challenges for designing technologies for specific 'atypical' families (e.g. defence). Relating to reunion their findings suggested that collocated children anticipated the eventual reunion; a finding closely aligned with Modlitba and Schmandt [15].

Within divorce-related separation, Yarosh et al. explored the role of technology in supporting parent-child communication [26]. They underlined the importance of technologies that could enrich closeness and take into account the tensions arising within this type of family. Even though reunion was not explicitly noted in this work, the authors highlighted the tensions arising between the divorced parents for the attention of the child while it was transitioning between the households. In another study of divorced families, Odom et al. investigated the design space of technologies that might support the complicated nature of co-parenting in divorced families [18]. Amongst other findings, they highlighted the challenge on behalf of children to construct and maintain their identity when travelling between households and, thus, reuniting with their separated parent.

Relationship between mediated and physical interactions
The relationship between the physical interactions – that constitute a major part of reunion - and the online ones has been central to CMC studies. Baym, in her recent account of this relationship, revisited the context of personal connections in the digital age through a series of reflections that lead to the formulation of key concepts based on which we can build an understanding of how mediated separation influences personal interactions [2].

Moreover, Turkle presented numerous field studies over a period of two decades that depicted her concern in relation to being 'alone together' [22]. She mentioned the need to revisit the relationship between mediated separation and co-located interactions, in order to address the gap between the technological and the physical with the aim of enriching face-to-face interactions. Alongside those findings were the ones also from Hollan and Stornetta who noted the need to design communication tools that "go beyond being there" and add richer value to the physical interactions to a point that "people will want to use them even when they are co-located" [8]. These works provided the necessary context for understanding the relationship between physical interaction

and CMC tools. Yet, they only touched the surface of the experience of reunion within periodically transitioning families.

Summary

The work within the current literature has outlined different perceptions relating to the relationship between physical interactions and technology use while in separation. Works within HCI have focused on understanding how to design for separation and why is that important. More recent research lines commence to highlight the different threads of reunion within the contemporary family life. However, there is little understanding of the interplay between the experience of reunion and the one of technology-mediated separation. Providing support for family separation does not necessarily mean that reunion is addressed within periodically transitioning families. In order to fill this gap, we answer the following question:

What aspects of the reunion experience are influenced by technology-mediated separation in periodically transitioning families?

APPROACH

We conducted a series of qualitative, semi-structured interviews interwoven with observations from our site visits with nine periodically transitioning families (N=9).

Participant Information

The recruited families fulfilled the following criteria:

- Families experienced some type of periodic reunion due to work-related reasons over the last 12 months.
- At least one parent was away for duration of two weeks or more at a time.
- The frequency of separation was at least once every two months.
- All families had children aged between 5 and 11 years old.

We drew participants from two cohorts: academic and defence. Academic families are those who have at least one parent working in an academic environment (e.g. a university) and residing away from their familial home. Defence families are those who have at least one parent in the military and are subject to frequent deployments. In the case of defence families, separation signifies not only the absence of a parent but also the commencement of a persistent concern about his or her safety of wellbeing [24]. On the other hand, academic separation occurs due to reasons that relate to the different responsibilities of an academic. Examples of this might be the continuous trips for fieldwork or in most cases the fact that an academic might find a position in a country different to the one of his or her origin where the rest of the family (e.g. mother and children) decide not to follow for their own personal reasons. In that case, academic separation resembles to business traveling or mining ones with the difference that it might occur for

longer periods of time, which is the type of separation that this research is focused on [12,17].

The reason we chose to recruit defence and academic families was due to the fact that even though they both go through periodic transitions between collocation and separation, the nature of the transition as well as the use of technology while apart is different. By doing so our aim was to be open to exploration of different themes that sourced from both of the families and could provide an account of the experience of reunion and its relationship with technology mediated separation. In all families the father was the person who was separated from the rest of the family. In the case of defence families, the fathers were in active combat deployments. Table 1 summarizes the family members interviewed, the durations of separation and reunion, and the most common communication technologies used whilst separated.

Data Collection

We conducted a series of semi-structured interviews (N=27) with parents and children from the four defence and five academic families following a similar approach as [18,25,26]. We interviewed the distant and the home based parent as well as one of the children – selected by the parents - from each family. The families were recruited by advertising at a local university campus and with the help of a local Defence Support Organization. The one-hour interviews were conducted either in the families' houses or online using communication software (e.g. Skype).

Each participant (including children) was interviewed alone without the presence of the other family members. The only exception was the child of family 8, who was interviewed with his mother due to his very young age. Initially, we asked each participant to give us a general account of how they perceived the current life of their family. Then, we focused the discussion on the aspects of separation and reunion. Questions covered the feelings of the interviewee on the separation of their loved one, the manner with which they kept in touch while separated as well as their perception of reunion and the role of separation – including technology use - on reunion. In the instances where we visited the families' home we also observed the children's rooms and asked to see any gifts that they might have received from their father upon reunion. With our questions we intended to understand the experience of reunion and deepen our understanding on its relationship with technology-use while apart. All family members shared their experiences of separation and reunion, their reflections on the periodic transitions between the two as well as how they used communication technologies to keep in touch whilst separated. As a token of appreciation all participants received a book voucher.

#	Interviewees (Father/Mother/ Child: Age in years)	Professional Background	Frequency of separation	Duration of Separation	Duration of Reunion	Communication technologies while separated			
						Mobile phone	Landline phone	Email	Skype Video
1	F: 34, M: 32, C: 7	Defence	Twice per year	6 months	2 months			✔	
2	F: 43, M: 40, C: 8	Defence	Three per year	4 months	1 month		✔	✔	
3	F: 48, M: 45, C: 7	Defence	Twice per year	3 months	2 months		✔	✔	
4	F: 42, M: 40, C: 9	Defence	Twice per year	7 months	1 month	✔	✔		
5	F: 41, M: 38, C: 11	Academic	Approx. four per year	3 months	2 weeks- 2 months	✔			✔
6	F: 52, M: 40, C: 11	Academic	Approx. four per year	4 months	2 weeks- 3 months	✔		✔	✔
7	F: 34, M: 32, C: 10	Academic	At least five per year	2 months	2 weeks	✔		✔	✔
8	F: 41, M: 38, C: 5	Academic	Twice per year	6 months	2-3 weeks	✔			✔
9	F: 38, M: 34, C: 10	Academic	At least six per year	1 month	2 weeks	✔		✔	✔

Table 1. Participant characteristics (F: father, M: mother, C: child).

Data Analysis

The data collected from the interviews was analyzed using a grounded theory approach [4]. Once the interviews were completed, they were transcribed and analyzed using the NVivo software package. The initial transcripts were analyzed and coded. While analyzing the data, we focused on the duration of separation, access to communication technologies while separated, the frequency of keeping in touch, type of technology used, the influence of time-zone differences and the sensitivity of the environment (e.g. life-threatening versus 'normal' conditions). The codes were then analyzed and categories emerged (focused coding). This iterative analysis, upon saturation, resulted in a stable theme set (theoretical coding). Integrated with the qualitative memos, the final themes were extracted and organized. We felt that we reached saturation after iterating the passing of the data multiple times and ensuring that no new evidence emerged. This analysis provided us with a series of themes that described the relationship between the experience of reunion and technology use while apart in the two cohorts.

FINDINGS

In this paper we ask what aspects of the reunion experience are influenced by technology-mediated separation in periodically transitioning families. Through the answer to this question, this paper contributes to understanding better the relationship between the experience of reunion and technology-mediated separation within the domestic domain. We chose to construct the findings around the three phases of the reunion process: pre-reunion, upon-reunion and post-reunion. Pre-reunion is the phase that occurs just before the physical interaction between the family members (e.g. days before the eventual reunion). Upon-reunion is the moment of reunion when the family members come physically together. Post-reunion is the phase that follows

the initial moment of reunion up to yet another separation. We have to note that different sections of the interview transcripts are used to illustrate the themes. These are attributed by the number of the family followed by the acronym of the family member. For example, 4F means family 4 – father; 4M family 4 – mother and 4C family 4 – child. With that in mind we present our findings. Figure 1 depicts the basic themes raised from our interviews through the analysis.

Figure 1. Themes raised in each reunion phase.

Pre-reunion

In this phase of reunion, family members are not physically together but very close to the eventual reunion. When questioned about the actual time boundaries of pre-reunion all of the family members gave a time range between a week and hours before reunion. We take this into account in describing the basic themes emerging from the first phase of reunion.

Technology use

Defence and academic families used different types of communication technologies to mediate their interactions

while in separation. As table 1 shows, most of the defence families used landline phones and emails to keep in touch with their family while separated. The nature of the profession alongside the cumbersome access to other types of technologies – apart from landline phone and email - was apparent within the defence families. While in the pre-reunion phase, defence family members noted that they would increase the frequency of communication with their separated loved one. As the mother and child of family three note:

"Yes I'd say that while waiting for him to come we uhm try to communicate more often..if that is possible..To make sure that he is ok and that he will be finally coming the date that he told us" [3M]

At the same time, the defence fathers felt more 'agitated' to harvest any available technology to communicate with their loved ones in order to ensure their mental and physical wellbeing prior to the upcoming reunion. On the other hand, four of the academic family members did not use technology differently while in pre-reunion. As the child of family six states:

"Well, yeah I would be in touch with dad throughout while he's away so it does not really make a great difference when it is coming closer to him coming back" [6C]

The mother from academic family seven described what happens while in pre-reunion in regards to the use of technology:

"Well, I would not say that that we talk more often. We know that he is safe and it does not really matter if he texts us or not more often as long as he comes back the day that he promised [laughs]..there are many things waiting to be dealt with here." [7M]

This asymmetry in the frequency of technology use, as families went closer to the eventual reunion, was due to the nature of the profession and the access to technology throughout separation. It seemed that the at-home academic family members seemed more 'secure' about their loved one compared to the defence families' ones.

Anticipation for reunion

Another theme, aligned with the previous one, was the anticipation to the eventual reunion. The talks between the at-home defence family members would be around the eventual return of the separated father.

"we would be always talking about him coming back in three or two or one more sleeps..we are really want him to be back" [2M]

"I would be thinking of him in so many uhmm random moments..especially uhmm when it will be like some days that he returns" [4C]

The eventual return of the separated father is anticipated with anxiety from the defence family members, as they are concerned about his safe return. The defence fathers would also be looking forward to their reunion with their wives and children. Three of the fathers depicted this anticipation as a continuous thought of their loved ones, which interweaves with fear of not being able to seeing them again. They noted that regardless of how many times they reunite, the

anticipation and 'longing' to be with their family once more was always present. In the case of academic families, anticipation was regarded in a different way. All of the at-home mothers stated that they would be happy for the eventual reunion with their husband but as academic mother five noted:

"Anticipation, especially after so many years of experiencing this, is slowly deteriorating..i think"[5M]

"I might feel anticipation but literally minutes or hours before seeing them" [7F]

Along the same lines as academic mother, the at-home children would anticipate for the return of their father but mainly for gifts – as will be discussed in the upon-reunion section. Finally, the academic fathers would anticipate for the upcoming reunion but would do so only in the final moments before the actual reunion. For example when they are in the plane or when arrive at the airport.

Preparation for reunion

Between the two family cohorts different practices were used to prepare for reunion, while in the pre-reunion phase. Defence mothers noted that there was a 'preparation procedure' days before the actual reunion took place:

"We would meet days before he comes back with his mom and dad and with the kids would prepare something for him. And then the dinner is fantastic!" [4M]

At the same time, defence fathers would spend time preparing for the upcoming reunion by choosing gifts for their at-home loved ones and by

"[..] dreaming of how the moment that I would hold them once more in my hands will be like"[2F]

Academic family members noted that no real preparation for reunion occurred:

"I would make a special dinner for him..and the kids might help but it would be probably for a big occasion like if we missed his birthday"[9M]

However, when academic family members were asked to reflect on the first time that they were waiting for the upcoming reunion they said that some sort of preparation was done but as it happened again and again:

"we simply stopped preparing for it as there is no point for preparing any more..I am worring that this not might be good."[6M]

This hints that the periodical nature of the transitions between separation and reunion influences the preparation for the upcoming reunion, which was reflected upon as a negative aspect of the family's life.

Upon Reunion

This is the phase of reunion that describes the physical coming together between the family members. We present the themes emerging from the interviews with family members in regards to the 'upon-reunion' phase.

Rituals

Within defence families, the moment of reunion was regarded as a moment of excitement and a celebration of family unity. Defence family members said that every time that their loved one came back they would be waiting in the

airport where they would have prepared a welcoming banner or would have brought with them the favorite cake or sweet of their loved one. Unfortunately we could not access a welcoming ceremony for defence families but a short online search depicts the importance of this ritualistic aspect of the upon reunion phase. In academic families, three out of five families noted that upon the return of their loved ones would not pick them up from the airport or wait with the children for their arrival home:

> *"Most of the times we would meet in the house..Of course we are happy for him to be here, but there are so many things that the kids and I have to do."[9M]*

In that sense, academic families would depict a different aspect of the nature of a ritual upon reunion. It seemed that each of the academic families appropriated the rituals to their personal experience as different reunions were experienced. For example, two of the academic families noted that in the first reunion some sort of rituals would occur.

> *"it is not only that we have been experiencing that for many years now, but also that in the first time we did not have any uhmm good contact with technology while away..we do have that now and I think this has changed something..not sure what it is"[7M]*

Apart from the physical interaction (hug etc.) there would be someone waiting at the airport, children would have had a drawing ready for their father but as more reunions were experienced these rituals faded away.

Emotional Interactions

Within defence families, the moment of reunion was interwoven with positive sentiments, acts of affection and intense physical interactions between family members.

> *"We would hug and cry and just be so excited and happy that he is back!"[1M]*

All defence families perceived reunion as an experience that signified the coming together of the family. On many occasions defence families saw the moment of reunion as the event where the family can finally start to 'recuperate' from the painful and stressful experience of separation.

> *"For me [the moment of reunion] is all about being together again in our home. Doing all those activities that we have not done for some time now. Together" [3M]*
>
> *"blah blah..[reunion] is very similar to being part of the family again. It is physical and i t is important to be physical"[1F]*

In defence family four, the child expressed his pride and happiness in seeing his father once more:

> *"It is cool to see him in the uniform and he is here with us. My friends are jealous! "[4C]*

Four of the academic families noted that in many cases the children would show modest interest in the return of the father, and the children were aware of this:

> *"He will return and the kids will just be upstairs carrying on with their stuff. Still not know why this happens.."[6M]*
>
> *"Well dad m ight be back, but we will be playing with [name] and I might not go and hug him or stuff. I will see him later anyways."[5C]*

According to the academic mothers, the children exhibited less interest in the event of reunion because of the numerous activities that they were involved in, and the fact that they already felt connected with their father due to their keeping in touch whilst previously separated.

Gifts

It was common for the absent father to bring gifts on his return. For defence children the return of the father signified not only the return of a loved one but also the anticipation of gifts. Similarly, both defence and academic children said that the first thing they do once their father is back is to search for a gift in his luggage. They expressed their expectation and certainty that their beloved father would have some sort of present for them:

> *"Daddy will come back and yeah I will go through his stuff and search for gifts. I like that."[4C]*

It was evident from the interviews with the children that the gift played a very important role in building anticipation prior to the return of the father.

> *"I am so happy that he is back especially when he shows me the gift. That makes me so happy. I don't care which gift he brings me. Well I think!"[6C]*

The absent parent would pick the gift based either on the personality of their child or because they would expect the gift to mediate a nice experience that they had while in travel. In both cohorts, family members noted that gifts were important since they were associated the reunion of the whole family. The parents felt that, in some occasions, their bond with children was reinvigorated through the process of gift-exchange upon reunion.

Post Reunion

In this phase family members are physically together until the upcoming separation. This is the most important phase of the reunion process, which is primarily characterized by the different practices that each family employs in order to 'recuperate' from the physical separation. These practices are centralized around the sharing of experiences and the mechanics of feeling connected again. However, both families experienced those practices in a different manner.

Experience sharing

When all family members are physically together after time apart, it is necessary that they reconstruct their family bonds in order to enrich their relationships. This occurs primarily through the sharing of experiences, which can have different interpretations for different families and for different family members. Technology played an important role in being used as a platform for sharing of experiences. In the case of defence families it was common that they would share photographs at reunion. They would reflect on experiences that were not possible to be mediated through technology (they named those 'lost experiences') but would do so through a protocol. The location of where the sharing occurred played an important role. For instance, all of the families who shared physical (printed on card or paper) photos chose the first family dinner or after the dinner in the family living room:

"After the dinner we will just sit down and talk with the kids about things that happened. Then [name] would have some photos and the kids would be happy to see where dad was.." [4M]

The younger and older members of the family would engage in some form of discussion and on many occasions the father would ask the children to reflect on their life at school or other important elements of their life that had occurred whilst separated. However, this sharing of experiences was not bidirectional since in most cases the fathers did not disclose many details of their life while in deployment for fear of traumatizing their children. Across defence families the concept of 'lost' experiences arose. Six out of eight parents felt that reunion was an opportunity to address issues that had occurred while the family members were apart and could not be mediated through the communication technologies used:

"The fact that we do not really talk a lot while away makes this [the coming together] even more important. We can now talk about things." [2M]

These experiences often occurred between the two parents, though in cases with the active participation of the children. Nevertheless, the children's participation was mostly around clarifications of details. Academic families, on the other hand, stated that they would rarely use technology while in post reunion, to share their experiences of separation:

"When dad is back we do not really see photos or things like that, uhmm, we might talk about it but no photos or videos." [5C]

"Well, I don't think that we would share photos or anything like that. What might happen is for [child's name] to show some of his drawings."[8M]

When asked to elaborate more on why they do not use technology to reflect on past experiences, academic family members noted that:

"We keep on talking daily. Especially through skype so when we come together we are already up to date with each other..not sure if that is a good thing or not though"[6F]

The experience sharing, in the case of academic families, was mostly a momentous process and it did not involve the practices that were used by defence families. Academic family members did not feel the need to share 'stuff' when reunited but as the extract from the interview with the father of family six shows, that does not mean that they were feeling comfortable with that neither.

Absence in presence

Related to the lack of experience sharing within the academic family members another theme that arose was the feelings of absence in (co) presence. This theme is best described by the following transcript extracts:

"When he comes back to the house it is as if he was never gone. It is the same every time. He will come back and then leave again for so many times that we are getting used to it. It is as if he is absent while he is also present.." [6M]

"For sure I enjoy that my father is here..But still many times it is very plain.it is like he is back and we just say hi and nothing more" [7C]

This feeling of being absent even though the family should all be (co) present was apparent in three out of five academic families. The mothers of these families felt responsible for stimulating the interest of their children and their partners in engaging both parties at some form of discussion:

"I feel many times that I am trying to provoke conversation when the family comes together. I do understand that since we are talking every day when [name] is away uhmm but still I would like the family to talk more. Maybe I am asking too much." [7M]

As the mother of academic family seven notes, the lack of discussion among the family members in post reunion was perceived as an issue of concern for the whole family. Fathers of these families would care mostly about the family issues that had to be coordinated upon their arrival back to the household. In some cases, this would result in tensions among themselves and their partners since academic mothers expressed their hope to see their partners and their children engaged in more interaction. Another mother from family nine noted that:

"It is as if we are together but struggle to really be together. We struggle to feel connected again."[9M]

When the fathers of these families were asked about the absence that their partners felt while in reunion they stated that the continuous use of technology while apart and the fact that they have been experiencing reunion for many times now was partly due to blame. As the father of family seven said:

"This [reunion] has been happening for a lot time now and uhmm we always keep in touch while I am away. We use skype all the time and it would seem redundant to go over the same things when we come together. It has become a routine [reunion]. I am not sure that this is a good thing" [7F]

In these families (the three out of the five academic) it was clear that meaningful interactions in post-reunion would be essential for the whole family. Engaging in what each family would consider as meaningful per their values, was of upmost importance. In the case of defence families there existed only some instances of this absence, primarily when defence fathers did not want to share their experiences while apart due to the sensitivity of the nature of their profession:

"I would not like for the kids to hear what it is like to be in Afghanistan; .in a war environment. So I just tell them the one part of the story. The beautiful one [laughing]" [1F]

Defence family members noted that they did not feel the kind of absence that is described by academic ones. Their main goal was to assist their loved one in being part of the family once more and focus on this as a family unit. For this reason they would use each day of reunion as a new and different one where they would employ all essential practices for the family to be really connected again.

Preparation for the next separation

Another important theme that emerged in the post-reunion phase was the fact that all families felt the need that they should somehow prepare for the next separation. However,

the practical activities that would address this need were not implemented in the same manner from both families. In defence families, preparation for the next separation associated with continuous use of reunion as a ground for enriching the family bonds. The anxiety of being separate once more and all the dangers involved in deployment alongside the lack of ways to mediate essential interactions while apart were key reasons for:

"preparing for the next separation is more than really preparing. It is about thinking of how you would make use of everyday when you are together and r eally bring the family together..Be really prepared for the next deployment" [2M]

Defence family members would prepare for the next separation by discussing of the critical issues associated with deployment and by reflecting on ways with which they could address issues that arose in previous deployments:

"even though I do not like discussing about it, yeah we go through of what might happen while I am away, what we did wrong in previous deployments and of ways we can use to keep connected" [3F]

Preparing for next separation became also planning for next separation and becoming aware of what it entails within the defence families. A different perception of preparing for next separation was encountered in academic families. All of the academic family members felt more secure in regards to the upcoming separation with their loved one. This security arose, mainly, from the fact that they could use technology to keep connected while apart and of the lack of sensitivity of the profession:

"preparing for another separation is not, I think, one of the main goals of this family while in reunion. Well, apart from the practical stuff.." [8M]

However, when asked to reflect on the importance of preparing for another separation all of the academic family members depicted their concern on the fact that they had not though of this before. For academic families it seemed as if reunion and separation were closely aligned with each other:

"Yes it is really strange but we would not really talk about the next separation, we might do so a couple of days before but we should have. We take for granted many things you know" [8F]

There was no need to prepare for the next separation yet there was a deep concern, primarily from the parents, that they were not using reunion as a time of enriching their bonds between themselves and their children. The access to technology while in separation resulted in parents and children feeling more secure about their communication while apart. Yet, even though they were feeling secure, it was clear that sadness and remorse was apparent not only for separating once more but also for not having used reunion as a ground for strengthening the parent-child bonds.

DISCUSSION
Comparing the experience of reunion between the two cohorts

For both academic and defence families the experience of reunion was a three-phase process: pre-reunion, upon-reunion and post-reunion. However, when comparing the main themes across the two cohorts we can highlight many differences. In pre-reunion, defence families would endeavor to harvest different communication resources - that in many cases were limited and simple - and ensure that the family members were aware of the safe return of the deployed parent. The anticipation to reunite increased closer to the reunion date due in part to the life-threatening context of the deployment and the limited access to communication technologies while deployed. It was manifested with the increased frequency of technology use, which served as a way of preparing for the forthcoming reunion. Similar work in defence family studies depicts the significant role of email and landline phones in not only communicating an awareness of the physical and mental wellbeing of the deployed parent but also preparing the deployed and at-home family members for reunion [12,24]. On the other hand, in academic families, the at-home family members would not demonstrate different uses of technology during pre-reunion. For instance, they would have positive sentiments of current technologies used to mediate separation and not increase their use of those technologies. For academic families, the anticipation of reunion was evident but in a scarcer manner compared to defence. They would anticipate reuniting but this would have an instant character, happening primarily minutes or hours before meeting. In terms of preparation for reunion, academic family members rarely prepared for reunion, in part due to the continuous use of technology whilst in separation and the non-sensitive context of the profession compared to the dangers of the defence sector.

When reunion occurred defence families regarded it a s a pivotal event interwoven with rituals and emotional interaction. For instance, at-home family members would be waiting at the airport or preparing the first dinner as a family. Academic families did not regard the moment of reunion with the same gravity. The rituals of academic families had a more 'routine-like' manner that was still important for the family wellbeing but different to defence. This aligns with previous work on business related travelling and dual-earner families, which outlined the routine-like experience of reunion [3,17,21]. In the moment of reunion the emotional connection between the returning parent and the child was evidenced by a hug or a kiss. These actions were, of course, meaningful but not in the same way or with the same intensity as defence reunions. Parents and children were happy to be together yet the periodic nature of reunion and the different communication technologies used altered the way in which the moment of reunion was experienced. In all cases the families exchanged gifts upon reunion. The close relation of gift and reunion was evident in the reactions of the children. In many cases, children

would search for a gift, which took on the characteristics of a 'hide and seek' game, a playful activity for both parents and children.

While in post-reunion, defence families would engage in different practices of experience sharing. Defence family members had the need to reinvigorate their bonds and did so through discussion and shared family activities. Defence parents reflected on what they called 'lost experiences', those that were hard to share whilst apart due to the cumbersome use of technology. Throughout post-reunion defence families would organize family activities where all members (including the extended family) would participate. Digital artifacts had a central role in the post-reunion phase of defence families in not only facilitating experience sharing but also in informing all family members and preparing them for the next separation. The benefits of the collocated use of technology that we observed in defence families have been documented extensively elsewhere in photo sharing, the collocated use of displays for experience sharing and the role of collocated technology generally [6,9]. However, within academic families the collocated use of technology for experience sharing was not apparent. Family members would not engage in extensive reflection about their time apart, either through photos or other types of technology. They felt that the increased frequency and access to technology whilst apart – in particular through video-mediated tools - was successful in keeping in touch with absent family members. Therefore, in most of the academic families a sentiment of 'absence in presence' would be evident that depicted a lack of engagement in post-reunion collocated family activities (e.g. through dialogue). This absence of collocated interaction also resulted in a lack of preparation for forthcoming separation. We understand these differences, particularly during post reunion, to be due to the nature of experiences mediated by technology whilst in separation, as well as the periodicity of the transition between reunion and separation. There exist other reasons (e.g. threatening professional context and nature of existing family bonds as [12] underlines) but for the purposes of this paper we confine our discussion to periodicity and the nature of mediated interactions.

Periodicity not only relates to the frequency of separation and reunion but to the broader temporal aspects of reunion and separation. Since we are focused on reunion and inspired by previous work on the temporal aspects of usability [7], we frame the periodicity of reunion as being defined by the duration, location and frequency of the reunion event. The duration of reunion refers to the actual duration of the family members being together prior to another separation. The location of reunion is when the reunion happened in relation to other events (birthdays, Christmas, funerals etc.) and the frequency is how often reunion occurred. The nature of experiences mediated whilst separated depends on the type and frequency of use of the specific technologies. Most academic families – as table 1 shows – had continuous access to synchronous technologies

(mobile phones and Video Mediated Communication tools as well as in some cases access to social media) that they were content to use, whereas defence families sporadic access to asynchronous ones (e.g. email). Academic families were able to mediate their essential interactions through easy access to technology. Despite different technologies that enable family members to enrich their collocated interactions [9] academic family members would not use them since they felt that they had little more to share and most importantly no creative ways in which they could engage in the reunion prior to another separation. This was manifested in different aspects of the post-reunion phase that were attributed to concerns about the strength of the family bonds by the academic parents.

What aspects of reunion are influenced by technology-mediated separation?

Recent sociological research has depicted the opportunities that reunion provides to families to enrich their the quality of their relationship through collocated parent-child activities [5,12,14,17,20,24]. However, returning to our original study question, we have identified a series of aspects of the reunion experience that are influenced by technology-mediated separation during both pre- and post-reunion.

The anticipation to reunite was one of the threads of the reunion experience influenced by technology use whilst apart. The sentiment of anticipation has been mentioned within the previous work on work-related separation and 'atypical' family structures [15,25]. In all of those studies children anticipated the eventual reunion. In fact as [25] describes, in most cases, children would prefer to not engage with their separated parent through communication tools but would wait for the eventual physical reunion. We found similar practices by the younger family members in the case of defence families but not with academic families. In the latter case, children would look forward to the eventual reunion not only because the family was together once more but also because of the gift that awaited them. In that case, the anticipation to reunite was embodied in the 'artifact' that the parent would bring along upon his return. In the case of preparation for another separation research on work-related and divorce separation [15,18,25,26] is the separation anxiety that family members feel approach the separation event. Our study found similar results but academic families felt more secure about the separation due to the less-sensitive professional context and the different types of technology-use whilst separated.

However, a contradiction was apparent. Even though it seemed that technology was achieving the purpose of ensuring the continued connectedness and closeness of physically separated parents and children [1,11,13], academic parents felt that it was also responsible for the lack of interaction amongst family members during reunion. Academic families experienced a feeling of *absence in presence* (an inversion of the more commonly used phrase

'presence in absence') relating to a lack of engagement felt in collocated family activities during reunion. This finding aligns with the work of Turkle, who in addition to accounts of the role of technology in the everyday life, refers to the thin line between feeling alone and together even though one might be collocated with the significant other [22]. Throughout her research she extracted observations from a series of interviews that she conducted with children and adults over a ten-year period. Her main claim is that even though technology is omnipresent with the purpose of enriching our essential interactions whilst apart, in many cases it is technology that makes us feel alone even if we are collocated.

This view might be regarded as a dystopian one by many researchers; however, it was apparent within the academic families. As stated above, our purpose is not to take a stance in favor of technology use while apart or during reunion. We do not argue against the use of technologies that mediate separation or against having contact when separated. The main message of this paper is that there exist specific attributes of reunion that are influenced by technology-mediated separation and that it is important to consider those aspects when designing for transitioning families.

Our work does have certain limitations (e.g. in all cases it was the father that was separated from the family). In future work we intend to further explore opportunities for informing the design of communication technologies that do not only mediate family interactions but also help them appreciate and reflect on the importance of reunion. Inspired by Hollan and Stornetta [8], we envision technologies that go "beyond being there" and balance mediating essential interactions whilst separated with adding value to reunion.

CONCLUSION
The relationship between reunion and technology-mediated separation is important and complex. This paper investigates the nature of this relationship, within two diverse family cohorts, in order to map the different aspects of reunion that are influenced by technology-use whilst apart. We found that the nature of family interactions mediated through different communication channels does influence certain aspects of the reunion experience. These aspects are centered on the post-reunion phase and associate with the sharing of experiences when the family members are physically together but in preparation for yet another separation. The lack of experience sharing leads to a sentiment of *absence in presence* that was a concern for academic families. Our work extends current literature in that it provides empirical findings, which suggest there is a need to design technologies that not only support separation but also add value to reunion within periodically transitioning families.

ACKNOWLEDGEMENTS

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Publication 3:

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Workshop Summary | CHI 2013: Changing Perspectives, Paris, France

Exploring the Diversity of Families: Designing Technologies for the Contemporary Family Life

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Abstract
In recent years, the HCI community has expanded its interest to include exploring the role of technology within the domestic domain; particularly in the context of families and technology. Numerous studies have focused on mapping the challenges and opportunities faced in designing technologies that are appropriated to the needs of contemporary families. However, few research lines have focused on supporting families with diverse structures and situations (i.e. divorced, same-sex, dealing with death, work-related periodic separation and reunion). This workshop aims to bring together researchers, practitioners and designers who are interested in exploring the research space of family design and furthering our understanding of what it means to design technologies for diverse family structures. During the workshop we will readdress the meaning of a diverse family, the methods used to conduct family research as well as discuss design and evaluation techniques with a focus on user experience.

Keywords
Diverse families; technologies; design; user experience

ACM Classification Keywords
H.5.2 [Information Interfaces And Presentation] : User Interfaces – User centered design.

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Introduction

In recent years, the interest of the HCI community has broadened to include everyday domestic activities. Most of this focus has centered on the role of technology in family life and the social practices surrounding the interactions between family members when technological interventions are present. Numerous research lines have explored the role of technology in mediating essential interactions between parents or grandparents and children as well as between intimate couples [4,10,12]. Other studies have depicted the need to better understand the outcomes of technology use that go beyond the actual use of technology focusing on the experience that this use produces [2].

Even though these works have touched the surface for designing for the family there exist other dimensions of the contemporary family life that are ubiquitous yet underexplored. Diverse families encompass the many different forms of families that exist within contemporary society. We also recognize that while such families can be characterized as 'atypical' or 'alternative', we expect that a large portion of families will fall into one of these categories at one time or another. Examples of these family types include those separated by divorce, families that experience continuous transitions between being together and apart due to work-related reasons, foster and many-children families, same-sex and multi-cultural families, as well as families experiencing chronic illnesses.

Within HCI only very recently have different forms of these families and their relationship with technology been studied. Researchers have studied the role of communication technologies within divorced families (i.e. [14]) as well as the notion of understanding technology use within dynamic family structures or families

dealing with death [5,9]. Furthermore, the existence of numerous families that experience work-related separation has spurred the interest of research lines in exploring and designing for the parent-child interaction within these families [13]. Recent studies have also focused on how technology can be designed to support multi-cultural families [1] and to probe the understanding of social class related values that emerge when technology is used within this context [3]. At the same time, works like Turkle's [11] have noted the importance of taking into account the both the negative and positive influences of technology on the interpersonal relationships between family members. It is evident, therefore, that the current research on 'atypical' families and technology is still in the early stages and there exist numerous issues and challenges to be addressed.

Motivation and Topics of Interest

The proposed workshop aims to address the issues and challenges that arise when we design for diverse families. Our motivation stems from the desire to better understand the type of family related research that has been excluded from current HCI work and discuss how the HCI community could be more inclusive in family related research. We expect this workshop to extend the current research space on designing for the family by concentrating on the following topics of interest within diverse families:

Exploring the contemporary family
We aim to start the discussion by asking: what can a family look like? We hope that through understanding and exploring the range of families we will better ground our discussions throughout the course of the workshop, and also form a basis for future family dis-

cussions. Even though it is troublesome to create a family definition, it is, nevertheless, essential to explore what constitutes contemporary family life and have a shared and broadened understanding of what is encompassed before we engage within the space of family technology.

Supporting family needs
One of the roles of technology within the family domain is to support the needs of family members. Nascent work has depicted some ways with which technologies can support these different family forms, yet we have barely scratched the surface, and there are many more challenges that deserve to be discussed and reflected upon. These challenges could include but are not limited to:

- *Connection in the context of division*: For example, a parent may desire for their child to have contact with their separated spouse while avoiding contact himself or herself. What other challenges does technology create or solve for families that balance supporting connection in the midst of division?

- *Transitioning between being together and apart*: Separation may happen due to changes in employment, military service, or discovery of an illness. More generally this also occurs as children going off to college or aged parents move to a care home. How do technologies help or hinder in these times of transition?

- *Understanding the challenges that contemporary families face*: Jobs, health, and many other external circumstances can lead to a home life that looks very different than the traditional family image. What kinds of challenges do these families face? What should we consider when designing to support these families?

- *Balancing ethics*: How do we integrate respect and awareness into studies where the subjects are vulnerable due to family circumstances? Is it ethical to intervene at these times, and if so how can we proceed in a manner that limits further 'injury' to the participants?

Specific Issues to be addressed

In order to make sure that this one-day workshop will be of value to the participants we propose the following set of issues.

a) ***Defining the Space***: Definition of the contemporary family life with a focus on the diverse family forms. What are the attributes and characteristics of these types of families? How does this challenge our previous beliefs when designing for families? Although we do not expect to come to a definitive definition for "family", we do hope that through this discussion we will begin to represent the depth and breadth of what contemporary family life looks like.

b) ***Understanding and Designing***: Are the needs of the family members of diverse families addressed with the current technologies? What design considerations should we take into account? What do we need to consider prior to designing? Are there tensions that arise between designers and users? Through these questions and others we aim to critically examine the methods applied and how they can be appropriated in the context of contemporary families. Finally, another topic within this subset is the ethical considerations that we have to take into account when studying and designing for a diversity of families.

c) **Evaluation**: How can we evaluate family technologies within the context of diverse families? What are the best practices? How can we evaluate the technologies used when focused on the holistic and individual user experience? What about the ethical considerations which encompass the lives of these families and how can we take into account and reflect on the sensitive issues that arise when we evaluate the technologies in use?

This workshop builds on previous workshops held at CSCW 2008, GROUP 2010 as well as a SIG at CHI 2009 [6,7,8]. We hope for this workshop to be the first in a series at CHI exploring how the community can better understand diverse families into the design and evaluation process in thoughtful and meaningful ways.

Conclusions

This workshop aims to address questions arising within the practices surrounding the technology design and use in diverse family forms. We aim to attract researchers, designers and practitioners interested in the different aspects that encompass the contemporary family life and inform the design of technologies that are appropriated to the needs of contemporary families.

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Publication 4:

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Design-Led Inquiry for Mobile Lives

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Abstract
Mobile living and working has become a feature of everyday experience and interaction with others, mediated by digital, Internet-enabled technology. Such patterns of interaction in 'mobile lives' pose new opportunities and challenges for people and societies. We argue that *design-led inquiry* has a potentially transformative role to play in addressing these opportunities and challenges of mobile living and working, in future HCI research. This workshop aims to bring together design researchers and practitioners in an effort to critically explore the use of design-led inquiry within HCI research on mobile lives, for conceptual and empirical investigation, and for forms of stakeholder and partner engagement.

Author Keywords
Design-led inquiry; mobility; mobile living; mobile computing; interdisciplinary research; practice-based research

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction
Across the globe, patterns of living are changing in both industrialized and post-industrialized nations, as people

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migrate from rural to urban areas, or travel between places, connected to varying extents by digital, Internet-enabled technology [2]. Increasingly, people are living and working in mobile ways that require them to move and interact across regional and transnational borders [11]. Such 'mobile lives' [2], present opportunities and challenges for individuals to communicate and connect, and to participate in and sustain communities. The development and proliferation of communication technologies including mobile telephony addresses some of these challenges, and offers unique potential for those living mobile lives to be partially present in the lives of others; people may remain connected even though their mobility might transcend spatial, temporal and possibly even cultural boundaries [12].

The HCI community has shown significant interest in understanding how to design technologies that support the key challenges of people living and working at geographical distance from one another. Extant HCI studies have highlighted the significance of the mobile phone in affording communication alongside other interactions supported through rich channels (like video [9]) as well as in 'mediating closeness' and other important human needs [5,8]. In the context of mobile lives, other research efforts have explored the role of mobile technology in addressing the needs of people who are continuously on the move [11]. In their work on "extremely mobile people", Petersen et al. [10] for example, investigated the lives of business travellers and explicated the different notions of 'home' that were created as part of their lifestyle, as well as the opportunities that arose for mobile technology to be appropriated in their specific living/working contexts.   A common thread in this work is its focus on

communication, which eschews broader concerns of mobility in people's lives [2]. What it clearly demonstrates, however, is the *agency and transformative potential* of mediating designed artefacts like mobile phones to shape experiences of interaction in mobile living and working.

In our proposed workshop, we explicitly connect this design potential to the *processes* of doing HCI research on mobile lives. HCI is a field that has always engaged design practice in one form or another. The work of prototyping and innovating new technological concepts has previously leveraged engineering design, applied computing and, more recently with 'third wave' HCI [4], creative, arts-based design approaches [1,3,6,7]. Whilst design practice has traditionally been positioned as being responsive to research *outcomes*, more recently the HCI community has begun to reflect on what the potential research *contribution* of design practice could be, as a form of HCI inquiry [1,3,6,7,13]. In the context of investigating mobility, there is arguably significant scope for using design-led inquiry to establish and explore new directions for addressing key opportunities and challenges that relate to living a mobile life mediated by technology use.

This subject matter connects with processes of doing HCI research in another distinct way. HCI research teams investigating mobile lives may also engage team members, partners and stakeholders (including user communities) who – themselves – are living and working at geographical distance from one another or 'on the move' during the research engagement. In the workshop we therefore aim, in addition, to explore the potential value of design-led inquiry to foster and support

meaningful interaction between people invested in or doing HCI research about mobile lives.

This workshop will bring together design researchers and practitioners to critically and creatively explore the potential of design-led inquiry for supporting mobile lives, for conceptual and empirical investigation, and for forms of stakeholder and partner engagement. Specifically, the workshop will create a context for considering extant insights within the HCI community that relate to concepts of 'mobility', relating these to a design space of mobile living and working. Alongside the presentation of case study examples of completed or proposed project work, participants will engage in design activities to generate new perspectives and directions on mobile living.

Motivation and Topics of Interest
Our motivation for proposing this workshop stems from the desire to understand the currently underexplored spaces of mobile living and design-led inquiry to further discuss design-led visions and perspectives that could inform technology innovation for supporting mobile lives. We expect this one-day workshop to provide opportunities to further explore and extend this space, concentrating on the following topics of interest.

Constructing 'Mobility' and 'Mobile Living'
We will invite participants to reflect on their own interpretations of mobility and mobile living, in order to assemble comparative, diverse understandings. The workshop will start with a discussion around these concepts with participants presenting their understanding of mobility and mobile life grounded in their research and design activities, revealing the

potential opportunities and challenges of mobile living and working. Our intention is not to formalize definitions but to construct common ground, which can foster dialogue throughout the workshop.

Making design responses to mobile living and working
Our participants will engage in a series of design activities during the workshop, drawing upon the city of Seoul and on their own engagement with mobility (as conference *visitors* and *tourists*) as a backdrop for investigation. Conceptual design work conducted at the workshop will allow participants to tease out and further refine collective understandings of mobile living and to map the broader aspects of a design space around notions of mobile living and working.

'Capturing' Mobile Participants
Designed artefacts potentially offer a variety of forms of data collection and 'sensing' within research settings. This potential *agency* of such artefacts to provide discrete lenses on the research setting is of value when research populations are by their very nature 'hyper mobile' and therefore hard to reach using traditional techniques. We will discuss best practices, tools and techniques for the design and deployment of such *research objects* in design-led inquiry for mobile living.

Discussion Points
Following these topics of interest and in order to ensure that this one-day workshop will be of value to the participants we propose the following set of discussion points to be unpacked throughout the workshop.

1. What are the challenges and opportunities for mobile living and working, mediated by digital, Internet-enabled technology?

2. How may the *practices*, *processes* and *artefacts* of design-led inquiry contribute to HCI research on supporting mobile lives?
3. How may design-led inquiry foster and support dialogue and stakeholder engagement in HCI research teams investigating mobile lives?
4. And a closing provocation: Does the mobile phone solve all of our problems?

Summary

Mobile living and working has become a feature of everyday life, presenting both opportunities and challenges for interaction and connection with others around the world. In this proposed workshop, we invite HCI researchers and design practitioners to critically reflect on the design and use of digital, Internet-enabled technology to support and enrich mediated interaction in mobile lives, grounded in extant and proposed HCI work. Further to this, we seek to explore the potential value of design practices, processes and artefacts within HCI inquiry for developing new forms of engagement and investigation around mobile lives.

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