Designing Technology to Promote Play Between Parents and their Infant Children

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Abstract

Parents' interaction and engagement with young children is fundamental to their healthy development. Children whose parents interact and communicate more frequently exhibit greater school readiness, better language ability, higher grades, and the ability to make friends, guarding against negative outcomes across the lifespan, such as reduced employment prospects and lower mental health. While HCI research has recently begun to address important challenges in parent-child communication, these have focused predominantly on understanding how parents use technology while parenting. However, designing technology-based interventions to support communication practices in parenting young children is largely under-explored.

The research presented in this thesis investigates how technology can promote positive interaction between parents and their infant children, specifically those younger than three years old. This time of childhood is fundamental to healthy development as children progressively construct their understanding and knowledge of the world through their coordination of physical interaction with objects and their sensory experiences during this time. Play is especially crucial in this regard, being the primary method of communication between parent and child. Using three case studies, the thesis describes how I worked collaboratively with play specialists and parents to gain a rich understanding of parents' current play practices with their children, the challenges they face when seeking to engage with their children, and the barriers to this engagement; my approach to engaging parents in to a co-creative process to build an online resource to support their needs around play; and how the design of the technology builds on how parents currently play with their children, the frenetic nature of being a parent, and the need to leverage opportunities to play as they arise rather than pre-planned play experiences.

This research makes four contributions. It argues for parent-infant play to be a potentially important and viable area of research in the nascent HCI literature on parenthood. It provides a rich and detailed account of how parents' play with their children, highlighting novel uses of technology among numerous examples of communicative play. However, it also illustrates that many parents find it difficult to play with their children. Finally, it provides rich insights in to the complexities and challenges of conducting design research with parents of infant children and the importance of engaging organisations in such long-term design engagements.

Publications

McNaney, R., Balaam, M., **Marshall, K.**, Durrant, A., Read, J., Good, J. Robertson, J., & Abowd, G. (2013). Designing for and with children with special needs in multiple settings. *Proc. IDC '13*, 603-605.

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Chapter 1. Introduction

1.1   Overview

The principal concern of this thesis is the design of interactive technology to support parent-infant play. Play is fundamental to the healthy development of young children (Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004). Large strides can be made in terms of children's development of regulation, cognition, and sociality (Shonkoff & Phillips, 2000), skills that are crucial to their potential to flourish later in life (Seligman & Csikszentmihalyi, 2014). However, environmental stimulation is needed to foster this development and this is often provided through the everyday moments of play between parents and their infant children (Maccoby, 1992). When a parent plays with their child, they are providing a rich sensory environment for the infant to act upon, supporting their growth and development. Play enables the infant child to practice new skills, perform new roles, and experience their environment in a safe way (Axline, 1947). Evidence for this is provided by studies of children raised in institutional settings (Nelson et al., 2007). These illustrate that infant children need a stimulating environment created by consistent and close interaction with a loving caregiver to fully reach their developmental potential (Maccoby, 1992). Without this environment, children can experience developmental delay, which has the potential to negatively impact outcomes across the lifespan (Nelson et al., 2007).

The increasing ubiquity of digital technology has transformed the way parents care for their children, with many parents considering their smartphone to be the most crucial tool in their parenting repertoire (Gibson & Hanson, 2013). The story of Amy Webb illustrates the depth to which technology has pervaded in facets of parenting, detailing in an article how she and her husband chose their daughter's name in response to it being an available Gmail address and refused to post photographs of her daughter online, fearing it would create a digital footprint that could be interrogated by university admissions officers, potential employers, or even future dates (Webb, 2013). In response to this, human-computer interaction (HCI) and interaction design has begun to explore the various contributions that technology design can make to parenthood. This has seen accounts of parents' use of technology while caring for their children (Ammari & Schoenebeck, 2015), including the rules set for use when with their children (Hiniker et al., 2015) and use by children in the home (Hiniker et al., 2015). This significant body of work provides rich understandings of how parents actually use technology as part of their parenting practice. Further research has explored the design of a series of technology interventions to support a range of important tasks of parenthood. These have considered how to facilitate the tracking of health data

(Hayes, Cheng, Hirano, & Tang, 2014), monitoring of important developmental milestones (Suh, Porter, Hiniker, & Kientz, 2014), and enabling improved communication both in immediate conversation (Hwang et al., 2014) and when separated by distance (Yarosh, Tang, Mokashi, & Abowd, 2013). However, despite this varied approach to the design of digital technologies for parenthood, research and technology design for parent-infant play is underexplored in HCI.

The research presented in this thesis explores how digital technology may be designed to support parent-infant play. Prompted by recent interest in the design of interactions for toddlers (Hourcade, Mascher, Wu, & Pantoja, 2015), it is argued that play provides an avenue for HCI to make an important contribution to parenting practice. Therefore, I describe how I engaged in an experience-centred design process with parents, children, and service providers in three case studies situated in a children's hospital, children's centre, and the homes of the families involved. Through the first case study, I came to understand that parents can struggle to play with their children, with adults often providing play experiences devoid of the control and spontaneity that children natural engage in. Given the significance of play with parents for infant children, the second case study provided an in-depth experience-centred inquiry into parents play with infant children, and highlighted the ways parents play with their children, contributing a rich, detailed account of parents' play with their children. However, I also uncovered the difficulties many parents face when trying to play with their children, often finding play to be a challenging, uncomfortable experience. A lack of confidence in their own capabilities often resulted in parents seeking mentorship from other parents in the children's centre or in significant time wasted searching for ideas online at the expense of engaging the child in play. In response to these findings, I developed the concept of the *Digital Toybox*.

The *Digital Toybox* is a technology designed to probe the space of parent-infant play to better understand how HCI might support this fundamental aspect of parenting practice. It is an online platform that enables parents to create content documenting their favourite ideas for play, sharing this with other parents in their local community. It provides a space for parents to share knowledge and ideas, comment on the ideas of others, and find social support by connecting with other local parents with shared backgrounds and experiences. Content takes the form of a blog post, created by the parents, where they describe an activity and illustrate it with photographs or videos. Parents are invited to join the platform either through a local children's organisation or by invitation of an existing member of the platform. The *Digital Toybox* was deployed in a five-month evaluation period among 14 parents, which resulted in the collection of a rich multimodal dataset, unpicking parents' experiences, their

motivations for adopting the platform, experiences of use, and reasons for subsequent disengagement.

1.2 Research Questions

The research presented in this thesis explores the role of digital technology in promoting play between parents and their infant children. This thesis focuses specifically on the following research questions.

1) What is the current state of the art in design for parenthood in HCI?

The design of technology for parenthood is a new and largely underexplored area of research in HCI. Considering the nascent HCI literature on parenthood, I describe how research has mostly explored how parents use existing technologies while caring for young children, including setting rules around technology use. I outline how design studies have addressed how technology designs might support parents in specific application areas, such as monitoring health data, facilitating communication in non-traditional families, and tracking important developmental outcomes. To extend current understandings of parenthood in HCI, I argue that HCI ought to explore how technology designs can facilitate parent-infant play. This is prompted both by the importance of play with parent or caregiver to children's healthy development and recent studies exploring digital interactions for infants.

2) What constitutes parent-infant play?

There is little research in HCI exploring how parents play with their children, particularly infant children. I therefore explored how parents played with their children in a play session for parents and children less than 2-years-old. I provide a rich, detailed description of how parents play with their children, illustrating novel uses of technology to engage in communicative play, and contribute an experience-centred understanding of play. I also showed that, for many parents, playing with their children is not easy, with many suffering from an absence of confidence, resulting in lost time searching for ideas for play they could use with their child at the expense of playing with the child. However, I highlight how being present, engaged, and responsive to a child is more important than the form of play. I also discuss how the children's centre was a vital source of social support for the parents as they aimed to find ways to play with their child, with parents often mentoring each other and sharing ideas and knowledge throughout the session. Furthermore, I describe four design requirements for technologies to support parents to play with their infant children.

3) How can we support long-term participant engagement in socially-oriented HCI research and design?

The work described in this thesis responds to recent challenges in HCI for long-term, community-based design engagements among the HCI community, especially to address pressing societal issues. However, there remains little guidance on how we can actively involve parents, organisations, and institutions in these research and design engagements. The case studies presented here involved "doing something for" participants (Chapter 4 & 6) and "doing something with" participants and service providers (Chapter 5) and these resulted in very different outcomes. In the cases where I was designing for participants, there was a mismatch between the motivations of the service providers or participants and the offer of the design. Yet, when designing with service providers and users in Chapter 5, greater buy-in and responsibility for the research was illustrated. I also discuss how staff turnover negatively impacted the collaboration with this organisation in the second case study and advocate for a designing with approach that makes all stakeholders equal partners in the design process, better matching their motivations and may encourage organisations to take responsibility for these initiatives.

1.3   Thesis Structure

The research presented in this thesis is structured as follows. In Chapter 2, I introduce the developmental trajectories that children can experience in the first two years of life, discussing how this time can see significant growth in self-regulation, communication and learning, and socialization. I highlight how this potential is underpinned by the capability of the brain to rapidly form new connections as the children engage in a stimulating sensory environment that is provided by play with an adult or caregiver. The potential benefits of technology are then explored, including how it has been shown to increase confidence and sense of social support. The chapter concludes with a discussion of the existing HCI research addressing parenthood, arguing that while it is a significant, and growing, body of research, exploring how technology designs can facilitate parent-infant play would be a valuable contribution to the parenting practice.

Chapter 3 describes my approach to the research, justifying the choice of an experience-centred design approach given its potential to provide rich accounts of parents' and children's experiences of play, the use of narrative to engage with, understand, and design in response to the experience of others, and the vital role of empathy in understanding the experiences of others, even when personally unfamiliar with this experience.

In Chapter 4, I describe the deployment and evaluation of an interactive system in a children's hospital. I present an account of how children play with the system, the importance of control and spontaneity in this play, and the differences between children's play and play directed by a specialist, and illustrate that parents do not always know how to play with their children.

Chapter 5 details an in-depth, experience-centred inquiry in to parents' play practices with infant children, providing a rich account of how parents play with their children, the challenges they face when trying to do so, and their perceptions and use of technology.

Chapter 6 presents the findings of the deployment of the *Digital Toybox* with parents. This provides rich accounts of their motivations for adopting the platform, experiences of use, and how they subsequently disengaged with the platform.

Structured around the research questions, Chapter 7 discusses the findings of the work presented in this thesis and highlights avenues for potential future HCI and design research.

Chapter 2. Literature Review

2.1 Introduction

Parenthood is considered an immensely fun, rewarding, and enjoyable experience (Harwood, McLean, & Durkin, 2007), which is desired by many (Langdridge, Connolly, & Sheeran, 2000). While parents mostly expect impending parenthood to be accompanied by feelings of enjoyment, pleasure and excitement (Delmore-Ko, Pancer, Hunsberger, & Pratt, 2000), it can also be very challenging because it does not consist of positive experiences alone. Instead parents can face significant challenges including a loss of sleep, learning how to care for an infant, and significant disruption to their lifestyle (Feeney, Hohaus, Noller, & Alexander, 2001). Should parents' expectations be more positive than their subsequent experiences of parenthood, it has been associated with increased difficulty adjusting to parenthood, decreased marital satisfaction, and greater signs of depression (Matthey, Barnett, Ungerer, & Waters, 2000). In this situation, it may prove difficult for a parent to attend fully to their infant, potentially impeding their development across self-regulation, communication, learning, and social development (Kennedy, Landor, & Todd, 2011). Given the difficulties that many parents may face during the transition to parenthood, and the ubiquity of technology for young and new parents (BabyCenter, 2014; Gibson & Hanson, 2013), understanding how parents can be supported by technology is an emerging area of research within the HCI community.

This chapter identifies the key features of child development during the first two years of life. These aspects highlight the rapid development that children go through during this time and the significance of these changes to their long-term development, particularly in terms of their emotional development, control of attention and executive function, communication and learning, and making friends. These significant domains significantly predict the later-life outcomes of children, with children who do not develop appropriately in these skills suffering reduced later-life outcomes. Specific outcomes can include difficulties with language and social development, lower academic achievement and employment prospects, and increased potential for criminality (Law, Todd, Clark, Mroz, & Carr, 2013).

The importance of the first two years of life stems from the extensive neurological growth that children can potentially experience. Specifically, through every day experiences, children develop an increasing number of synapses, with repeated use strengthening a synapse. However, those that are not used on a regular basis cease to exist. This rapid neurological change requires appropriate environmental stimulus through everyday experience, provided by close interaction between children and caregivers. However, research

indicates that parent-child interaction, such as shared gaze, close physical contact, and talking during moments of play is of greatest importance to the child's development, beyond the interaction that occurs during daily care duties (Frost, 1998).

While HCI research into parenthood remains a relatively young but growing field, little of this has focused on supporting play between parents and their children despite the noted importance of moments of play between parents and their children. Instead, research has focused on parents use of technology while caring for their children on a daily basis, ease of access to a wealth of information, or supporting different ways of maintaining communication, record keeping, memory making, and language development. Consequently, this chapter maps out a space for HCI research to explore how digital technologies might be used to support parents to play with their children with the aim of fostering healthy development.

2.2   Developmental Trajectories During the Early Years of Life

From birth to early adolescence (age 9-13), children go through a rapid development. For children towards the older range of this spectrum, development is a time fraught with both difficulty and opportunity (Steinberg, 2005). Piaget (1957) argued that children become capable of logical thought and able to understand and analyse things in their heads rather than by acting them out. During this time, children may be particularly vulnerable to the different maturation timetables of their developing brain and behavioural and cognitive systems (Steinberg, 2005). While parents still have a crucial role to support their children's development at this stage of life, play mostly focuses on peers who they can learn from, model, and who will support their development (Fischer, 1980). Therefore, parents play a less crucial role in the development of children in the early adolescence stage.

Young children require a greater degree of support from and interaction with a primary caregiver. During what Piaget (1957) termed the pre-operational stage (ages 2 – 7), children become able to use symbolic thinking. However, children struggle to take on any perspective other than their own during this time, with research suggest the ability to adapt to others' perspectives comes around age 5 (Whiteside, Bush, & Horner, 1976). The latter part of the pre-operational stage exhibits a shift towards more co-operative play both with parents and peers (Whiteside, Bush, & Horner, 1976). However, during this stage, responsibility for the child's development is shared among child, parent and caregivers, and peers.

Primarily, this thesis focuses on the first two years of life as these are among the most crucial contributors to children's healthy development. Research suggests that during this period, the capacity to self-regulate emerges (Shonkoff & Phillips, 2000), which underpins

children's socialization and development of cognition, language, and control (Kopp, 1982, 2000). Delay in children's socialization and developmental capacities has been shown to have significant impact on later-life outcomes, such as school readiness, academic achievement and even employment prospects and likelihood of engaging in criminal behavior (Shonkoff & Phillips, 2000). In the following section, we sketch the developmental trajectories of children in the first two years of life and emphasise how this development can only emerge as part of an interactional process with caregivers and parents (Kopp, 1982). Consequently, this review explores how young children develop and the role of play with parents in this.

2.2.1 *Self-regulation*

Many researchers conceptualise development as the infant's growing capacity for self-regulation, evidenced by the child's growing comfort to function independently (Bronson, 2000; Kopp, 2000) and consider it one of the most significant aspects of the development of a young child (Flavell, 1977). Self-regulation refers to the ability to follow instruction from caregivers and monitor one's own behavior (Shonkoff & Phillips, 2000), requiring awareness of behaviours that fit within social norms (Kopp, 1982). While self-regulation research has mostly focused on older children and adults (Mischel & Patterson, 1979), researchers argue that it is vital in early development due to its potential importance in the transition from sensorimotor cognitive function to more reflective thought and social interaction (Kopp, 1982). The development of self-regulation occurs as a gradual process during the second year of life, as children slowly become aware of the contexts within which they find themselves and adjust their own behavior accordingly (Bronson, 2000; Kopp, 1982, 2000). This occurs as children are socialized by their parents or caregivers, and from this interaction, self-regulation begins to emerge and develop (Kopp, 1982).

While the development of regulation is effected by individual characteristics, it is also deeply embedded in the infant's relations with others, such as parents or caregivers (Blair, 2002; Shonkoff & Phillips, 2000). In the earliest days of life, the parent attempts to establish the regulatory connection with the infant, which is not always an easy task (Shonkoff & Phillips, 2000). This requires appropriate and consistent responses to the infants' signals (Bernier, Carlson, & Whipple, 2010), meaning the parent must be able to know what their baby wants and respond in a way that is useful, requiring knowledge, energy, and appropriate resources (Shonkoff & Phillips, 2000). The importance of parents' role in this process is supported through a significant body of research on child-rearing environments characterized by deprivation, neglect or abuse (Chunagi et al., 2001; Curtis & Cicchetti, 2007; Marshall & Fox, 2004), which suggest that such environments negatively impact brain development of

infants (DeBellis, 2001; Rutter et al., 2004).

2.2.2   *Emotional self-regulation*

Emotions are central to human life (Westphal & Bonanno, 2004), helping people to respond to opportunities and challenges in their environments (Levenson, 1994; Nesse, 1990) and cope with any difficulties that arise (Westphal & Bonanno, 2004). Emotional development in early childhood lays the foundation for the adults' wellbeing later in life (Shonkof & Phillips, 2000). Developing emotional self-regulation skills during childhood leads to children who are less distractible and more positive and moderate in their emotions, with research indicating they are easier to teach and reach higher levels academically (Keogh, 1992). The regulation of emotions is considered to be as important as levels of intelligence to school readiness and academic achievement. A significant body of research has shown a clear association between motivation and self-regulation and academic achievement (Gottfried, 1990; Skinner, Zimmer-Gembeck, & Connell, 1998), where time spent studying or working at academic activities results in higher achievement (Greenwood, 1991). This is considered to hold true in both regular and special educational settings (Blair, 2002). Emotions are also relational (Emde, 1987, 1998) meaning they emerge from relationships and provide the basis for attachment, social interaction, and both prosocial and antisocial encounters across the lifespan (Emde, 1987, 1998; Izard, 1991).

Parents play a crucial role in how children understand, respond to, and express emotions (Gottman et al., 1997), with emotional experience organized during the early childhood years (Emde et al., 1993). Young children face diverse emotional experiences at home during the first years of their life and are supported to understand and manage them by their caregiver (Shonkoff & Phillips, 2000). In homes experiencing emotional turmoil, such as marital dysfunction (Lieberman & Van Horn, 1998), negative parent-child interactions (VIG), or parental depression (Dawson et al., 1994), children must face confusing emotional experiences. Research has found that children who are raised in such environments experience difficulties with emotion regulation and, potentially, develop disorders of emotion (Shonkoff & Phillips, 2000). Similarly, parent-child relationships that are seriously unattuned can result in young children displaying severe conduct problems (Shaw et al., 1994, 1996). Given that children are born completely reliant on their caregivers, negative experiences in early childhood can significantly impact child development and, ultimately, undermine their wellbeing as adults (Shonkoff & Phillips, 2000).

Children significantly develop their capacity for emotional self-regulation during the first two years (Rothbart, Ziaie, & O'Boyle, 1992) through interaction with parents or

caregivers who support socializing emotion regulation and gradually giving control to the child (Blair, 2002). At first parents soothe a crying child by structuring an organized, predictable daily routine as a way to help the infant begin to understand and deal with their emotions. Caregivers also support the growing child as he or she attempts to engage in emotion regulation, including dealing with frustration when attempting a task beyond their capability or learning turn-taking (Thompson, 1990). Furthermore, the development of emotion self-regulation is supported by the young child's confidence in the security and confidence provided by the relationship with the caregiver (Cassidy, 1994, 1995).

2.2.3 *Self-regulation of attention and executive function*

Similarly, children also learn to self-regulate the sills of executive functioning, with precursors of these skills being studied in infancy (Welsh & Pennington, 1988). Executive function refers to the ability to a variety of related skills that are important for purposeful activity (Shallice, 1982). Research indicates that executive function may improve in conjunction with the development of the frontal lobe during infancy (Anderson, 1998). Early frontal lobe dysfunction is considered related to deficits in executive function (Benton, 1991). Furthermore, research has found that six-week-old infants can form expectations anticipate the location of pictures that are appearing and disappearing from predictable locations at predictable times by moving their eyes to the predicted location before the picture appears (Haith et al., 1988). This improves as the child grows and becomes consistent around age 4 months (Johnson et al., 1991) and does not develop further until 10 months (Posner et al., 1997). By age 18 months, the young child is able to anticipate ambiguous actions that are influenced by context (Posner et al., 1997). Young children also develop self-control in infancy, such as complying with a request, ceasing an activity, and adjusting behaviour based on social norms (Kopp, 1982). This self-control develops further, becoming more reflective form of regulation by age 30 months. While less is known about how parents impact the development of self-regulation of attention, studies have indicated that it can be amenable to environmental influence (Borkowski & Burke, 1996; Graham & Harris, 1996), suggesting parents may play a role in its development.

Deficits in executive function have been linked to children having problems in school (Shonkoff & Phillips, 2000). For example, children struggling with executive function may struggle to plan and organize new actions, reflect and build upon past experience and maintain attention (Lyon, 1996). Similarly, such planning skills and reflective thought are important components of social interaction and deficits in executive function may limit an individual's ability to make new friends or achieve social goals (Goodnow, 1987). As Rubin

and Krasnor (1986) indicate, problem-solving is an important component of social interaction, as people negotiate unpredictable others and competing goals. Difficulties identifying problems, generating strategies to overcome these, and being flexible to deal with the challenges that arise may hinder an individuals social competence (Rubin & Krasnor, 1986). This is particularly challenging for young children (Shonkoff & Phillips, 2000).

2.2.4 *Communication and learning*

Children's communication and learning are important components of child development as they can significantly influence school performance (Shonkoff & Phillips, 2000). Stipek (2001) argues that children's early academic performance is a crucial predictor of children's experience of school and behavioral and performance outcomes later in life. If a child does not complete high school, there is a significantly greater chance that they will experience a set of negative outcomes such as substance abuse, unemployment, welfare dependency, and crime (Hinshaw, 1992; Rutter et al., 1998). Research indicates that there is a significant link between education performance in adolescence and a child's readiness at school entry (Chen et al., 1996; Cunningham & Stankovich, 1997), though this can be corrected with appropriate early intervention (Schulman et al., 1999). Furthermore, children's school readiness can be traced back to children's capabilities developed during infancy and early childhood and the experiences at home through which they develop (Shonkoff & Phillips, 2000). The cognitive skills of children at preschool age are strongly associated with those in primary and high school (Stevenson & Newman, 1986) and can also predict the completion of high school (Brooks-Gunn et al., 1993).

Similarly, the development of children's language and communication ability during the first two years of life is a very significant milestone. A child produces their first word between ages 10 and 15 months and develops an increasingly complex understanding of morphology and syntax (Shonkoff & Phillips, 2000). Carey (1978) reports that by 18-months-old, a child learns 9 new words a day on average and begins to produce two-word strings. This continues until children are able to talk in full sentences by age 3 years. While the majority of children learn to communicate in the first few years of life, this is not always the case (Law et al., 2013). Early-life language delay is defined as when the language skills of a child are developing significantly more slowly than expected (Hart & Risley, 1995). Language delay can result in a child being slower to start to use words than other children and, later, slower to put simple sentences together (Law et al., 2013). This effect can continue as children begin school and is one of the leading factors of children being unprepared for school. Specifically, this can hinder reading skills, classroom performance, and the ability to

socialize and make friends (Roulstone et al., 2010). Language delay has also been found to have negative outcomes across the lifespan, including diverse outcomes ranging from employment prospects to mental health (Roulstone et al., 2010). Parental engagement in children's language development can, potentially, prevent the onset of language delay and support healthy development. For example, children whose parents interacted and communicated more with them showed increased symbolic thought, which is understood to be a crucial aspect of language development (Hart & Risley, 1995). They found that parents using more unique words when talking with a young child positively impacted their language development. It has also been noted that language delay is more likely to occur if a child's parent belongs to a less privileged socioeconomic background, as this has been suggested to influence the number of unique words a child may hear (Law et al., 2013).

Infancy and early childhood is also a period of intense cognitive development and learning for children, with complex human reasoning based in childhood experiences where children seek to make sense of the world around them on a variety of levels (Shonkoff & Phillips, 2000). For example, Meltzoff and Moore (1989) report that infants less than one-month-old are able to imitate the gestures of others even after they are no longer in view. Similarly, around age 9-12 months, infants learn new behaviours by observing others do similar tasks (Mandler & McDonough, 1995). Furthermore, research indicates that children become aware of the physical properties of objects after 6-months-old (Baillargeon et al., 1995), recognizing that an object falls if nothing supports it (Shonkoff & Phillips, 2000) Infants are also able to distinguish causal relations between objects (Leslie & Keeble, 1987) and accidental from intentional actions (Oakes & Cohen, 1990) during the first two years of life. While this is not an exhaustive list of the cognitive developments experienced by children during their first two years, it is indicative of the immense growth children experience at this time. The young child achieves this by learning from others, understanding the goals of their intended actions and attempting to mimic their strategies to reach the same goal (Tomasello, 2000).

The preceding paragraph illustrates some of the cognitive developments children can experience in the first two years of life. Children learn and develop these through an active engagement with the world around them and when they receive responses from caregivers and others that are predictable and can be enmeshed in to their schemas (Shonkoff & Phillips, 2000). While the majority of research in the earliest years focuses on identifying patterns, studies of school age children indicate differences in cognitive development that may occur during infancy and early childhood. For example, Gobbo and Chi (1986) suggest that while all children arrive at school able to organize or categorise objects, it is only when a child has

been exposed to subject-specific knowledge that they can categorise in greater detail. Similarly, executive function also illustrates potential individual differences. Some children arrive at school more capable of the forethought, planning and organising required for executive function, which can result in problems both in school and beyond (Douglas, 1980), limiting their potential intellectual growth and development as problem solvers (Shonkoff & Philiips, 2000). This suggests that the early environment that young children are exposed to can significantly impact their development of cognition.

2.2.5 *Making friends*

Connecting with others and establishing relationships is also a prominent development of early childhood (Shonkoff & Phillips, 2000) and one which is of the utmost importance to the child itself, providing the mirror through which the child evaluates self-worth, competence, and how they view the world (Harter, 1982; Ladd & Price, 1986). However, as Howes and Matheson (1992) note, the skills required to make and keep friends are very taxing of the developing cognitive and emotional capacities of the child. While the majority of research on problematic peer relations has mostly focused on school-age children (Webster-Stratton, 1990), difficulties with social interaction can be identified during infancy and early childhood (Shonkoff). Eckerman (1979) identified that the sight of other infants can excite babies at age 2 months. Other research suggests that at between the age of 6 months and 9 months, babies will attempt to gain the attention of other infants (Hay et al., 1982), with babies beginning to imitate each other between 9 and 12 months (Mueller & Silberman, 1989). In the second year of life, peer interaction becomes far more complex, witnessing longer communication. They exhibit aspects of turn-taking, reciprocal mimicry (DiLalla & Watson, 1988), aspects of the foundation of coordinated play (Howes, 1992). Language plays a crucial role in this, with children who can better communicate being able to more easily play together (Mueller, 1972).

This kind of play can be particularly difficult for very young children, as distractions or interruptions can bring the children out of their play pattern (Shonkoff & Phillips, 2000). Consequently, adults play an important role in structuring and providing opportunities for young children to make friends and connect with peers (Howes & Unger, 1989). The child's developing cognitive skills are also important to the growth of a child's ability to make friends. It is important that a child can plan and execute actions or behaviours (Shonkoff & Phillips, 2000) and young children also find it particularly valuable to play with the children they play with often (Howes, 1996), especially when the children are compatible both cognitively and emotionally (Rubin et al., 1994). When children play together, conflict sometimes arises (Brown & Bronwell, 1990). However, theories of peer relations posit that

conflict is an important, positive source of children's development (Hartrup, 1996; Piaget, 1932; Vygotsky, 1978). This causes the child to recognize that there is a problem and to develop an effective solution to resume playing (Shonkoff & Phillips, 2000). When conflict happens among friends, children attempt to find a compromise to continue playing (Hartrup & Laursen, 1993), an important aspect of appropriate social behaviour (Shonkoff). Parental influence is central to establishing competent peer behaviour. Research indicates that children who do succeed in establishing appropriate peer relations are likely to have secure relationships with their parents (Kennedy, Landor, & Todd, 2011). Their parents are also likely to see their role as crucial in facilitating their children's social relationships, creating opportunities for peer interaction for their children, developing their skills of observation and positive and constructive attitudes (Shonkoff & Phillips, 2000)

2.2.6 *Neurological underpinnings of development in the first two years*

The first two years of life are a period of significant growth and development of a child's brain, during which the neural pathways are formed that will determine intellectual capabilities across the lifespan. The early foundational work of Jean Piaget (1952) suggested that children actively construct their understanding of the world by interacting with the world around them. Specifically, he suggested that children form schemas of the world around them, which are cognitive structures used to make sense of, and act on, the world. These schemas develop through continuous use and are broadened through the process of accommodation, where children adapt their existing schemas to integrate new information that they may not have previously known. Therefore, exposure to a variety of new experiences leads to more developed schemas and an increased rate of development. This remarkable insight has gained credence from advances in neuroimaging technology, where it has been found that children's brains undergo rapid development in the earliest years of life (Frost, 1998). A baby is born with significantly more neurons and synapses than required, with most surplus neurons disappearing shortly after birth (Frost, 1998). During the first three years, synapses, the connections between neurons, have been shown to develop rapidly, with the number of neurons remaining consistent (Shore, 1997). By age three, children have almost twice as many synapses as an adult and their brains are 2.5 times as active (Shore, 1997). Similar to Piaget's (1952) understanding of the development of schemas, synapses require constant use through every day experiences to grow and those that are under-utilised are discarded throughout childhood (Frost, 1998). Therefore, neuroimaging research suggests that children are born with a significant number of neurons that are awaiting programming through the formation and development of synapses. The increasing formation and repetition of synapses

increases neural development, leading to increasingly complex neural pathways, which underpin children's intellectual capabilities across the lifespan (Frost, 1998). Research exploring the impact of deprivation on cognitive development supports this, with young children placed in institutional care exhibiting markedly less cognitive development at age 54 months than children who had been moved in to foster care (Nelson III et al., 2007). This work highlights the importance of the daily experiences of infant children and also the sensitivity of early years for children's cognitive development (Nelson III et al., 2007).

2.3   Parenthood and Play

Parenting can often be a challenging experience for many new parents (Ahlborg & Strandmark, 2001). Research shows that while being a parent is highly rewarding, it is also an overwhelming experience for both mothers and fathers. Parents found this new world to be very demanding and one that significantly challenged their confidence in their own abilities, with fears of not achieving closeness to their child being a primary concern (Nystrom & Ohrling, 2004). Play is a crucial aspect of parenthood and the mechanism through which parents establish a relationship with their child, bond, and support their development (Shonkoff & Phillips, 2000). Children's development occurs through the opportunities for interaction provided by parents playing with their infant on a day-to-day basis (Ginsburg, 2007). This section begins by defining what we mean by play, critically examines the value of play for the developing child, and discusses the types of play that ought to be supported to facilitate healthy development.

2.3.1   *Defining parent-infant play*

The value of play for young children has been well established through the field of play therapy (Axline, 2013). In this field, play is a useful way to develop the client-therapist relationship as play provides a mechanism for the child to become more comfortable with a therapist than traditional taking therapies may allow. It is also valuable in cases when a child may either be lacking capability to verbally communicate or when it is too difficult for the child to speak directly with the therapist (Axline, 2013). However, play therapy does not necessarily value specific aspects of play. Instead it is simply about building a rapport with the child, establishing a therapeutic relationship and creating the space within which a child feels comfortable to talk or share some problems they are facing. For example, Axline (1950) provides vignettes from her therapeutic sessions with specific children. In one case, a child is colouring on some paper when she suddenly reaches over to take some crayons from another boy in the room, despite already having the same colours. During this time, the therapist is

simply there with her, establishing rapport as she draws on the paper, and giving her time and space to think and talk, if she wishes. This leads to the child reflecting on why she wanted to take those crayons, acknowledging that she had the same colours as the other boy, suggesting that she only took them because she wanted them. This provides a platform from which the play therapist can begin to explore the problems facing the child in more detail. As Landreth (2012) argues, play therapy is the art of the relationship.

However, parent-infant play has significant benefits beyond simply establishing a relationship and these are best illustrated by a comparison with parent-child interaction more generally. Research has shown that there is a significant difference between the impact of the normal duties of care during motherhood on children's development when compared to moments of play (Clarke-Stewart, 1973). This research suggests little difference between the physical actions in normal parenting duties and moments of play, especially with infants, but argues that when a child is ready to play and a parent engages, this accelerates the child's development. For example, a mother feeding her baby will engage in eye contact, shared gaze, close physical contact, and verbal interaction. Similarly, when playing with their child, a parent will also engage in these physical and verbal activities. Yet deprivation studies show that the same development is not experienced in both situations (Chisholm, 1998). Instead, children's development is rapidly fired by a parent engaging in play when it is initiated by the child (Ansell, 2016; Clarke-Stewart, 1973).

This suggests an initial definition of an opening definition of play which guides the research contained in this thesis. It suggests that the actions of play are similar to the normal moments of parenting, including close physical contact, shared gaze, eye contact, and vocal interaction. However, difference resides in that it is initiated by the child indicating he or she is ready to play and built upon by the parent understanding this cue and beginning to engage in those actions (Clarke-Stewart, 1973).

2.3.2 *Play providing the opportunities needed for growth and development*

There is a long history that suggests parental play has an important impact on children's healthy development (Sutton-Smith, 1993). Early studies of institutional environments for children suggested that children raised separate to their mother showed slower development (Bakwin, 1942; Spitz, 1946; Spitz & Wolf, 1946). While these early studies did not illustrate the specific cause of this developmental delay, they did suggest that children's development did not solely require the satisfaction of needs for warmth, food, and hygiene (Clarke-Stewart, 1973). Studies would suggest that social, language and intellectual development require stimulation beyond institutional provisions (Provence & Lipton, 1962; Schenk-Danzinger,

1961). Research has also shown that manipulating aspects of maternal care, such as adjusting feeding times, have not explained this impact on children's development (Ainsworth & Bell, 1969; Clarke-Stewart, 1973). Similarly, the total amount of contact between mother and child does not critically mediated children's healthy development (Schaffer & Emerson, 1964). This highlights that the most significant impact parents can have, on their child's development and later-life intellectual capabilities, are more complex than attending to their child alone (Clarke-Stewart, 1973).

Despite not being a point of interest initially for this research, mothers' play with their children increasingly came to prominence as a potentially significant variable in children's healthy development (Sutton-Smith, 1993). These studies indicated that mothers' contingent responses to a baby starting to coo and smile reinforced this behavior (Beckwith, 1971; Yarrow et al., 1971). Similarly, maintaining the baby's attention required the parent to copy his or her behavior and respond in novel ways, with the stimulation provided by mothers' more important during times of play than during normal caretaking activities (Clarke-Stewart, 1973). This has lead researchers to suggest that it is moments of play that are most crucial to children's development rather than regular aspects of caretaking (Sutton-Smith, 1993).

Research has also indicated the ways in which parental play with infants leads to the development of particular skills and abilities. For example, Bruner and Sherwood (1976) richly describe the stages through which a one-year-old child can learn to play peekaboo with their parent. The infant observes, learns from, and matches the actions of the parent, learning how to play peekaboo. This illustrates the increasing social synchrony between parent and child (Sutton-Smith, 1993) and the infant's transition from passive recipient of play to a more active participant (Ross & Kay, 1980). Evidence for the utility of play to development is provided by studies which show the infant exhibiting object constancy that extends their ability when not engaged in play (Hodapp, Goldfield, & Boyatzis, 1984). Other studies have shown that parents can teach their children how to pretend during the first years of life (Haight & Miller,) and that, in other cultures, siblings teach infant the same capacities for pretence (Farer, 1993).

There is significant empirical evidence of the benefits of play to children's development. This illustrates that play is more important to long-term outcomes of maturity, such as intelligence and academic performance, than interaction that occurs during parent caregiving (Andrews et al., 1982; Bornstein, 1989; Levenstein, 1970, 1993; Slaughter, 1983). It is also an important part of the socialization process for many children, with Fein (1986) reporting that play gives children an opportunity to mimic the behavior of others, adapting their own viewpoints with those of others, and learning appropriate social norms and

behaviours. It enables children to express unacceptable feelings in acceptable ways and provides a safe space for them to work through negative feelings (Fein & Schwartz, 1986; Hendrick, 1986; Sutton-Smith, 1986). Furthermore, research supports play as a mechanism to enhance language and cognitive development (Hart & Risley, 1995; Law, Todd, Clark, Mroz, & Carr, 20213; Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004). This work has illustrated that when parents engage parents supportive parenting positively predicted children's performance on measures of language and cognition (Tamis-LeMonda et al., 2004). Children whose parents interacted and communicated more with them in play showed increased symbolic thought, which is understood to be a crucial aspect of language development. Specifically, (Hart & Risley, 1995) found that parents using more unique words when interacting with a young child positively impacted their language development. Studies also highlight the importance of greater parental playfulness with infant children as a predictor of superior attachment between parents and their children (Beckwith, 1986). Finally, Gottfried and Caldwell (1986) illustrate that greater availability and use of appropriate toys during parental play is related to increased development during childhood.

2.4   Potential Benefits of Technology for Parents

Health professionals have long identified the Internet as an advantageous medium for promoting parenting skills (Lamp & Howard, 1999). Online parenting forums provide a space where parents can come together, anonymously seek advice without fear of being judged, and share in the experiences of others who have gone through similar before (O'Connor & Madge, 2004). The potential to be anonymous and speak candidly was especially valued by many parents, being able to pose questions and seek answers that they may have been uncomfortable asking a health professional for (O'Connor & Madge, 2004), receiving responses that either indicated support and help from others or similar experiences being shared by parents. Specifically, an analysis of the types of content posted on parenting sites found that one third of the posts were direct expressions of support. Three quarters of the posts contained shared personal experience, with parents reporting that they felt comfort and support from reading others' posts (Brady & Guerin, 2010). These sources of advice or support increased parents' confidence in their own ability either by providing viable ideas or by illustrating that they were not doing something wrong and that other parents also had the same challenges they were currently facing. Knowing that they were not the first person to experience a particular problem or were not doing something wrong was important to their sense of competence in their own ability and empowered them as parents (Madge & O'Connor, 2006).

It has also been suggested that the parenting forums may be of most advantage to parents of lower socioeconomic status or those in less traditional family relationships as an accessible tool that provides general support to people in a parenting role (Dunham et al., 1998; Sarkadi & Bremberg, 2005). A study of single mothers with access to an Internet parenting forum found that those who regularly used the forum showed lower levels of parenting stress compared to those who did not regularly use the site (Dunham et al., 1998). In an analysis of the use of Sweden's largest online parenting forum, it was found that parents who were less educated, living as a single parent with their child, or from the lowest income levels found good support from the site, with the researchers suggesting that they may have felt little support from elsewhere but found some support on the forum (Sarkadi & Bremberg, 2005). Similar findings have also been reported about social media use and blogging by stay-at-home fathers or fathers who were raised alone by their mothers (Ammari & Schoenebeck, 2015). Fatherhood forums and groups enabled fathers to find support from others in a similar situation or identify and interact with potential mentors who could provide advice and share experience. However, to receive most benefit form such sites, it is important that parents actively contribute both as providers and seekers of information and advice (Sarkadi & Bremberg, 2005).

Belsky (1984) identifies the contextual sources of support available to parents as one of three major determinants of parenting. This research argues that parents can gather resources and ideas through face-to-face interaction with other parents or with family and friends. Research suggests that digital technology can also be a powerful facilitator of this social support, connection, and capital (Bartholomew et al., 2012). This study explored new parents Facebook use using a social capital perspective. A survey of 154 mothers and 150 fathers found that, despite the new responsibilities and the constraints of a new baby, new parents continue to use Facebook, with the majority of new mothers and fathers visiting Facebook once a day and managing content once a month. Specifically, mothers reported using Facebook more than fathers during the transition to parenthood. The researchers suggest that use of Facebook may be important in the acquisition of social capital and social support, with parents reporting that they perceive themselves to be posting more photographs after birth, potentially as a way to draw family and friends closer to them. Furthermore, better parental adjustment was reported when mother's friends' networks were family or relatives and when fathers connected with real life friends through Facebook. Other research has examined how blogging and social networking can impact feelings of connection and social support (McDaniel, Coyne, & Holmes, 2011). The study involved 157 new mothers being surveyed on their media use and their wellbeing. The results indicate that mothers spend on

average approximately 3 hours per day mostly on the Internet. Social media was the most prominent activity, with some of the mothers reporting blogging. 86% of respondents identified regular blogging as an important way to stay connected to family and friends and positively impact feelings of social support and connection.

2.5   HCI Research Exploring Technology and Parenthood

The majority of the work discussed in the previous section was conducted before smartphones, tablets, and wireless connectivity became so prevalent. This shift is likely to have had a significant impact on how parents use technology during their parenting practice, with many parents considering it a vital lifeline in their parenting practices while caring for a young child (Gibson & Hanson, 2013). Research in the HCI and interaction design community has begun to look at parents' and families' relationship with technology and how that influences their parenting and home life. This section begins with a review of how parents use technology in their parenting practice, followed by a discussion of how parents' and families negotiate technology use in their home and with their children. This will be followed by a review of research that has explored the design and evaluation of technologies designed to support parents in diverse ways, including in record keeping, tracking health data, and communication

2.5.1   *Technology use when caring for a young child*

Parents' use of technology when caring for their children on a daily basis has also become of significant concern to the HCI community and this research indicates that it has become a crucial source of support to parents in their parenting practice (Gibson & Hanson, 2013). This was an ethnographic study conducted in five parent and child community-based groups, with the study being conducted during the lead researcher's maternity leave. This resulted in the researcher attending the group as a new parent, leading to a rapport developing between the researcher and participant based on their shared experiences of pregnancy, child birth and motherhood. The study consisted of two parts; a series of ethnographic observations supplemented by interviews with participants, and lasted approximately eight months. Observations were conducted in the parent and child groups. Parents attending the group had infants under one year old and the groups provided a space where parents could come together with their babies, meet new people with similar experiences, and find support. The observational segment of the study was supplemented by six personal interviews with mothers who had a baby within the previous 12 months. The interviews lasted for approximately one hour and were conducted in a neutral venue. Interviews were informed by preliminary

analysis of the observational data, with these presented to the participants and subsequently discussed in terms of whether this is something they have experienced in their own lives. Data was analysed using a constant comparative approach.

It was found that new mothers use technology to improve their confidence as a mother and to develop their identity beyond that of a mother. In line with previous health and social sciences research discussed above (e.g. McDaniels, Coyne, & Holmes, 2011), the parents used the Internet to find parenting-related information, such as stages of development or to answer any health or feeding concerns they might have. This proved especially useful as a space to ask what they considered embarrassing or silly questions that they may be reluctant to ask in person. Dedicated parenting forums were useful for this, providing instant access to answers or even illustrating that they are not alone in facing this problem. This provides significant reassurance to those who may be unsure of what they are doing and realise that others have faced and overcome similar issues. However, such forums are mostly designed for use o a PC or laptop and the mothers preferred to use their smartphones, given that they could use it one-handed while attending to their baby with their free hand. Facebook was considered particularly useful in this context as a space where they could receive support and advice and one that was easily accessible using their smartphone. With many mothers reporting difficulties in finding free community-based support groups that they could attend with their baby, access to social support through Facebook proved increasingly important. Technology was also an important aspect of parenting practice for the mothers, such as writing a blog to keep family updated and reduce the disruption of them needing to contact her directly for updates. Others used a Google document or twitter to record feeding, naps, and nappy changes. While the vast majority of mothers had a smartphone, only 12% reported downloading a mobile application designed to support aspects of parenting.

Similarly, technology played a crucial role in supporting the mothers to re-assert or re-establish their identity, as beyond being a mother. They often used social media sites to share aspects of their own personality and preferred not to simply share updates of their baby or photographs of their baby. Blogging was also an important aspect of this identity assertion, with two of the mothers writing blogs that focused on their own journey and not serving to simply chart and share their child's development. However, it was through facilitating contact and connection with others and the world outside their home that technology was most useful. In particular, technologies like Facebook or email that did not require immediate replies but instead support asynchronous communication proved most useful. It allows the mothers to send a message to a friend and they can respond when they are able to. Similarly, being able to browse other people's social media posts led to a feeling of connection with others or to

read news and remain up-to-date about current affairs were crucial to mothers feeling part of a world beyond their baby. This would often take the form of browsing social media or news sites during the middle of the night while feeding their baby. Many of the mothers also used this time to do some shopping, whether groceries or for gifts, leading to a feeling of productivity.

While this study particularly highlighted the potential of technology to new mothers to assert their identity as more than a mother, other research has found that many mothers use social media to assert their identity as a mother and receive validation for good mothering (Kumar & Schoenebeck, 2015). Semi-structured interviews were conducted with 22 new mothers, exploring the types of baby pictures new mothers share on Facebook and the factors that influence decisions to share. Participants were recruited through local daycare or wellness centres, online local meetup groups, and a local university graduate group. 19 of the participants were first time mothers and had one child under the age of 2. Interviews lasted for about one hour, with 9 conducted face-to-face, 11 over the phone, and Skype being used on two occasions. Three of the face-to-face interviews were conducted in-home and four had babies present. Participants logged in to their Facebook profile at the beginning of the interview and referred to it through out the interview process. Interview questions focused on gathering demographic information initially before exploring participants' use of Facebook and experiences of viewing posts or content about babies on the social network. The participants experiences with photos they had taken, shared or removed were then explored, followed by questions relating to their attitudes towards sharing baby photos on Facebook, opinions of Facebook, and the other sites they share content on. Interviews were transcribed and then coded in to categories in an inductive process.

The participants reported sharing photographs that were cute, funny, relating to milestones, or those taken with family or friends on Facebook, with 21 reporting feeling comfortable sharing photographs there. Only one participant was reluctant to share photographs on Facebook. They chose not to share photographs that they considered to be low quality, or ones that showed their baby naked, or photographs that contained traces of negativity, such as their child crying or throwing a tantrum. Whereas the mothers interviewed in Gibson and Hanson's (2013) study used social media to show that they had a personality and life beyond being a mother, the participants here wanted to share their motherhood. These sharing practices were an important part of the participants asserting their identity as a mother, such as their profile picture only showing their baby's face, as the mother considered he represented her identity now. While also serving to archive their child's development, posting photographs, and receiving likes and positive comments, reassured the mothers that

they were doing a good job as mothers, giving them validation. Nonetheless, concerns remained about oversharing or managing their children's digital footprint, ensuring photographs did not humiliate their child or carefully considered how their child may feel about the photographs once viewed in the future.

Other research has explored how mothers of young children use social networking sites (Morris, 2014). This study explored whether becoming a mother changes their social networking practices, how they use social networking sites, whether those in special circumstances use social networks in different ways, and how social networking sites can be better designed to support the needs of mothers of young children. Data collection involved the completion of an online survey where they could also share data from their social networking use if they wished. Mothers of children under three years old and who had either a Facebook or Twitter account were eligible to participate in the study. The survey was advertised in a number of channels, including posts to mailing lists for new mothers, through twitter, and paid advertisements on both Facebook and BabyCenter. The survey explored demographic data and child-specific data, such as whether the child is first-born, date of birth, diagnosis of developmental delay, and maternal wellbeing. Questions also explored use of Facebook and/or Twitter to share information related to their child. The mothers could also provide their Twitter username or install a Facebook application that would take a one-off screen shop of their social media posts. This included the username and public posts for Twitter and the status updates, captions on photographs or videos, and links shared on Facebook. In total, 412 valid responses were received to the survey.

The results illustrate that the mothers did not consider Twitter to be a suitable venue to share information or photographs relating to their child. Facebook was the preferred medium for sharing photographs of their children, with the authors suggesting that the character restrictions or network composition on Twitter may preclude people from sharing child-related information there. It was also found that the style of post changes after birth, moving from text-based to imagery heavy. Mothers experiencing post-partum depression tend to post negative content at a higher frequency. It was also found that the mothers posted far less often after the child's birth than before it, with a 50% drops noted in posting frequency. Additionally, posts relating to the child's birth reduce sharply after the first month and continue in this way as the child gets older. This mirrors the work of Gibson and Hanson (2013), who also found that mothers prefer to post about other aspects of their lives, to illustrate that there is more to their life than being a mother.

Other research in this vein has looked at how social media sites can be a source of empowerment for parents of children with special needs (Ammari & Schoenebeck, 2015).

Interviews were conducted with 43 parents of children with special needs about their use of social media in terms of their children's needs. Specifically, it explores how parents learn to access services and resources for their child through social media. Parents were recruited based on their own definition of whether there child had special needs, with participants found through hospitals, community groups, or Facebook groups. Interviews were conducted with 17 mothers and 28 fathers (two husband and wife pairs were interviewed) and lasted on average 53 minutes but with significantly longer interviews occurring due to disruptions. The interview protocol began with demographic questions, followed by questions exploring the family and domestic life. This was followed by the two main phases of the interview, the first exploring the child's special needs and the second addressing the parents' use of social media. Data was coded and organized in to themes following an inductive approach.

The results indicate that the parents used social media as a way to overcome feelings of anxiety. They would connect with parents on Facebook groups and find information relating to treatment, health, and education services. It also enabled people to realise that others had gone through similar situations and that they were not alone. Parents would often read the content on groups without posting at first, eventually growing in confidence to post as their own questions arose. Through posting on Facebook groups, they received valuable advice that helped them manage their daily life with their child and find services that would be valuable to them. Using social media also formed part of the coping process for a parent who had a child diagnosed with special needs. Many felt it difficult to be around other parents who had typically developing children and instead sought solace online in the experiences of those who also had children with special needs. Social media also provided a way to learn about school services, with the parents reporting difficulties finding social workers who could guide them to appropriate services for their child's needs in the area. This often led to the parents becoming advocates for particular causes on Facebook groups due to the difficulties they had finding appropriate services. These illustrate how social media can potentially empower parents of children with special needs to locate and make use of the services their child needs and highlights the importance of technology supporting parents to access this kind of information easily.

Other research has addressed how technology has been (and can be) used to support cross-cultural parenting (Yarosh et al., 2016). An in-depth study interviewing18 cross-cultural families (20 participants in total and 16 female, four male) examined parents' practices in terms of finding, negotiating and integrating advice and how they use technology to find information and support. This sought to understand experiences of incorporating multiple cultures in family practices. The families involved represented a range of different cultures

and heritages. In-depth semi-structured interviews, beginning with a questionnaire segment. This questionnaire included an adapted version of the Multigroup Ethnic Identity Measure (Phinney, 1992), which has been previously tested and validated (Phinney, 1992). This measures participants' identity and the levels of affirmation, belonging and commitment to that identity. Demographic information was also gathered during this questionnaire, including exploring the influences of their multiple cultures on parenting practice. Participants were recruited if they could describe at least two cultures that were integrated in to their parenting practices and if they had at least one child younger than 11 years old.

Nine of the interviews were conducted via telephone or videochat and the remaining nine were conducted face-to-face, with each interview involving four distinct sections. The fist section explored participants' cultural backgrounds, their own traditions from childhood, and any traditions that formed part of their current parenting practices. The second section explored participants parenting experiences, including how they sought out advice, the unsolicited advice they receive and approaches to conflicting parenting advice. The third section addressed what it is like to raise a child in an environment replete with multiple cultures, while the fourth section looked at the role of technology in their practices as cross-cultural parents.

The findings indicate that many parents face significant challenges when seeking out advice, often feeling judgment based on unsolicited advice received from neighbours or family, seeking out social support without feeling judged based on their culture or parenting practices, managing conflict when integrating distinct cultures and approaches to parenting, and attending to culturally-significant practices. However, the multiplicity of cultures, and their sometimes inherently different approaches to parenting, reduced perceptions of their being one right way to be a parent. This helped to reduce anxiety as they realized that there were different approaches, each with their own merits. Technology was often crucial to parents in cross-cultural parenting practices. It enabled the parents to broaden the network from which they can get advice, finding others with similar cultures, backgrounds, and experiences. This network acted as a source of advice based on their own similar values and experiences and proved far more valuable to the parents than traditional online parenting forums, where many parents perceived being judged simply because of their culturally different practices. Instead, the parents would seek out similar cross-cultural parents and groups, who became their sources of social support both online and in person. The families also relied on the technology as they sought to manage conflict that arose from diverse approaches to parenting, whether sharing humorous images of their child to remove tension, having access to a wealth of information to better understand important childhood milestones

from their partner's culture, or simply gaining access to a diverse range of ways of being a parent through parenting forums from a range of different cultures.

Building on this, the authors suggest a number of ways interaction design may support parents to better overcome the difficulties they face. These opportunities focused on supporting additive cultural practices, reducing feelings of judgment and anxiety, and identifying shared values. The suggested opportunities for design include a form of slow technology that lets the users indicate their cultures, the practices in the culture that are considered additive, leading to the system sending occasional prompts about the importance of certain parts of the culture that may be added to their existing parenting practice. Another opportunity suggested relates to the finding that exploring diverse cultural parenting practices reduced parents' anxiety, emphasizing that there is no correct way. This proposed the design and development of a *Family Answer Map*, where families of different cultures can answer specific questions detailing their approach. Sharing and understanding different experiences would highlight the diversity of approaches to parenting and reduce parents' anxiety to find the "right" way. Finally, identifying shared values and potential conflicts was also considered a valuable avenue for design. This argues for technologies that focus on celebrating when cross-cultural parents' agree on fundamental issues, support identification of cases where discussion may be needed, suggest where easy compromise can be found, or facilitate connection with other families with shared experiences.

2.5.2 *Managing tensions over technology use when parenting*

Despite these notable positives, there is growing concern about the use of technology by, and around, children and the potential impacts of this on their own development (Turkle, 2012). This suggests that both parents and children are predominantly valuing screen-based devices and becoming absorbed in them at the expense of face-to-face interaction. Recent studies have begun to address caregivers' and childrens' use of mobile devices while together.

Research in HCI has explored parents' use of smartphones while attending a playground with their children (Kientz et al., 2015). Researchers covertly observed 282 adult caregivers across seven playgrounds, conducted informal follow-up interviews in the playground with 25 caregivers, and conducted an online survey with 154 caregivers to validate their initial findings. However, in contrast to the findings of the previous study, little absorption in mobile device use was found. Rather, phone use was not an important part of parents' time at the playground, with approximately two-thirds of participants spending less than 5% of their time at the park using their phone, including 41% who did not use their phone at all. When phone use did occur, it was in small, fleeting bursts of activity, with nearly

30% of uses lasting less than 10 seconds and more than 50% lasting under a minute. Phone use was mostly focused on touch-based interaction, as voice calls comprised only 5% of all instances of use. The follow-up interviews and survey revealed that smartphone use mostly occurred to complete child-focused tasks, such as taking a photograph of their child and organising or coordinating aspects of their child's care rather than for the parents' own entertainment. Notably, this study highlights how many of the parents consider the non-use of smartphones while with their children to be desirable. The parents reported intentionally choosing not to use their smartphones, sometimes leaving them in the car, so that their child was the focus of their attention. In cases where the parent used their smartphone, a stated desire was to reduce this use. Therefore, parents identify the non-use of technology to be a desired value when caring for children and were hoping to maintain current standards or improve their non-use.

This builds upon existing research from the medical sciences, which covertly explored smartphone use when children and caregivers were eating together in a fast food restaurant (Radesky, et al., 2014). A member of the research team would attend a fast food restaurant at either lunch or dinner time and observe caregivers and children's mobile device use during their meal times, gathering a total of 55 public, non-participant observations. In 40 cases, an adult was observed to be using their smartphone, with a large proportion of adults found to be absorbed in device use to the detriment of face-to-face interaction with the child(ren) present. Some children seemed to accept this lack of engagement from their parent or caregiver by entertaining themselves. Others, however, increasingly attempted to gain the adults' attention through more challenging behavior, with increasing success. Thus, many of the caregivers focused their attention mostly on their mobile device to the detriment of their face-to-face interaction with the children present. This occurred despite the children being almost always curious about what the adult was doing on the device and desiring to co-view the device as a source of enjoyment.

These studies present vastly different patterns of phone use from parents while caring for their young children. A possible explanation for this may reside in the different types of activity in each study. In to fast food restaurant, the children were seated with the parent, eating their meal, meaning that they did not require much attention. In the playground, however, it is plausible that the parents felt the need to be more attentive toward what their child was doing, making sure they were safe and not in danger of wandering off. However, the findings suggest that, despite not always being successful, parents and caregivers express a desire to limit their use of mobile devices while with their children.

Research has also explored how families manage screen-based technology use for children aged between one and five (Hiniker et al., 2016). Semi-structured interviews were conducted with 27 parents (5 fathers) who had children between the ages of one and five. Two of the interviews were conducted over the phone, with the remaining 25 conducted in person. Interviews lasted between 30 and 45 minutes, with each participant given a $15 Amazon gift card at the end of the interview. Interviews sought to explore parents' experiences of managing their children's time using screen-based systems. This focused on understanding the content of media consumed by children and the times and places it occurred. Further questions explored the limits parents set on screen time, motivations for this, and whether decisions to end a period of screen time was driven by parent or child. The final aspect of the interviews focused on the challenges experienced and strategies used to manage their child's transition to or from screen-based media consumption. Data was analysed iteratively and using an open coding approach, enabling the researchers to adjust their interview protocol based on any emerging themes of interest. The themes uncovered were used to inform a diary protocol that was provided to parents for a period of two weeks. This protocol sought to understand the factors that predict easier or more difficult transitions for children and the participants were asked to complete the protocol after each occasion their child used screen-based media over the two-week period. The first task involved completing a sentence based on the activity, device, reason for stopping and concurrent parent activity that explained the reason for the transition. This was followed by questions regarding how the child felt when transitioning, ranging from very happy to very upset, with the parent also marking how normal or unusual the child's reaction was. The parent could also choose from a list of attributes describing the event and add any further comments. Twenty eight families, who had not completed the interviews and with children between 14 and 66 months old, were recruited and provided with the diary for two weeks, generating 380 diary entries in total.

The parents reported a generally negative impression of technology, with 25 of the 27 parents interviewed considering that screen use should be limited to short durations and carefully monitored by parents, with a clear preference for children to engage in non-screen-based activities. There was also conflicting beliefs about the impact of screens on children's development, with some parents worrying it may encourage development disorders and others valuing it for its educational potential. However, the parents reported making use of screen-based activities when they needed to distract their child so they could complete other tasks without interruption, such as household chores or caring for another child, or when they were tired and needed a break. The parents would often withhold access to screen-based media until they were unable to give their child their full attention and would switch the media back

off once they felt suitable recuperated. Nonetheless, the parents still reported reservations about their child's use of screens, unsure of whether it was good or bad or they were doing the correct thing. Finally, parents also reported allowing their children to view screen-based media in situations that may be frightening or upsetting, such as on an airplane journey.

It was mostly the parents' initiative that brought an end to their child's period of watching screen-based media, despite rare occasions where the children ended it voluntarily. The process of ending a child's time watching a screen was often fraught with difficulty, with 93% reporting occasional tantrums and 37% reporting frequent tantrums. While it may prove distracting and enable the parent to complete important household chores or tasks, it often resulted in difficulties immediately afterwards, such as a tantrums. The parents identified establishing a routine around screen time, using advance warnings to prepare their child for a transition away from a screen (such as a two minute warning), or moments when the experience comes to a natural conclusion, such as the end of a video or the battery dying. The diary study explored whether these strategies were effective in managing transitions. It was found that the children managed transition significantly better when it was part of a routine compared to when it was spontaneous. However, it was also illustrated that when screen time was part of a routine, it was substantially longer than spontaneous viewing. Conversely, two minute warnings did not ease transition, with the children being significantly more upset about transition when receiving a two minute warning. The children were more upset about transitions initiated by parents rather than those initiated by technology, such as the absence of autoplay when media ends. .

2.5.3 *Supporting record keeping with technology*

A notable line of research encompasses record keeping, whether motivated by preservation of memories or the tracking of developmental milestones (Kientz, Arriaga, & Abowd, 2009). In a series of related studies, Kientz and colleagues (Kientz et al., 2007; Kientz, Arriaga, & Abowd, 2009; Suh, Porter, Hiniker & Kientz, 2014) have sought to understand how parents maintain records in relation to their child and explored different ways to support this through the design of digital technologies.

Early qualitative work (Kientz et al., 2007) explored parents' motivations for maintaining records regarding their child's development and the design requirements for technologies to support parents in this aim. Interviews were conducted with 16 parents, half of whom were new parents, and five secondary caregivers. Two focus groups were also conducted, one with nine daycare providers and another with four medical professionals. The interviews and focus groups explored parents' current practices for record keeping and

examined the use of photographs or videos in this. They also explored parents' aims and concerns in terms of their child's developmental progress, alongside their experiences and plans for childcare. Finally, the researchers also sought feedback on potential design ideas. The findings highlighted that parents may value support in tracking and recording information about their young child, particularly in relation to developmental progress. It was argued that any system should support this by leveraging existing motivations to record moments to share with family and friends, facilitate parent-pediatrician interaction through being a source of evidence, and support interaction and communication across the child's caregiver network.

BabySteps (Kientz, Arriaga, & Abowd, 2009) provided an initial attempt to address these findings through the design of an interactive system. Following the metaphor of a baby book, BabySteps is a standalone system that allows parents to enter their child's developmental milestones based on age and provide photographic or video evidence to support this. Developmental milestones were derived from the Ages and Stages Questionnaire, a well validated and widely used developmental survey (Bricker, Squires, Potter, & Twombly, 1999). It encourages parents to track developmental milestones by leveraging motivations to share sentimental moments of their child's life with family or friends. BabySteps was evaluated in a three-month deployment with eight families and their pediatricians. This study indicated that *BabySteps* encouraged increased keeping and reflecting on records, improved their confidence to report developmental concerns, and facilitating better communication with their pediatrician. However, many parents required more specific guidance in terms of what to record, with concerns also highlighted about the potential of the system to increase anxiety if it suggested a child was not developing correctly.

Further iteration has led to the development of @BabySteps (Suh, Porter, Hinikier & Kientz, 2014), a system that enables parents to track tweets relating to developmental milestones and respond to them. This was motivated by a concern that a standalone application may be vulnerable to parents' forgetting to open the application or by the novelty of a new system wearing off over time. *@BabySteps* attempted to make use of parents' existing use of *Twitter* where hashtag syntax allowed parents to respond to questionnaires tweeted by accounts based on a child's month of birth. Parents' responses were written to a database by a script using the Twitter API, with developmental progress displayed on a supporting website developed by the researchers. Parents were required to register to the system with their name, email address and Twitter handle, while also providing a name and the gender and date of birth of their child. Parents then follow a Twitter account associated with their child's birth month, which sends out questions relating to children's developmental milestones. Participants respond either through direct message to the account or on their

timeline, with responses requiring the hashtag identifying which milestone prompt they are responding to and their own response to the question in the form of a hashtag (i.e. #yes). The system was deployed with 14 parents over a 3-week period and this illustrated that parents were able to learn how to use the system, including as a way to communicate with other parents. However, parents suggested a need to simplify the hashtag syntax, as the syntax was sometimes forgotten. Parents also wanted an option to receive private responses via direct message if the parents send incorrectly formatted tweets. While *BabySteps* provides an interesting attempt to support parents to track their children's development and key milestones, it highlights the value of a more experience-based approach to the design of technology for parenthood. Specifically, parents required a more simplified approach that fit with their existing daily practices rather than additional tasks.

2.5.4 *Supporting parents of pre-term infants to track health data*

Similarly, a body of work has explored how parents can be supported to track the health of prematurely born infants both during the transition from hospital to home (e.g. Hayes et al., 2014) and in-home care (Hayes et al., 2011).

Hayes et al. (2011) explore the development of both capture and sensing technologies that support better record keeping reducing the burden on parents as they seek to record health related data for their pre-term infant and to improve the accuracy of the data. Two prototype systems were created as part of this work – one addressing automated gesture recognition and another focused on home-based record keeping. The Automated Involuntary Gesture Recognition (AIGR) is a lightweight accelerometer-based logging system that can be placed on a premature baby to assess changes in movement and transmit this wirelessly to a computer. A computer algorithm was used to quantify and categorize the pattern, relative strength, and frequency of an infant's movement in the home. Ten premature infant children were enrolled in the study by their parents and each was monitored for 1 hour using 4 accelerometers. The study demonstrated the potential for a sensor-based system to monitor gesturing in infants, which may be used to examine weight changes in pre-term children, early detection of involuntary gestures that indicate cerebral palsy, and identification of neurological disorders that exhibit movement symptoms. An additional experiment explored the design of tools for manual record keeping to augment sensed data, prompts to encourage caregivers to complete prescribed tasks, and facilitate communication between the participants, research team, and healthcare professionals through a mobile phone-based application. Participants enter data in to an application, which then transfers it to a database accessible by clinicians. An evaluation was conducted with 10 caregivers (9 mothers, 1 aunt)

of pre-term infants over 3 weeks. Home visits and interviews were conducted at the end of the first and third weeks. Participants used the application daily and completed the prescribed tasks nearly every day. Reminders to complete the tasks prescribed by clinicians were positively viewed by parents and resulted in adherence to the exercises and also documenting the exercises. Furthermore, many participants used the in-built camera to take photographs of their children on their own accord, suggesting the importance of photo and video capture as part of the tool.

More recent work has built upon the findings of the aforementioned study, providing a more comprehensive capture and access tool for in-home tracking of health data for prematurely born infants. Estrellita (Hayes et al., 2014) is a mobile capture and access tool that is designed to support parents of high-risk prematurely born infants to track their health data with in-home care. Children who are very prematurely born are at risk of significant long-term developmental delays and health impairments (Greenough, 2008) and caring for a pre-term child can be a very emotionally and physically taxing job for a parent. Estrellita was designed through an iterative cooperative design process with 29 participants (18 caregivers and 11 healthcare professionals) who were all caring for at least one preterm infant being interviewed. This led to the identification of collecting and sharing data parent and child health and wellbeing data as a primary goal, with the healthcare professionals joining the research team. Following this, 10 design sessions were conducted, each lasting between 1 to 2 hours with the healthcare professionals who joined the research team, with hour-long bi-weekly conference calls also taking place. Design workshops made use of paper prototypes, which supported the research team to quickly iterate on different design ideas and gain feedback from the clinical partners. A one-week pilot study of the system was also conducted with three sets of parents of healthy infants. This involved training the parents to use the system for 1-2 hours in a home visit, providing them with a phone, scale, and software, being montired by the clinical and research teams, and received messages from both the virtual coach and the clinical staff. Each participant was interviewed in the home afterwards, focusing on the usability of the system and logging errors during use.

The tool supports parents in four main ways. First, it encourages the collection of a range of health data. Clinically relevant data collected includes output information, such as weight and diapers, which is often neglected by parents in favour of intake data, such as amount of food eaten. However, Estrellita supports the gathering of both forms of data. The system also monitors parental wellbeing through validated questionnaires examining postnatal depression and stress levels, alongside a mood map. Additionally, the tool supports the recording of pragmatic care information, such as how restless the child is and parental

caregiving information, which aims to subtly encourage healthy caregiving practices. The final category of health data collected is custom information, which may be important to either the parent or clinician, such as sleep data. Second, a virtual coach seeks to empower parents to reflect on their caregiving practices, their infants' progress, and on the types of data that are important indicators of development and health. Third, it supports parents to communicate, whether that is by sharing data with their clinicians through a web portal, or to get social support from family or friends who can connect and send messages to the user via the web portal or their own application. Finally, it also supports parents to prepare questions for clinicians at forthcoming appointments through the appointment note feature and prompts parents to reflect on the notes in advance of any appointment.

An evaluation was conducted with 14 mothers of prematurely born infants and 16 infants, who were born between 23 and 32 weeks' gestational age. Parents were randomly assigned either to an experimental condition, involving use of Estrellita, or a control condition, where they received standard care. The deployment lasted for a period of 4 months, with each participant completing a baseline assessment. Those in the experimental condition received a smartphone preloaded with Estrellita and a baby scale at baseline, alongside training in how to use them. Each participant was interviewed twice, once after two months and again after 4 months. Interviews with those in the experimental condition explored the use of Estrellita, integration in to parenting activities, impact of recording and viewing data, data sharing, related privacy and security concerns, and the challenges of caring for a pre-term infant. For those in the control condition, interviews also examined the challenges when caring for a prematurely born infant alongside strategies for managing care and communication with healthcare professionals. Additionally, all data entered on the phone was logged, alongside when and how Estrellita was launched, the data accessed, and times of the day when data was updated.

It was found that parents entered data at least once nearly three three-quarters of the days of the deployment, despite high levels of stress and significant caregiver responsibilities, with diapers and bonding data most frequently entered. Parents suggested that data was not entered on other days given some difficulties using the tool combined with perceived importance of certain indicators. Specifically, pediatricians often ask about diapering as a health indicator given that this population experience frequent gastrointestinal problems, meaning participants perceive this as an important health indicator and prioritise this ahead of others, such as infant fussiness. Parents reported tracking days that were most problematic and not the days that went quite well. Weight was measured only half of the time, with some parents keeping the scale out of the way and creating a barrier to regular entry of weight.

Similarly, indicators of infant health were prioritized ahead of parent health. Interviews also identified issues with time and the practicalities of logging data on an additional phone that was not their primary device. Mood monitoring also proved a useful way of improving parental mental health, whether as a tool for coping or as a way to better understand the impact of certain activities, such as exercise, on mood. Additionally, those in the experimental condition exhibited greater awareness of the importance of certain activities, such as reading, to their child's development based on the need to enter activities or bonding time in to the tool. Participants also indicated that the messages from healthcare professionals received on the tool were very useful, with six of seven families indicating that they shared data with their clinician on at least one occasion during a consultation. However, clinicians often did not appear open to viewing Estrellita, despite asking questions answerable through the tool. The participants also indicated a preference for communication and data sharing with people in similar situations who were unknown to them rather than their own friends. However, most did not want to share their own mood or mental health data.

While Estrellita was valued by many of the parents, there were some challenges identified on the side of clinicians (Cheng et al., 2014). These challenges were drawn on data generated since 2008 in various studies, including the two earlier studies in this section (Hayes et al., 2011; Hayes et al., 2014) and observations of a clinician's attempts to integrate patient-generated data into her working practices over a period of eight months (Cheng et al., 2014). It was found that identifying a suitable clinical partner was a most significant challenge, given that the care of preterm infants is distributed among multidisciplinary teams. Additionally, ensuring a suitable fit between the workflow of the clinical partner and the Estrellita system proved to be a significant challenge. For example, the High-Risk Infant Follow-Up (HRIF) Program, with whom the research team partnered, has infrequent meetings with the parents, with a 6-month wait period between discharge and the first appointment with the HRIF. Additionally, the clinicians often tend to be very busy and were reluctant to take on the additional task of monitoring patient-generated data. Finally, there was concern among the clinicians with the increased liability patient-generated data may bring for them.

2.5.5 *Systems that support communication*

A thriving strand of research within the HCI and parenthood literature explores how technology can be used to support communication. The work of Yarosh and colleagues (e.g. Yarosh, 2015) has been at the forefront of research of family communication across distance. This includes an exploratory study of communication practices in divorced families and the challenges faced (Yarosh, Chew, & Abowd, 2009). During this study, ten parents and five

children, aged between seven and 14, were interviewed to understand the challenges faced and the role of technology in facilitating contact with the non-residential parent. The interviews lasted for 30 minutes and parents and children were interviewed in separate rooms, with one exception and particularly focused on ways of communicating both in person and apart, the role of technology in this and the challenges of maintaining connection. The parents were asked to describe an imagined technology that could help families stay in contact and the children were asked to draw a magical device that would help them stay close to their parents. This study highlighted the significant tensions inherent in communication in divorced families. Each parent acts almost autonomously when the child is resident, with little input from the other parent. The non-residential parent was considered to be able to focus more on having fun with the children, while the residential parent was the primary carer and set the family rules. There were also significant challenges in terms of communication. Non-residential parents wanted to be more aware of what their child was doing, with the children less comfortable talking about their daily life. There was also a fear of interrupting routines in the other home with inappropriately timed calls and difficulties actually engaging the children in conversation. The children faced challenges with upsetting one parent when wanting to call another or not having a private space where they could speak with the other parent. They also wanted to be able to spontaneously talk with their other parent as things came to mind during the day rather than having to ask the other parent to initiate the call, with parents also wanting to share routines. While the parents spoke with their children using the telephone, it was not always suitable as it proved difficult to engage the children in conversation.

The ShareTable (2009; 2013) was developed in response to the challenges raised in the formative interviews. This system consists of two cabinets, one each located in the home of the child and the non-residential parent, a face-to-face videochat system, and a shared table surface between the local and remote system, where a projector displays an image of the other tabletop on to the local tabletop. Children are supported to initiate a call as opening the cabinet door calls the linked cabinet. The call is then answered on the other cabinet by also opening the door and the parent and child can engage in shared play activities on the tabletop space, designed to improve engagement given the difficulties children face with conversation alone. The ShareTable was deployed with two families (four households) for four weeks, with a two week pre-deployment phase. The first family had a 7-year-old son, had been divorced for 5 years, lived within a 60-minute drive of each other, and the parents considered their relationship to be low conflict. The second family had an 11-year-old son and a 7-year-old daughter. They are divorced seven years and live 60 minutes drive apart. The pre-deployment phase involved interviews with each family, including any children over 6 who

live with the parents and any cohabiting partners. Interviews focused on ways of staying in touch and challenges faced, alongside surveys designed to assess relationships with past partner, current partner, and children. The children were asked to complete a shorter survey exploring relationship with parents and step-parents. A diary was also used to explore moments of remote communication, duration, medium used, and the topic. The children's version focused on medium used and topic. The ShareTable was deployed in each home for four weeks, with system use logged and calls recorded. Participants could mark any video for deletion if they wanted and video data was only stored locally. Interviews were also conducted on a weekly basis with participants, with the participants also asked to continue keeping the diaries.

It was found that ShareTable provided a playful context for conversation, particularly through unstructured play as the child demonstrated new skills or abilities and primarily using face-to-face interaction. It also provided a way to support parenting practice of remote parents who could facilitate their children's learning, such as playing math games, or engage in co-parenting, when the divorced parents worked together to get their daughter to clean her room. The system also became a place to meet for the families, such as being able to spontaneously share a card received from a grandparent or a place to come together to talk about a sports game before the non-resident parent and children watched it separately. There were some concerns, however, about spontaneous use of the system disrupting the activities of daily living in the other home. These concerns often meant that one parent was not happy – either the parent whose routines were being disrupted or the parent who tried to call but was asked to call again at another time.

Research has also been conducted in to how wearable technology might support the communication of separated family members (Teh et al., 2008). *Huggy Pajama* is a system consisting of two physical entities. The first is a small, mobile doll that is embedded with touch and pressure sensors and connected to a haptic wearable pajama via the Internet. The pajama consists of air pockets that are embedded in it, heating elements and a fabric that can change colour. The doll acts as an interface through which parents can hug their child or express their feelings or mood to them. When a parent hugs the doll, the sensation of a hug, using the airpockets, is reproduced for the child wearing the pajama, with the colour changing on part of the pajama to also communicate the parent's feeling and emotion but also distance. If the parent was nearby, it was indicated by a yellow colour. A dark red colour was used to indicate distance. While this work provides some interesting insights in to the way wearable technologies may support communication between parents and children over distance, no

deployment or evaluation has been conducted. This may be attributable to the complexity of the system and the need to create multiple two physical devices per family.

Attention has also turned to understanding intimacy in family settings (Dalsgaard, Skov, Stougaard, & Thomassen, 2006) and supporting that between parents and children (Dalsgaard, Skov, & Thomassen, 2007) both when separated by distance and together. Dalsgaard et al. (2006) report a qualitative study of parents' social interaction practices with their children through the use of cultural probes and contextual interviews. Three families with children aged between 6 and 10 participated in the study – one family with a 6 year old son, another with two sons aged 6 and 10, and a third family with four children, including a 9-year-old daughter and three sons aged one, four, and seven. The probe packs aimed to understand how intimacy expresses itself between parents and children and encouraged the family to reflect on the ways they use social connection to maintain intimacy. Each pack consisted of three cameras, a family scrapbook, small diaries, postcards, post-it notes, and pens, paper, scissors and glue. The families were asked to place the photographs in the scrapbook, among other assignments to be completed. Two families used the cultural probes for seven weeks, while the remaining family used them for six weeks. Two members of the research team conducted three interviews with each family during this time. The first meeting served to introduce the study, explain the aims and purpose, and to deploy the probes. Interviews at this stage served to understand demographic information about the participants, including background, professions, their family structure and the ways they communicate together. The second meeting involved the researchers and family reviewing responses to the probes and providing guidance on what was interesting, creating a shared understanding of the purpose of the probe pack. The third meeting addressed the contents of the scrapbook and encouraged the families to reflect on their communication practices. The participating families were also asked to imagine future technologies that could facilitate social interaction and intimacy within their family. Data analysis involved two phases. The first phase involved identifying themes through a coding process, leading to the development of a schematic representation of intimacy based on the codes identified. Once data was identified and categorized, this representation was compared to strong-tie intimacy [Vetere et al., 2005]. This work identifies intimacy as being derived from a strong bond and belonging to a unit that is formed from a shared background. Parent-child relationships are also unequally balanced, with the parents acting as guardian and protector to the child, with security being an important component of trust in parent-child relationships. It also identifies that parents are often responsible for facilitating acts of intimacy and take more responsibility for the relationship.

eKiss (Dalsgaard, Skov, and Thomassen, 2007) was developed in response to both these findings and the difficulties in mediating intimacy over a distance. An absence of intimacy has been suggested to lead to children feeling insecure and experiencing difficulties in their development [Shonkoff & Phillips, 2010]. eKiss is a mobile picture blog, consisting of a website that supports pictires and texts sent from children to the system, organising them according to date and time, and showing them to users. Each family has a unique weblog that can only be accessed by the family members. Children take photos with their normal camera phones and can add some text to it if they wish, sending via MMS to the eKiss system. These messages are displayed on the blog, with an existing blog service being used to extract pictures from the message and place them on the blog. The system checks every 5 minutes for a new message and displays this on the blog once found. For parents, the blog can be accessed through any computer and once they see a post, can click on a picture to open it in the original size. However, the system provides only one-way child-to-parent communication, with parents not able to respond or send their own messages as the researchers did not want conversations to occur while separated, instead using the images posted to eKiss as a spark for conversations when back together. Thus, eKiss focuses on providing the children with a space where they can share their experiences with their parents and motivating user engagement by facilitating attention from their parents.

A five-week evaluation was conducted with four families, with children aged between 10 and 13. Three of the families were two-parent families, ranging in age from 38-42 and one single parent family with a mother who was 41. Three of the families had both a daughter and a son, with one having one son. Each family was interviewed thrice during the evaluation period, with the first introducing the study and the system and the second interview was to ensure participants were comfortable with the system and whether any new questions had arisen. The final interview looked at participants' experiences using the system, its impact on their lives, and ideas for further development of the system. Overall, eKiss provided the parents with valuable insight in to their children's lives, especially while being apart. It helped parents' understand what their family were doing while away with work, with pictures shared during moments of separation often involved sharing situations from home where the remaining family members were doing things together. It also supported parents to initiate conversations with their children based on the messages shared. eKiss also allowed children to become more aware of their parents, , thinking more about what one of their parents might be doing while viewing their pictures. However, the children also found it difficult to know what pictures to take and share or what may be interesting to their parents. Despite this, it proved a useful way for children to communicate their emotions to their parents and for

parents to better understand how their child was feeling when a child could not express it through conversation. For example, a family who moved house during the evaluation and had to give up their dog due to the house move learned that their son was more upset than they realized about giving up the dog through a message shared on eKiss. It showed picture of the dog and a football, with their son adding a note saying he had gone home to play with the dog. It was also a useful tool for coordination, such as taking a photograph of a note a teacher gave one student to show his parents, sending it to eKiss so his parents would know. While sharing messages proved interesting for the children, they had little interest in engaging with the blog itself or checking the messages they had sent.

TalkBetter (Hwang, 2014) is a mobile intervention service offered through smartphone that aims to support parents' conversation with their child through the meta-linguistic analysis of conversation in real time and the provision of situated prompts in response. A microphone is placed on the child and the parent wears a Bluetooth earpiece to enable the system to pick up conversation, analyse it, and provide audible feedback to the parent. It enables parents to establish new conversational habits based on guidelines derived from best practice in speech and language therapy. It runs continuously in the background on a parent's phone, enabling access to everyday conversations and provides appropriate prompts to the parent based on principles derived from best practice speech and language therapy to guide parents while conversing with their child.

TalkBetter followed a three-phase design process. The first phase involved meeting twice with a single Speech and Language Pathologist (SLP) for a period of two hours each time and a questionnaire exploring clinical practices, speech and language training given to parents, and feedback provided by parents on the training, which was answered by eight SLPs. Additionally, 13 parents participated in semi-structured interviews, lasting an average of one hour, and focused on their experiences in applying the guidelines provided by SLPs during conversations with their children. The second phase focused on designing the background service to run on parent's smartphones and the in-situ reminders derived from analysis of parents' real-time conversation with their children. These reminders were based on the parent training guidelines that were feasible using meta-linguistic conversations. Ten parents were also interviewed during this stage to understand acceptance of the service and the prevalence of situations where the reminders might be appropriate. The third phase involved the development of a prototype of TalkBetter and a one-hour evaluation of real parent-child conversation with mother-child dyads that had not participated in previous phases of the research. An SLP also listened to and analysed the conversation and this was compared to the TalkBetter data.

The findings of this study indicate that parents find it difficult to follow guidelines provided by SLPs and are often unaware that they spoke too fast for their child. Parents often found it difficult to apply the guidelines provided by SLPs in practice, often being distracted by household tasks so failing to realize their child was talking or losing their temper if their child had not improved sufficiently. Additionally, the significant period of time needed to alter habits proved a source of frustration for the parents, while they often had not realized that they had stopped adhering to the guidelines. Additionally, training other family members proved very time consuming for the parent. A 3-minute proof-of-concept video was created demonstrating five differnet potential cases for TalkBetter and 10 parents were interviewed after viewing the video to explore the potential viability of the service. The cases involved different moments of communication where a parent had inappropriately responded to or interacted with their 3-year-old son. The interviews explored whether such situations were routine for the parents, whether TalkBetter was of interest to them, motivations for potentially adopting the technology, improvements that can be made to it, and any potential concerns with using the system in-home with their child. It was found that the parents frequently experienced each of these cases, with nine parents strongly interested in using it as it reduced the burden on them to learn the parent guidelines. However, there was also concern that interest may wane if improvement is not seen almost immediately. Furthermore, many parents highlighted situations where urgency may be needed, such as if their child is touching an electrical socket, and thought the system would need more awareness of context.

The evaluation of the prototype system illustrated that ambient noise hindered the effectiveness of TalkBetter, with the children often touching the microphone or with noise from other toys interfering with the audio. Analysis of reminders showed 22 correct reminders, 9 incorrect reminders, and 11 missed opportunities for reminders. Nonverbal responses also proved problematic with the healthcare professional noting appropriate nonverbal responses from the child to the parent's cue, where TalkBetter incorrectly triggered a reminder. Similarly, difficulties arose judging speed of speech from the parent and appropriate turn-taking.

Beyond communication within families, research has explored how technology can help parents communicate with organisations and services that may be of benefit to them. Le Dantec and colleagues [2011] explored the design, development and deployment of a system, called Community Resource Messenger (CRM) in a homeless shelter to support communication between the shelter and mothers who avail of the service. A three-stage design process was used to create CRM. The first stage involved a day-long participatory design workshop was held with staff members from the shelter and service providers in the

area, with the aims of identifying goals, resources, and flows of information for the service providers involved, focusing on understanding the larger service provision eco-system and how the different services offerings worked together. The second stage involved a series of meetings with shelter staff, moving from initial fieldwork exploring work practices at the shelter to defining CRM functionality, to high fidelity prototypes to rapidly test ideas. The final stage of the design process engaged shelter residents and focused on identifying the types of features they need and iterating the design to incorporate ideas created by the shelter residents.

Users were able to access CRM in three different ways. Staff could access it through a web interface, the Message Center, residents could use their mobile phones to access it, and a shared display in the center, the Shared Message Board, provided information for both residents and staff in the center. The Message Center allowed staff to send messages to the residents, post on the Shared Message Board, or communicate with other staff members. Messages could be sent to more than one resident at a time or scheduled for future or recurring delivery. Shelter residents could send messages either by sending an SMS or leaving a voicemail at either a private number (to communicate with staff) or a public number (to share a message with staff and residents). Google voice was used to transcribe voicemail messages. The Shared Message Board displayed either messages from staff, messages from residents, or external information from a housing search website.

CRM was deployed at an emergency night shelter for single mothers and their children, where families could stay for 30 days, which could be increased to 90 days under special circumstances, such as if a resident was involved in a job transition. Residents had to leave the shelter by 8am and were permitted to return after 4pm. Deployment involved twice meetings with the program director, weekend case manager, and night manager at the shelter to explore how CRM was being used in the shelter. These took the form of open-ended interviews. Shelter residents in three phases of the deployment, beginning with a brief interview where demographic information and phone use was obtained. Residents who did not have mobile phones were provided with one and with $50 pre-paid phone credit. Those who used their own phones were reimbursed for any costs incurred. The second phase involved twice weekly meetings between the residents and the researchers, taking the form of one-to-one interviews or focus groups. These focused on understanding the use of CRM and the features residents found useful or not. The final phase for residents involved one-to-one interviews as the residents left the shelter and reflected on their own use of CRM and how this impacted their interactions within the shelter. Observational data was also gathered during the visits to the shelter for the twice-weekly meetings. This focused on observing life within the

shelter and the practices of staff and residents there. A rolling approach was taken to data analysis, meaning analysis informed subsequent topics during the interviews and focus groups, augmented by log data from the system. Twenty-five residents, ranging in age from 20 to 53, participated in the study.

The findings indicated that CRM was adopted by the shelter staff and residents and proved useful as a communication and management tool. Specifically, CRM supported the development of new practices and communication, illustrated by 72% of private messages being exchanged during the day, a time when staff would traditionally have been unavailable to the residents. The volume of private messages sent would dip when new shelter members arrive and peak at times when there was increasing connection and closeness between the shelter staff and residents. CRM also enabled social boundaries to be redrawn, such as dealing with conflict arising through chores not being completed with a message rather than face-to-face intervention that may have been perceived as intrusive. It was also illustrated that the shelter residents engaged more with information presented on the message board, with staff noting how an event advertised on the screen immediately led to two families signing up, with none having signed up when it was advertised on a paper flier attached to a cork board. Examples of senior residents spontaneously introducing new residents to the message board were also observed by the staff, indicated its adoption by the residents. Residents also used the message board as a space to discuss issues they faced in the shelter, such as reminding others of the importance of keeping it clean and completing their chores. However, the CRM also proved a disruptive force to staff and their relationship with each other in the shelter. For example, the case manager became a frequent user of CRM and, considering developing a rapport with the residents primary to her role, used it to initiate and maintain conversations to the residents. This shifted the center of influence away from the program director, who had previously been the most frequently engaged with the residents, creating tension between their roles.

More recently, research and design work has looked at how digital technologies can support breastfeeding mothers to find, review, and communicate places to breastfeed their children with other breastfeeding mothers (Balaam et al., 2015). Feedfinder is a mobile phone application that is designed to support breastfeeding women to find, review, and share public places to breastfeed with other breastfeeding women. It was designed following a three-stage iterative, user-centred design process. The first phase involved one-to-one sensitizing interviews were conducted with 4 new mothers in a local café, each lasting 30 minutes. These interviews highlighted that the mothers often felt pressured to breastfeed given their own social, professional, or family ties, such as working for a children's centre that encourages

mothers to breastfeed. It was a process that proved unexpectedly tiring and one where making a decision to continue or stop breastfeeding was based on a decision of what was best for both mother and infant. This also highlighted that the mothers often do not feel confident to leave their house as their child baby may need to be fed. This hesitancy appears related to concerns over public perceptions of breastfeeding and alongside fears of intimate body parts being exposed.

The second phase of the design process involved design workshops with 21 mothers, spread across four breastfeeding community support groups. The workshops focused on understanding and mapping places where women had previously breastfed publically, describing their feelings about having done so. This highlighted the anxiety faced by many women when they breasted in public, which can prove particularly stressful when first breastfeeding, although recedes over time. It was suggested that the women prioritized venues with baby-changing facilities, as these were likely to indicate that babies were welcome. The second activity explored the qualities that would lead to a positive breastfeeding experience in a place. These qualities changed relating to the age of the baby and personal experience with breastfeeding, with a new mother with little breastfeeding experience preferring somewhere private. Cooperative evaluation of a medium fidelity prototype, illustrating the interactions involved in finding or adding a review or adding a place to breastfeed with one of the community support groups formed the final part of the design process. Six women participated and were asked to find and view the reviews for a location, add a review, and add a new place to the map while thinking aloud about what they were doing and the problems they found. This highlighted usability issues and identified potential solutions. The authors report that the application has been deployed for 12 months with approximately 3,000 members, mostly in the UK, with members using it on 2.6 separate occasions over 25 days. Additionally, 48% of users have used it on more than a single day, with an average of 4.16 sessions over an average period of 53 days. Initial feedback from users suggested a need for more places that were local to the users, with users being both those who use the application as breastfeeding mothers currently and who want to support those who may find it useful in the future.

2.6 Summary

Overall, the first two years of life provide the foundation for a child's healthy development and capacity to flourish in adulthood and these years are the primary focus of this thesis. Parents and caregivers' play a crucial role in this, with play, regular face-to-face interaction between caregiver and child, supplying the necessary arousal to spark development. Yet, the

literature review also illustrates that the parenthood can be a very challenging experience fraught with difficulty. Play is just one part of parenting but research indicates that moments of play can provide the spark to accelerate a child's development. There is also evidence of the potential utility of technology to support parenting, despite existing concerns that it may be damaging parent-child interaction. The literature review demonstrates how carefully designed technology, integrated with the lived experience of parenthood, can support parents during difficulties they might face. One branch of this seeks to understand how parents' use technology during their everyday parenting practices, whether to find information (Gibson & Hanson, 2013) or to negotiate the challenges of parenting mixing two cultures (Yarosh, Schoenebeck, Kothaneth, & Bales, 2016). Others look at managing use of technology when with children (Hinikier, Suh, Cao, & Kientz, 2016) or setting rules for children's technology use in the home (Hinikier, Schoenebeck, & Kientz, 2016). These have very much focused on understanding existing technology use in parenting practices and how technology use is managed and negotiated in the home.

There has also been a wealth of design interventions in quite specific settings, where novel technologies have been designed, deployed, and evaluated. These contexts include supporting recording keeping of their children's development (Suh et al., 2014), tracking health data when pre-term infants' transition to home (Hayes et al., 2014), encouraging communication across a range of diverse family structures, including children in divorced families (Yarosh, 2015). Research has also looked at how technology may be used to provide situated language cues to parents of children suffering with language delay (Hwang, 2013). However, these are all quite specific application areas and may not often form part of everyday parenting practice. A notable exception is FeedFinder (Balaam et al., 2015), which explores how breastfeeding mothers can identify, review, and communicate suitable places for breastfeeding with other mothers. This PhD research seeks to further develop our understanding of how technology, and particularly the HCI and interaction design community, can positively contribute to everyday parenting practice. It does this by exploring how technology can be used to facilitate parental play with their young children, a vital component of everyday parenting practices that provides the platform for healthy child development.

Chapter 3. Research Approach

3.1   Overview

The research in this thesis followed an experience-centred design (Wright & McCarthy, 2010) approach to the study of technology for parent-infant play. By adopting this approach, I sought to gather rich, detailed accounts of parents' experiences of playing with their children, replete with the unique characteristics of their relationships and their own personal sense making of the experience. Pivotal in this was the establishment of empathic relationships with the participants, especially the parents, across the study. My approach to this involved contrasting their expertise as parents and players with their infant children with my personal inexperience both as a parent and in terms of play with a young child. Finally, narrative was crucial to my sense making and understanding of the parents' experience, making sense of their experience through conversation with them.

3.2   Experience-Centred Design

Experience-centered design (McCarthy & Wright, 2004; Wright & McCarthy, 2010) is a suitable approach to explore how we can gather rich accounts of the experience of parents playing with their infant children and understand the experience of being a parent and the what it means to be responsible for the care of a young child on a daily basis, despite my personal unfamiliarity with parenthood. It is important to adopt a design methodology that is open, empathetic, and can understand and engage with the multiple layers of meaning in human experience. It can provide insights into the richness of human experience and supports the design of artefacts that can be flexibly appropriate (McCarthy & Wright, 2004). It enables an individual's experience of technology to be considered in terms of how the individual acts, feels, perceives, and makes meaning with and through that system (McCarthy & Wright, 2015). Experience-centred design demands that we move beyond the idea of the user and employs empathy to understand the complete individual. It provides a lens to understand how people make sense of their experiences, places the designer and user as co-creators of experience and understands the person exists within networks of social relationships where experience is a shared construction. Finally, it views the person as an active agent in their world who imagines possibilities, envisions creative choices and acts upon those choices (Wright & McCarthy, 2010). Therefore, it ideally supports empathizing with, and understanding, the experience of the participants so that we can develop novel methods that

will engage them in the design process, help us understand their experience of play, and design novel digital technologies that can then facilitate this play.

3.3   An Experience-Centred Approach to Design for Parent-Infant Play

The present research adopts an experience-centred design approach to the study of parent-infant play. This section details the reasoning behind this decision, highlighting the richness of accounts of experience provide through experience-centred design, the value of stories as tools to collect and share experience, and the inclination towards empathy that enables the designer to come to know the people he is designing for.

3.3.1   *Providing rich accounts of experience*

McCarthy and Wright (2004) provide a detailed account of experience that illustrates how experience-centred design can understand and collect rich accounts of play, from the perspectives of the parents and the childen. Influenced by the pragmatic perspective of Dewey (1925), experience is conceptualised as being lived and felt (Wright & McCarthy, 2010). This emphasises that we experience our world holistically through the integration of body and mind (Wright & McCarthy, 2008). Essentially, this argues that lived experience is an embodied experience, that emotion cannot be separated from action (Wright & McCarthy, 2010). This treats experiences as being made of four intertwining threads: a sensual thread, emotional thread, compositional thread, and spatio-temporal thread (McCarthy & Wright, 2004). We experience the world physically through our senses, making sense of the character of experience. We judge the importance of people and events in terms of our own needs and desires. We talk about needing space and time to make sense of certain experiences and do so in terms of the causes and consequences of the experiences.

This holistic approach to conceptualising experience occurs through continuous engagement with the world and various acts of sense-making. We anticipate an experience based on our previous history, immediately connect to a situation, gaining a sense of what it feels like. We interpret our experiences, structuring a narrative based upon prior experiences and future expectations. We reflect upon the experience as it occurs and even recount it, sharing the experience with others and judging it in terms of people's responses, integrating new meanings. We also appropriate experiences, making them part of our sense of self and personal history (McCarthy & Wright, 2004). This provides a rich perspective through which to reflect on the experiences of a person.

An important aspect of this work was the need to gather a rich account of the experience of play as a means to understand play and be able to design in response to it.

These accounts detail what play feels like as a parent plays with their child and how they make sense of this play. They highlight that play is embedded in the social context of the relationship between parent and child and also the intrapersonal feelings of the parent. This results in accounts of the experience of play that are holistic, describing both what the play feels like and how the parent is making sense of it, in terms of previous experiences of play with their child and an anticipated future.

3.3.2 *Empathy and knowing the user*

A second crucial component of this research was to establish close, empathic relationships with the parents, children, and service providers that enabled more open sharing of experiences. Experiences of parenthood are often deeply personal and unique for each parent, with a complexity that can only be shared through a meaningful emotional encounter between the parent and another individual (Wright & McCarthy, 2008). In this sense it was crucial to form an empathic relationship with participants, gaining their trust, and being seen more as another person rather than simply a researcher. My role in each case study was often that of the welcome outsiders—engaging in conversation with parents around their experiences of parenthood and their lives more generally. Such conversations benefitted from my personal circumstance. As a young man who does not have children, my understanding of parenthood was very limited. This enabled the development of a meaningful empathic relationship with the parents, who shifted their perceptions from research participants to teachers. Specifically, the parents to used my presence at the sessions as a way to teach me about parenting. My dialogue with the often ended with the parents saying, *"it's all ahead of you"*. It seemed as though the parents could comfortably speak about their experiences as a way of increasing his knowledge of parenthood.

My approach to empathy in this research had two related strands. This involved acknowledging the parents I encountered as experts in their own experiences of being a parent, with a unique account of what it feels like to be a parent and how they made sense of their experiences as a parent (Wright & McCarthy, 2008). The second strand was my own personal unfamiliarity with parenthood. In embracing the parents expertise and my own lack of such knowledge, I was able to work collaboratively with the parents to co-create understandings of parenting, such as accounts of play. My personal inexperience removed certain boundaries between the parents and myself, as they did not fear being judged by someone who may have their own experiences of parenthood.

3.3.3 *Using stories to collect and understand experience*

Prioritizing narrative and story to share experience was also fundamental to the experience-centred perspective adopted in this study. Wright and McCarthy (2010) highlight the value of stories as a means to collect and understand people's experiences, as well as the way we make meaning in our own lives through the telling of stories. They argue that storytelling is a feature of our everyday lives and something that has been developed from a very young age, enabling us to provide information, use our imaginations, or seek responses from others (Wright & McCarthy, 2005). As we listen to the stories of others, we are also bringing our own perspectives to bear on their experiences, as the storyteller too tries to adjust to the listener.

Wright and McCarthy (2010) note how there are many different methods to collect stories. Examples include cultural probes (Wallace, McCarthy, Wright, & Olivier, 2013) and diary studies (Hagen, Robertson, & Gravina, 2007). Common across many of the story collection methods is the use of unstructured narrative interviews that invite the participants to talk about their lives and experience (Wright & McCarthy, 2010). Importantly, these stories do not just convey behaviour. Instead, they share motivations, feelings, the meanings people make of experiences, and the social interaction around these experiences (Carroll, 1995) and give voice to lived experience (Wright & McCarthy, 2005). Through these, it is possible to imagine another person's life and experiences and, potentially, design in response to our understanding of their experiences narrated through stories.

This potential of stories to communicate another person's experiences and enable imagination of their life provided another motivation for adopting an experience-centred design approach. I sought to collect and understand parents' stories of play, parenthood, and the experience of being responsible for the care of a very young child. This enables a designer to understand and engage with specific experience, even without first-person experience of the situation. Given my own lack of parenting experience, it was important to engage with rich, detailed stories of parenting practice through which I could understand the parents' experience of play with their children and begin to consider design in response to their stories and experience. Through the telling of stories, I was able to co-create meaning with the parents as we engaged in unstructured conversations around their experiences of parenthood.

3.3.4 **Summary**

Fundamental to the research presented in this thesis is the use of an experience-centred design approach to understand experiences of parenthood and play with infant children. Experience-centred design builds on the humanistic tradition to understand people's lived and felt

experience and how they make sense of this experience (Wright & McCarthy, 2010). Crucial to this is how they experiences of parenthood are deeply personal and unique, informed by each parents' own personal history. (McCarthy & Wright, 2005). Detailed accounts of lived experience shared what it felt like to play and how the parents made sense of this play as it occurred. Establishing empathic relationships with the parents was important to capturing and understanding these experiences. Parents became comfortable sharing their experiences after acknowledging my own inexperience of play and parenting. Engaging in conversation around the stories shared by parents deepened my knowledge of their experiences of parenthood, as they used their experiences to teach me about what it is to be a parent.

3.4   Data Collection

This thesis adopted a qualitative approach to explore the experience of parents and their lived experience of parenthood across three case studies. The three case studies were chosen to build a rich understanding of what it is like to be a parent, the challenges faced, and the ways parents currently seek to overcome it. A qualitative approach relies on the participants' views of the subject being studied (Creswell, 2009) and can provide a deeper understanding of the realities of a phenomenon in their lives, enabling me to better understand the lived experience of parenthood through these case studies.

The first case study explored the nature of play in the children's hospital. This involved the deployment of a technology, Magic Land, in the play room of a children's hospital over a period of 12 weeks to better understand how children played there, with play sessions observed and informal conversations occurring in the playroom with the play specialist, parents, and children.. The second case study built upon this to explore, in depth, how parents play with their children, the barriers they face during this time, and the strategies used to overcome these barriers. This was conducted in a weekly play session in a children's centre and focused more on working with the parents to understand what it was like to be a parent, co-creating a shared understanding of their experiences and the difficulties they faced. The final case study involved the deployment of a technology probe that sought to further develop our understanding of how parents play with their children, the form this play takes, and the challenges that arise during such an everyday moment of parenthood.

Dialogue formed the basis for the qualitative research method chosen throughout this thesis, yet there was a difference in approach to dialogue in the case studies. Wright and McCarthy (2010) argue that it is through dialogue that we start to learn about one another. Specifically, by listening as another person tells us their story, trying to tell our personal story, and adjusting our own story based on the responses received to our storytelling (Wright &

McCarthy, 2010). The research throughout this thesis adopts dialogue as the basis to understand parents' lived experiences in terms of parenthood and play. Data was gathered throughout the research using dialogue as the primary method. Engaging in conversations with parents, their children, and service providers, I sought to understand the lived experiences of parents, the challenges they face, and to better understand how we might support them through the design of technology. Dialogue was chosen for the flexibility it provides compared to more hands-on data gathering approaches. For example, I spoke to parents throughout the research when they were with their child. Therefore, their attention was always primarily on their child and dialogue and conversation provided an easier, more suitable way to explore their lived experiences of parenthood.

However, there were differences in quality of dialogue across the three case studies that were influenced by the design of the studies. The first and third case studies both adopted a 'designing for' approach, where as researcher I sought to design in response to the answers that participants provided, conducting research on them rather than conducting research for them. In both of the case studies, I was a researcher there to better understand a phenomenon and design in response to this increased understanding. The second case study, however, adopted a 'designing with' approach. This focused on working with the parents to understand what life was like for them as parents, actively co-constructing this with the parents during the sessions. This was achieved by orienting myself more as researcher-participant than simply participant alone, becoming a volunteer, supporting staff in the research site as they prepared to welcome the parents, chopping fruit for the kids, cleaning tables, and tidying up afterwards. Similarly, when speaking with the parents, I highlighted my lack of knowledge of parenthood. As a result, the parents would often either start or end their stories by saying "It's all ahead of you, Kevin", as they used our dialogue as a way to educate me about what it is to be a parent.

In the first two case studies, data collection took the form of field notes. Due to the sensitive nature of the settings, audio recorders could not be used. Consequently, extensive field notes were taken during the research and these were immediately written after each session. As data collection in the third case study was conducted in the home, audio recorders were used to record conversations between parents and researcher. These were transcribed immediately after each session.

3.5   Data Analysis

Thematic analysis, a common approach to qualitative data analysis, was used across all case studies in this thesis. Bryman (2008) states that the search for themes can be discerned in most approaches to qualitative analysis, such as grounded theory, critical discourse analysis,

and narrative analysis. In this sense, thematic analysis can be hardly considered as a distinctive cluster of analysis. Yet, where an approach like grounded theory ultimately seeks to contribute to our understanding of theory, thematic analysis instead focuses on capturing and explaining data in a meaningful way. Thematic analysis in this thesis followed the approach advocated by Braun and Clarke (2006). They provide structured guidelines for conducting thematic analysis, involving familiarising yourself with your data to generate initial codes, organising these codes into initial themes, reviewing themes, defining and naming themes, and producing the report. At the conclusion of each case study, all field notes, transcriptions, and images were gathered together and coded. These codes were gathered together in to initial themes, reviewed, refined, and distilled repeatedly before arriving at the final themes documented in the case study chapters.

3.6   Summary

This chapter has detailed the research methods chosen and has provided a rationale behind the methods chosen. It has also elaborated upon the methodology of this study, highlighting potentials strengths and limitations. In sum, a qualitative approach was taken with dialogue at its centre. This allowed for an understanding of parenting and play to be uncovered while coping with the challenge of conducting research in a setting where children are present with the parents. Through a thematic analysis, a rich understanding of parents' lived experience, the challenges they face in terms of play, and what it means for them are highlighted. The following chapter presents the findings of the case studies.

Chapter 4. Exploring Play in the Children's Hospital

4.1   Introduction

In chapter 2, it was shown that play is crucial to children's healthy development and helps children to explore and adjust to an unfamiliar world around them. In this chapter, I explore how children play, whether that is playing alone, with a parent, or the play specialist employed by the children's hospital.

That hospitalization is a difficult time for children is well documented. Research has shown that time spent in hospital results in immediate decreases in the patient's wellbeing (Coyne, 2006), while also hampering their potential to recover from illness (Melnyk, 2000). Hospitalization serves to disrupt the normal life of the child (Forsner, Jansson, & Sørlie, 2005), causing confusion as the patient faces what may appear to be a threatening environment (Coyne, 2006; Gammon, 1998) and this is often exacerbated by the provision of limited information to help them better understand the environment (Coyne & Kirwan, 2012). Hospitalization also brings separation from friends and family, causing increased anxiety as the young patient may miss the social support they are accustomed to (Coyne, 2006). This brings about loneliness and sadness at their inability to share their experience in hospital with their family and close friends and a fear that they will remain isolated (Forsner, Jansson, & Sørlie, 2005). Therefore, hospitalisation can have a significant impact on the wellbeing of a child, beyond the effects of their immediate illness.

Play serves an important function for children who must stay in the hospital. It is considered to provide a platform for children to deal with confusing or uncomfortable feelings through acting them out in the process of play (Piaget, 1951). It enables children to explore additional outcomes to the situation they are in, ones which may be more appealing (Wilson & Ryan, 2005). Its potential as a support to wellbeing is probably best exhibited by the advent of play therapy (Axline, 1947), a form of therapy that proffers play as the medium through which children can best express and understand themselves. This work suggests play is a viable mechanism to support the wellbeing of children. Consequently, it has long been recognised as an important support to wellbeing within hospitals. It is considered particularly beneficial for young children, as it enables them to overcome the emotional and psychological difficulties than can result from a hospital stay (Patte, 2010). Given the importance of play for children who must stay in hospital, this may prove a viable area of research and design for HCI. However, as a first step, it is important to understand how children play in hospital.

In this chapter, the nature of children's play is explored in a hospital setting through the evaluation of Magic Land, a digital technology that supports children to make and tell

stories (Pykhtina et al., 2012). Magic Land was deployed in a playroom of the Royal Edinburgh Hospital for Sick Children for a period of 12 weeks. Analysis of log data and observations and interviews gathered in weekly visits to the hospital highlighted that children preferred to play with Magic Land. However, their opportunities to do so were limited by the play specialist's discomfort with technology. Furthermore, making and telling stories through Magic Land also appeared to enhance the wellbeing of the children who were observed playing with the system alongside the play specialist (Marshall et al., 2014). Finally, reflection on conversation with the play specialist and parents highlighted that many parents find it difficult to play with their children.

4.2 Method

Magic Land was deployed for a period of 12 weeks in the inpatient playroom in the Royal Edinburgh Hospital for Sick Children. The system consists of four applications that were designed to provide new opportunities for play through this making and sharing of stories (Pykhtina et al., 2012). It makes use of a touchscreen display to provide four toys for children. The first is *Flying Feathers*, which seeks to support both creative and emotional expression. Second, *Rosebush* facilitates storytelling. The third application, *Hero*, enables fantasy play as children create their own superhero character. The fourth and final application, *Water,* provides new playful opportunities with digital water and fish. The system also had a microphone and an audio recording feature, where the children were asked to provide feedback on Magic Land.

Magic Land adopted an approach of designing for the children. In other words, a pre-existing technology was deployed within a play room on the hospital to better understand how children play in the hospital. The researcher would visit the hospital once per week, observing play sessions both analogue and digital, interviewing the play specialist, some parents, and their children. In this sense, the participants were users of the system, whom research was being conducted on to inform our understanding of how they play in the hospital rather than partners in the research to actively co-construct the understanding together (Simonsen & Robertson, 2012).

Figure 4.1. Magic Land installed in the hospital playroom.

Magic Land was deployed in the playroom of the inpatients ward, a small square room full of toys and vibrant colours (Figure 1), with a rocking horse sitting just outside the door to the room. A small round table sat in the middle of the room, with four low chairs placed around it for children to sit on. A play mat was placed on the ground at the bottom of the room, underneath the window, with a collection of toys placed all around it. Some books stood on a small bookshelf against the back wall of the room. Paintings and drawings created by the children adorned the remaining wall space of the room. Above a toy oven, hob, and sink was a noticeboard, where the play specialist could share any important information about the hospital radio station or upcoming events with the parents and children. The touchscreen was affixed to the far wall, away from the door, at a height suitable for a young child to stand in front of and interact with it. This was connected to a desktop computer, which was stored in a locked, floor-level wooden cabinet to the left of the screen. A microphone rested atop the cabinet, beside an information sheet that explained the purpose of Magic Land, how to record feedback, and how to delete it if required.

4.2.1 *Data collection*

There were three aspects to data collection, including log data, observation of play sessions, and interviews with the play specialist and families. Data collection occurred over a 12-week period where I visited the children's hospital once per week. Each visit lasted for three hours and involved a mixture of observation of play sessions and interviews with the play specialist and families of children staying in the hospital. Ethical approval was granted through the Royal Edinurgh Hospital for Sick Children. The project was identified as a service evaluation, meaning that research was not being conducted. Consequently, approval was provided by the Clinical Director to conduct the evaluation, with internal approval also granted by the Faculty of Science, Engineering, and Agriculture at Newcastle University.

4.2.1.1 *Log data*

Log data of all interaction with Magic Land was recorded. This was screenshots, taken every time something new was added when using one of the applications. Time and date-stamps were also recorded for each new screenshot. Log data was recorded locally on the device and downloaded to a USB key once per week when the researcher visited the hospital.

4.2.1.2 *Observation*

During the 12 weeks of the deployment, I observed the play specialist engage in 18 play sessions between with 12 different children. Six of these play sessions involved Magic Land and 12 were play sessions involving analogue toys or craft materials. The children ranged in age from 4-years-old to 11-years-old. One of the children was involved in two play sessions, another was involved in three play sessions, and a third participated in four play sessions. The playroom was often quiet during these visits, depending on the children and the severity of their illness, with four visits not having any children in the playroom. Observed play sessions lasted between 7 and 35 minutes in total. Observed play sessions with Magic Land were shorter, with duration between 7 and 16 minutes. I also observed two moments of play between parents and their children in the playroom. These, however, were of significantly shorter duration, one lasting for just 2 minutes and the other lasting for 5 minutes. Field notes were taken throughout the observation sessions.

4.2.1.3 *Interviews*

A weekly interview was conducted with the female play specialist to explore use of Magic Land throughout the preceding week. These interviews also sought to understand how she used play with the children, the types of play she felt were most valuable for the children in

the hospital, how parents used the playroom with their children while in the hospital, and new opportunities for how technology might support her play practice with the children. Interviews with the play specialist lasted between 13 and 37 minutes depending on her work schedule and were prone to sudden interruption from a child, parent, or staff member walking in to the playroom to speak with the play specialist.

Interviews were also conducted with 6 families in the playroom and these were conducted while the play specialist played with the child. In four of these instances, it was only the mother present. However, in two cases fathers were also present. Interviews lasted approximately 15 to 20 minutes and mostly involved speaking with the parents, with the child sometimes joining the conversation. These interviews focused on how their children liked to play at home and how this differed to their play in the children's hospital, how the parents play with their children, and their perceptions of Magic Land if they had seen their child use it. Given that the interviews were conducted in a public space where other conversations occurred, these were not audio recorded. Instead, detailed notes were taken during the interview and written up immediately after the visit to the hospital. Data was subsequently analysed using a constant comparative method and followed an open coding approach (Glaser & Strauss, 1967). Related codes were grouped together and distilled into appropriate thematic headings. These heads are illustrated through a series of vignettes and supplemented by direct quotations from the data.

4.3   Findings

In this section, I describe the findings from the 12-week deployment of Magic Land in the children's hospital. It illustrates that Magic Land was often used by the children but rarely when the play specialist was working given her discomfort with technology and preference for traditional arts-and-crafts-based play. I highlight the differences between the more child-led play with Magic Land and the play-specialist-directed analogue play. Finally, I present initial evidence suggesting that, for some parents, playing with a child can be very difficult.

4.3.1   *Log data*

The log data shows 51 unique uses of Magic Land over the 12-week period. Of these, 8 uses occurred between 9.30am and 5.30pm on weekdays, during the play specialists working hours. The remaining 43 uses occurred outside of the play specialists working hours, either early morning or late evening, or during the weekend. Examples of the screenshots are included in figure 4.2. While the log data was also time-stamped, this included only the hour and minute, meaning that duration of use can only be approximated in minutes. However, the

shortest play with Magic Land lasted for one minute, while the longest was of 49 minutes duration. The average duration of use was 14 minutes. The log data also showed that Magic Land was often used early in the morning generally between 7.30am and 9am or late in the evening and night, with times of use shown as 6pm and 11.30pm. On two occasions Magic Land was used in the very early hours of the morning – once for 11 minutes between 1.10am and 1.21am and another time for 7 minutes from 0.57am and 01.04am.

Figure 4.2. Screenshots of stories created by children from the log data.

Eleven audio messages were also recorded on Magic Land, with only two of these being recorded during weekday working hours. These audio messages lasted between 4 seconds and 15 seconds. While originally envisaged as a way for children to provide feedback on their use of Magic Land, the audio messages recorded became a form of play in itself. While 3 of the messages involved a child saying "hello" before quickly pressing the stop button, the remaining eight 8 audio recordings were of children singing different pop music songs into the microphone before dissolving into laughter and pressing the stop button. These eight audio recordings occurred over two days in one week between 7.30pm and 10.30pm.

4.3.2 *How children play*

The observed play sessions with Magic Land provided rich insight in to how children play. Normally, in these play sessions, the play specialist would be sitting in front of the touchscreen, with another chair beside her. The children would move between sitting in the chair and standing in front of the screen to play with Magic Land and creating and telling stories through interaction with the system. It was noticeable throughout this deployment that the play specialist was not comfortable using Magic Land and was especially concerned that she would not be able to correct any mistake that she may make. As a result, the children led the play when interacting with Magic Land and focused on creating increasingly complex stories that they shared with anyone present in the room during the session.

One observed Magic Land session involved Sarah, a 9-year old girl who had to stay in the hospital for a few days. Her play with Magic Land lasted approximately 20 minutes, with Sarah and the play specialist sitting together at the touchscreen, while her mother, Orla, and the researcher sat at the small table behind Sarah. Sarah creative engagement with Magic Land involved both creating and telling stories. She used the *Rosebush* and *Water* toys to create and perform some very imaginative stories. This started off by her selecting the *Rosebush* toy, carefully browsing the in-built images, and choosing an image of a chicken. She created a new story, telling the tale of the chicken boarding a plane and going on holiday to America and of him sitting on the wall at Sarah's friend's house, turning to her mother while pointing at the screen to illustrate where he would be sitting. At this point, Sarah's mother asked if the chicken had visited Emma's house, saying that Emma is Sarah's best friend and lives close to their home, before telling her that Emma will visit with her mother soon. Sarah agreed that it was Emma and said she missed sitting there with her. Sarah then chose the *Water* toy and added some fish to the water. She then paused briefly, wondering aloud what she should do next, before choosing to add some thunder and lightning. On

hearing the sound of thunder, Sarah turned to the play specialist and began to talk about her brother, how he is scared of thunder, and always hides when he hears it. After being asked by the play specialist whether she missed her brother, she quickly answered yes, turned back to the screen, and closed *Water*.

Similarly, when observing Keir, a 10-year-old boy, who had to stay in the hospital for a few days each week over a period of three weeks, it was clear that playing with Magic Land enabled him to create stories and express himself through those stories. Keir was a frequent visitor to the playroom during the deployment, playing with Magic Land alongside the play specialist on three different occasions, with each lasting between 15 and 20 minutes. Keir's play focused on the *Hero* application only. After he chose the male character and selected the cape image for him to wear, the play specialist turned to Keir and asked him whom this was. In a quiet voice, eyes still trained on the *Hero* character while scrolling through the images he could add to his superhero, Keir responded that it was him. Keir's mother, Samantha, who had been sitting slightly behind Keir and the play specialist, leaned forward to ask him what his super power is. Pausing briefly, he thinks aloud, turns around and notes that his cape makes him invisible. He shares how he is afraid of a nurse who tells him off sometimes for being out of his bed when he should be resting and that if she could not see him, he could move around more. Turning back to *Hero*, he looks through the other pictures he can add and finds a pair of wings. Adding these to his character, he excitedly says that he wishes he could escape sometimes because it is boring and how, with these wings, no one could stop him. On adding the wings to his character, Keir begins to tell a story about how he would put on his cape, become invisible and sneak out of the hospital in a way that no one could see him. Asked by the play specialist where he would go, Keir adds a winged creature to his *Hero* character (see figure 3), saying how he would use his wings to fly home because he misses Rex, his family's dog. Keir continued to talk about how he wishes he could just fly home to play with Rex before the play session comes to an end when another staff member comes looking for the play specialist.

Figure 4.3. Image of Keir's *Hero* character and companion.

While Sarah and Keir were similar ages (9 and 10, respectively) and among the older on the ward, the younger children who interacted with Magic Land also used it to create and share stories and were directing the play session while doing so. Tara, who was 6 at the time of the study and had to spend one week in hospital, played with Magic Land alongside the play specialist while her parents, Joanna and John, and I sat at the table behind them. Tara's play session was much shorter than Sarah and Keir's session, lasting just 8 minutes in total. Tara's creative engagement with Magic Land focused mainly on the *Water* application and she used it to tell all those in the room about her home. Selecting the *Water* application, Tara quickly turned around to her father and telling him that it's just like their garden. While still looking back to her parents, the play specialist asked Tara if they had a fish tank at home, like they do in the hospital. Tara seemed unsure of the question and remained looking at her parents before her mother intervened to say "it's like the water at home Tara, isn't it? Like the pond?". Tara's mother, Joanna, quickly talked about how they have a covered fish pond in their back garden and that Tara loves to go there and watch the fish. Turning back to the screen, Tara notices that fish can be added to the *Water* application. Slowly counting, she adds three fish to the application and talking about her three favourite fish. At this point, Tara pauses for a few moments to watch the fish travel across the screen, running her finger across it and causing a ripple in the water. Turning to the play specialist, she tells her that she has three fish, which are called Nemo, Garfield, and Sunny. Tara talks about how, every morning, she runs out to the fishpond to say good morning to them and how she always helps her father, John, feed them. As Tara speaks about how she likes to watch the fish and talk with them, her father,

John, realises the time and reminds Tara that they need to go for a scan. Prompted by Joanna, Tara turns around and closes the *Water* application.

These vignettes illustrate the importance of creating and telling stories in children's play. In the three examples, the children led the play and were able to construct any narrative they wished, while the play specialist sat alongside them, encouraging them and talking to them about what was happening. Common in each case was that the child used the story to talk about their own lives or something they missed while having to stay in hospital. Sarah's story revolved around her best friend and her brother and communicated how she missed them. Similarly, Keir's story revolved around how he wished he could be invisible so that a nurse who frightens him cannot see him. He also shared a story about his dog and how he wished he could fly home just to see him. For Tara, she shared a story about her life at home while playing with the *Water* application, talking about how she enjoys running out to the fish pond, and the names she has given to the fish. Ultimately, these stories show the children to be making and telling stories that help them to make sense of the environment around them or to share aspects of their home and life that they are missing while in the hospital.

Despite this, the play specialist was not comfortable using Magic Land and did not consider it to be a useful addition to the playroom. During one interview with the play specialist, she noted how it had not been used during the week, at least when she was there:

"That hasn't been turned on at all this week. I don't think the children really like it, they just end up standing in front of the screen looking at it. So I don't really use it at all. I don't mean to offend you but I don't think it's as good as all, I guess, old-fashioned play. It's much better for the children to get their hands dirty or to be painting something and making something. And then I can get right in beside them and work with them while they are doing it, even just to help them or talk to them".

This negative perception of technology-enabled opportunities for play continued throughout the deployment. Towards the later stages of the deployment, the play specialist started to ask how much longer Magic Land would be in the playroom:

"Do you know if this is going to ward 3 soon? Maybe it will be better there because they have a bigger playroom. Here it's just sitting in the corner and getting in the way. I'm sure it is good but here it just doesn't get used much and I don't think that it is right for what the children here need".

This perception of right led the decisions the play specialist made in terms of how she played with the children. She believed that because the children were only in the hospital for a few days, feeling that there was someone there they could be with and who could distract them from whatever they were facing was most important. As a result, she valued what she termed more simple activities, where unlike with Magic Land, she knew how to fix any mistake that one of the children made:

"I don't really think they need to be doing anything too challenging or different. It's just about them having someone beside them, feeling like they are not alone and being able to distract them. It has to be simple and I think that, if they make a mistake on that screen [pointing to Magic Land] and I can't fix it, then it isn't going to help them and might just make them upset".

In sum, despite the children being comfortable making and telling very creative stories through the new opportunities for play provided by Magic Land, the play specialist remained very reluctant to use it. While the play specialist believed that the system was not really used on a weekly basis, the log data illustrated that children often played with it early in the morning or late into the evening. She believed more traditional, analogue play activities were more useful for the children as it enabled her to be actively involved in working with the children, talking to them, connecting with them, and helping their adjustment. However, as the next section illustrates, the children demonstrated much less control in these analogue play sessions when compared to the digital play sessions with Magic Land.

4.3.3 *Different preference for play between the play specialist and children*

There was a noticeable difference when play was child-led, such as in the vignettes above, compared to when the play specialist led it. The previous section detailed three of six observed play sessions with Magic Land involving a child and the play specialist. Common across all six of these was that the play specialist would sit beside the child and either offers words of encouragement or would ask the child about what was happening in their play. The child, then, had control of the play and was able to shape it as they wished. This occurred because of the play specialist's discomfort using technology. Yet, this made up only one-third of the observed play sessions. The remaining 12 play sessions focused on more traditional, analogue methods of play, particularly using arts and crafts, and these offered little creative freedom for the child.

One traditional, analogue play session involved Kayla, an 11-year-old girl who had to spend more than three weeks in the hospital. The deployment occurred during the summer months and one fieldwork trip to the hospital occurred on a particularly warm summer day. While sitting in the playroom, the play specialist saw Kayla and her mother, Sandra, in the hall and asked Kayla if she would like to come in to play. As Kayla walked in to the room, she was greeted by some paints and paintbrushes placed on the small circular table in the middle of the room. Once Kayla was sitting at the table, the play specialist placed a small box containing different shapes cut out of paper. Given the warm weather, the play specialist had spent the morning cutting the out the shapes of toys that children would use on the beach, such as buckets and spades for digging sand. After putting these on the table, the play specialist turned to Kayla and asked her which shapes she would like to paint, quickly handing her one of the buckets before she had time to answer. Kayla looked down at the bucket in front of her and slowly reached for a paintbrush. At this point, the play specialist asked Kayla which colour she would like to paint it, suggesting red because Kayla had previously told her it was her favourite colour. Without saying a word, Kayla moved her brush towards the red paint and began to quickly colour the bucket. As Kayla wordlessly finished colouring the bucket shape, the play specialist placed beside her one of the paper spades she had already cut. Kayla quickly looked up at the play specialist and waited for instructions about what she should do. The play specialist, looking at the colours said that maybe yellow would be nice, while complimenting Kayla for how well she painted the red bucket shape. Again, Kayla quickly and wordlessly reached for the yellow paint and completed both shapes in less than 5 minutes. After being asked by the play specialist if she wanted to paint some more, Kayla shook her head and quietly left the room to find her mother again while the play specialist began to clean off the paintbrush.

The summer beach themed painting activities continued a week later on my next fieldwork visit to the hospital as the good weather continued. Once more, the play specialist had cut the same summer shapes out of paper and placed them on the circular table in the centre of the room with some paints and paintbrushes. During one interview with the play specialist in the playroom, Chris, Liz, and their 4-year-old daughter Elspeth wandered in to the playroom. After quickly realizing that Chris and Liz had been waiting with Elspeth all morning with no break, the play specialist suggested Elspeth join her in some painting while her parents find something to drink. Once Elspeth was settled at the table, the play specialist placed the bucket shape in front of her and encouraged her to start painting it. Sitting beside Elspeth and leaning in close to her, the play specialist asked her what her favourite colour is. When Elspeth quietly whispered yellow, she suggested that she paint the bucket that colour.

Moving the paints closer to Elspeth, she reached out with her brush began slowly painting, trying to stay inside the lines. As she was coming to the end of painting the bucket, the play specialist placed another one on the table beside her and encouraged her to paint another one red, given how nicely her yellow one had turned out. With the play specialist guiding her, Elspeth dipped her brush in some water, gathered some red paint, and began to paint the second bucket. Throughout this time Elspeth remained quiet, even sitting silently not doing anything when one of the play specialist's colleagues came in to speak with her.

These prescriptive play sessions continued throughout the deployment of Magic Land. When children were playing using traditional, analogue activities, they had limited choice. I observed another play session with Ben, a 6-year-old boy who had to stay in the hospital for 5 days. Ben was moving around the playroom, looking at the different toys that were in the room, lingering at the rocking horse. Ben's parents, Audrey and Alan, sat on some chairs running along the wall of the room, underneath what appeared to be new paintings that had been made by some of the children during the week. These paintings all depicted different types of flowers. Noticing Ben moving around the room, the play specialist invited him to come and sit with her at the table and to do some painting with her. Encouraged by his parents, Ben moved to the table and sat beside the play specialist. Pointing to the paintings on the wall behind his parents, the play specialist asked him if he had seen them and explained how the children on the ward that week had been making paintings of flowers that that they could stick on the wall and bring more colour to the room. Placing some paper in front of Ben and bringing the paints and paintbrushes closer to him, she suggested that he too paint some flowers. Pointing to the paintbrush, Ben was encouraged to pick it up and start with a green stem. After saying okay, Ben moved his brush towards the green paint and began with the stem. Once the stem was completed, Ben paused and looked at the play specialist, who suggested he dip his brush in the water to clean it. She then asked Ben what colour he would like to use for the flower itself, who then paused and looked to his mother, before suggesting red. After painting a red circle at the top of the stem, the play specialist encouraged Ben to draw the sun shining in the top of his painting, using some yellow paint. Guiding his hand towards the water and then on to the yellow paint, Ben quietly painted the sun in the upper right hand corner of his painting. This process continued for another 5 minutes as the play specialist guided Ben to paint four different flowers. Once he had finished, the play specialist said she would let it dry and that he should come back later to see his painting stuck up on the wall. Ben nodded his head before moving to his parents, who thanked the play specialist and got up to leave.

The three vignettes presented here highlight how the children, when engaged in more traditional, analogue play in the children's hospital had little control over the play and were not able to take the lead in expressing it. Instead, play occurred in these instances in a highly prescriptive pattern, shaped by the play specialist and carefully directed by her along specific paths. One potential benefit of play in a children's hospital is its potential to support children to feel a modicum of control in an otherwise unfamiliar and frightening landscape. Yet, the examples of play presented above seemed to further emphasise their lack of control, with the children not even able to shape how their own play may occur. While only three vignettes are presented above to illustrate the point, this occurred across all 12 analogue forms of play. The children were provided with a prescribed task and guided through the process of completing it, often only being able to influence the choice of colour chosen when painting. This is in stark contrast to the play with Magic Land, where the children were able to take the lead and direct the play as they wished, given the play specialist's discomfort with technology.

4.3.4 *Struggling to play*

A major finding of this work was that, for many parents, playing with their children could be difficult. This became clear through both the observational work and the interviews with the play specialist and the parents. The playroom was not just a space for the play therapist to use to play with the children. Instead, it was also treated as a space where the children could come alone or the children could be joined by their parents. On one such occasion, Liz brought her daughter, Elspeth, in to the playroom while the play specialist was busy on the ward with one of the children who could not leave her bed. Liz sat in a chair placed along the wall while Elspeth roamed around the playroom, exploring the different toys available. Picking up a small, stuffed toy giraffe Elspeth came over to her mother and handed her the toy, leaning on her knee. Liz immediately thanked Elspeth and placed the toy on the chair beside her. This continued as Elspeth would pick up another toy and bring it over to her mother, who would watch her, and then thank her when handed the toy, placing it once more on the chair beside her. After the third attempt to engage her mother had the same effect, Elspeth appeared to grow bored with the activity, moving towards the play mat in the corner of the room and laying on her back, looking at the ceiling. Here she remained, sometimes reaching out for one of the toys to the side of her, until her father came in after 5 minutes and they all left together.

This vignette raised an interesting issue about Liz's difficulty playing with Elspeth while they waited in the playroom. Given that the family are in the hospital because of Elspeth's health it is plausible that worries over Elspeth's health may have resulted in play not being Liz's priority. However, the interviews with the play specialist and also with the parents

suggested that this may not be such a rare occurrence and that many parents seem to struggle when it comes to playing with their children. The play specialist noted:

"You would be surprised how much that happens and actually it is something that we, me and the other play specialists, have remarked on. A lot of the time, you will get parents who just come in to the playroom and sit on the chairs around the side while their children walk around the room, pick things up, and play with them. It's almost like they think that once they have all the toys, the children don't need anything more, but they still need someone there, an adult or even an older sibling who they can interact with and learn from. We've had some training and have play qualifications and parents might need some training too".

While many of the parents in the hospital may have been distracted by their child's health and wellbeing at the time, this was not considered to explain the difficulties faced when in the playroom. This view was shared by Orla, whose daughter Sarah was in the hospital for a few days. She reflected on what it was like to play with Sarah when she was younger:

"It's different now because Sarah is 9. You saw with the chicken story that she has a very active imagination but now she's better at expressing it. So a lot of the time I am just responding to what she is saying, asking her about it, prompting her to tell me more, sometimes intentionally saying completely the wrong thing to make her laugh. It was much more difficult when she was younger and it gets harder the younger the child gets too. I remember when she was a baby just looking at her and thinking 'gosh, how can I do this?'"

It seemed that many of the parents were relying on the play specialist for help and support, whether that is playing with their child while in the hospital or even being asked for ideas of what to do next. Audrey spoke about how she sought out advice from the play specialist about what she could do with Ben that would be good for him:

"There are definitely times when I just leave Ben in here with her. We've been here for a few days now, and while there's nothing serious wrong with him, it is still draining. So it is really great to have someone here who can entertain him for a bit so that I can grab a coffee. But also, it's not just that. There have been a few occasions where it was just me

and her (the play specialist) talking and I have picked her brain. He's going to be 7-years-old in 6 weeks time and I have no idea what to do with a 7-year-old".

This mentoring seemed to be very important for Audrey and was something that the play specialist also acknowledged, particularly in terms of younger and first-time parents.

"I suppose I always try to look out for the younger ones or the first time parents. You've probably noticed yourself that I am always trying to learn a little bit about the parents who come in here. Are they from here, how many children do they have, or are there families nearby..? I also see myself as a support for the parents who come in here. It might just be giving them a short break so they can have a cigarette outside or get a cup of tea. Or it might be sitting down with them and giving them advice. I always say 'this is what I would do with a 3-year-old or a 5-year-old, girl or boy'. I don't force it on anyone but if someone asks, and many do, then I'm happy to help them. But even that is limited because most parents will just be too distracted thinking about what's wrong or waiting for a doctor".

For Samantha, whose son Keir is 10 and has been in the hospital on-and-off over a 3-week period, she wishes that she had been able to access this kind of support when Keir was younger.

"Keir's dad works away so I'm often left at home with him and our other son, who is 6. And sometimes I can feel like I'm making it up as I go along. So it's nice to be able to turn to someone to turn to. I can just say something in passing to one of the play specialists here, like 'I'm so tired from the hospital and don't know what to do with the boys this weekend' and they'll sit down with me and give me some advice. I really appreciate that. But I suppose the other thing is too when you are a parent here, you're not really thinking about much more than just 'what's wrong with him? What will help him get better?".

This suggests that many parents can find it difficult to play with their children. It is plausible that the parents interviewed in the children's hospital were distracted by concerns for their children's health and this made it difficult for them to play with their children, such as Liz and Elspeth in the playroom. However, to the play specialist, this is not the only reason that parents find it difficult. Instead, it is suggested that parents may think that if children have

access to sufficient toys, then there is little else required. Yet, the play specialists in the children's hospital act as an important source of support for these parents, providing ideas or suggestions of activities they could use with their children. While I was sensitized to this potential difficulty with play during this case study, it was not possible to explore in-depth with the parents what the barriers to playing might be, given that the parents were naturally focused on their child's health and supporting them to get better.

4.4   Summary

In this chapter, I described how Magic Land was mostly used outside of the normal working hours rather than being integrated in to the existing play practices of the hospital's child specialist despite enabling new opportunities for play. The play specialist remarked that Magic Land was rarely used, often with the touchscreen not even being turned on over the course of a week. However, the log data showed that children in the hospital used Magic Land regularly but that this occurred outside of her normal working hours. Despite this, the play specialist was eager for the system to be moved to a different ward, suggesting that it takes up too much space and may be better suited to a different ward where the children stay for longer periods of time. Her discomfort with technology appeared to drive this perception, where she feared being unable to correct a mistake that the children might make when using Magic Land.

In relation to the specific play activities that occur in the playroom, I presented three vignettes of play with Magic Land and play with more analogue materials. The vignettes illustrated a significant difference between how children played while using Magic Land when compared to the traditional analogue methods of play preferred by the play specialist. When playing with Magic Land, the children took the lead, with the play specialist sitting beside them, making and telling creative stories to their audience that reflected aspects of their lives outside the hospital that they missed. The stories they told reflected the people, or pets, they missed while in hospital, and the children decided everything about the story, including characters and narrative. In contrast, when playing with the traditional paper-based materials, the children often sat passively, rarely saying anything and being completely directed in the activity by the play specialist. I highlighted how most decisions were already made for the children in these play sessions, with shapes often being pre-cut by the play specialist for them to paint, or being directed to follow a theme that had governed all painting activities during the week. However, it is also important to reflect on the purpose of the play specialists' work. While she mostly plays with the children, a significant aspect of her work is the mental and emotional support that she provides to parents. For example, having a child in

hospital is a very stressful time for parents and they have little opportunity for respite. While playing with their children, taking their attention away, the play specialist offers the parents some invaluable time to themselves to rest and recover. By structuring the play session, the play specialist may be focusing on ensuring that the child is kept occupied long enough to give his or her parents some respite.

This chapter closed with a description of how some parents find it difficult to play with their children and highlights that this can be even more difficult when their children are younger. The play specialist played a valuable role supporting some of the parents, giving ideas or suggestions where possible. However, with most parents naturally focused on their child's diagnosis and health, further probing the difficulties parents face when trying to play with their children was not feasible in this case study. The next chapter, Chapter 5, presents the findings of an in-depth, experience-centred inquiry into parents' play practices with their young children, the challenges they face when playing with their children, and how they seek to overcome this.

Chapter 5. An Experience-Centred Inquiry into Parental Play

5.1   Introduction

The previous chapter highlighted the difficulties that many parents can face when playing with their children. It suggested that parents often feel uncomfortable to play or lack what they think are good ideas that they can use with their children. The play specialists in the children's hospital highlighted how they often act as play mentors to some of the parents whose children stay on the ward, providing new ideas for play that they can use at home with their children. While this was greatly valued by the parents at the time, they were not always able to fully receive the advice that was being presented given that they were concerned about their child being sick in hospital.

This chapter builds upon the previous findings by detailing an experience-centered design (Wright & McCarthy, 2010) enquiry that explored the how parents play with their children, the barriers that may be effecting their play, and the ways in which digital technology might better support parental play with infant children. Children's development occurs through the opportunities for interaction provided by parents playing with their infant on a day-to-day basis (Ginsburg, 2007). While the children in the previous study ranged up to twelve years old, this case study particularly focused on infant children, those under two years old, and was conducted in a 'Little Monkeys' play session a community-based children's centre in the North East of England. This age group was chosen given the vast developmental change that occurs in this stage of life in areas including self-regulation, cognition, and language (Shonkoff & Phillips, 2000) and the crucial role interaction with parents and caregivers plays in this development (Kopp, 1982). Surprisingly, given its centrality to parenting practice during the earliest years, little research has explored how parents play with their infant or toddler children, an omission we seek to address in this paper. There is substantive evidence of the importance of play as part of children's healthy development, particularly in the first two years of life (Bernier, Carlson, & Whipple; McHale & Fivaz-Depeursinge, n.d.; Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004). Large strides can be made in terms of children's development of regulation, cognition, and sociality (Shonkoff & Phillips, 2000), skills that are crucial to their potential to flourish later in life (Seligman & Csikzenthmihalyi, 2014). However, environmental stimulation is needed to foster this development and this is often provided through the everyday moments of play between parents and their infant children (Maccoby, 1992). When a parent plays with their child, they are providing a rich sensory environment for the infant to act upon, supporting their growth and development. Play enables the infant child to practice new skills, perform new roles, and

experience their environment in a safe way (Axline, 1947). Evidence for this is provided by studies of children raised in institutional settings (e.g. Nelson et al., 2007). These illustrate that infant children need a stimulating environment created by consistent and close interaction with a loving caregiver to fully reach their developmental potential (Maccoby, 1992). Without this environment, children can experience developmental delay, which has the potential to negatively impact outcomes across the lifespan (Nelson et al., 2007).

Early intervention programs, such as the Early Head Start in the United States (Zigler & Styfco, 1995) and the Sure Start program in the United Kingdom (Glass, 1999), recognize that the development of cognitive, emotional, and social skills can be changed in children (Bloom, 1965; Bronfenbrenner, 1986). The Early Head Start program provides services that are either home-based, center-based, or a mixture of both, depending on community needs (Raikes & Love, 2002). Thus, no two Early Head Start programs are alike given the specific needs of the community they are situated in. These programs seek to work with expectant mothers and children up to three years of age. The UK-based Sure Start Local Programmes are community-based projects incorporating different agencies, including health visitors and play workers, and situated in disadvantaged areas of England (NESS, 2007), working with children from birth to four years old. A significant focus of this is to encourage and support parents to better with their children so as to provide the rich sensory environment needed for their development (Anning & Ball, 2008). For example, play has been identified as a central focus for these interventions and mothers who participated in Early Head Start programs in the United States were shown to be more supportive and sensitive to their children and more likely to encourage play to provide the environment necessary for children's cognitive development when compared to a control group (Raikes & Love, 2002). Specifically, parents engaged in the Early Head Start program were more supportive than control parents, showing greater response to children's bids for attention, facilitating learning while playing, and being accepting and positive towards the child. Similarly, their children were also found to perform better on standardized assessment of cognitive development than a control group at 2 years of age and to have lower levels of aggression (Raikes & Love, 2002).

This case study was conducted over a period of nine weeks and involved a total of ten parents, including one couple, and four centre volunteers as they met in regular 'Little Monkeys' sessions at the centre. During this time, I conducted experience-centered fieldwork and participatory activities with the parents in order to understand their experiences of being a new parent (or supporting new parents) and the ways in which they communicated with their child(ren). This work with the parents highlighted the ways in which they used the 'Little Monkeys' session as an opportunity to learn activities they could use throughout the day to

pass the time when caring, alone at home, for their child. This proves especially important as it is also noted the ways in which many new parents felt inhibited from playing due to fears over how to play, whether it is correct to play, and finding the time and energy to play. However, some novel uses of technology to engage in communicative play with an infant also emerged during this work, such as taking a self-portrait with their baby as a way to be physically close and share eye contact and attention. Finally, it is also shown how technology makes a positive contribution to the mothers' lives despite having some frustrating experiences when using technology or feeling judged by others for using it.

This chapter begins by introducing the context within which the study occurred and describing the experience-centred design approach that was followed. I then detail the findings from the study, describing how parents play with their children, the difficulties they encounter, how they use the *Little Monkeys* session as a way to find a mentor from whom they can learn, and their perceptions of technology. The chapter concludes with the identification of four design requirements for digital technologies to support parents to play with their children.

5.2 Method

In our experience-centered design enquiry we sought to understand the lived experience and knowledge of the parents we met by engaging them in conversation and group dialogue around their experiences of parenthood (Wright & McCarthy, 2010). Our enquiry was based in Cindertown Children's Centre. Cindertown is a former coal-mining town in the North East of England. The Children's Centre opened in 2006, and caters for local families with children aged under 5. The area within which Cindertown is located is characterized by extreme disadvantage (NESS, 2007). The centre provides access to a number of targeted services for local families to improve outcomes for children in the area. The centre serves people from all backgrounds, provided they live within the locality of the town.

The *Little Monkeys* case study adoped an approach of designing with the participants to actively co-create an understanding of parents' lived experience, the challenges they face, and their strategies to overcome this. This was achieved by positioning myself as researcher and volunteer, helping staff to prepare for the play session by chopping up fruit, cleaning tables, laying out toys and greeting parents. Through these activities, I established a close relationship with the staff members in the play centre. This resulted in the staff members becoming comfortable to joke with me both privately and in front of the parents, positioning me more as one of them than as the researcher there to understand a topic. Consequently, I developed a similar, close relationship with many of the parents, reaching the point where

they would use their stories and experiences to teach me about what it is to be a parent. This was emphasized through their stories either starting or ending with *"it's all ahead of you, Kevin"*. Through this, I was able to work closely with the parents to actively co-create an understanding of what it is to be a parent and the challenges they face.

5.2.1   *The 'Little Monkeys'*

During our time at the centre we joined the *Little Monkeys* sessions, a playgroup open to children under 18 months that ran for 90 minutes every Thursday. The sessions are informal with families able to drop-in as they wish without needing to commit to regularly attending (Figure 4). However, during our time attending the Little Monkeys, nine families regularly attended the group each week, with up to 11 further families attending some weeks. Normally, the group would mostly consist of mothers and children, although on four occasions both mother and father came along with their child, and on one occasion a grandmother attended with her grandchild. Two fathers also regularly attended alone with their children. While the majority of the parents attended voluntarily, some had been referred by local services and directed to attend the sessions.

Figure 5.1. Parents and children playing during the *Little Monkeys* Session.

5.2.2 *Photo taking and sharing workshops*

My involvement at the centre came in the form of three researchers taking part in the Little Monkey sessions for nine consecutive weeks. Our engagement in the sessions took two forms. First, I participated in the sessions as welcome outsiders—engaging in conversation with parents around their experiences of parenthood and their lives more generally. Such conversations benefitted from the personal circumstance of the researcher. As a young researcher who does not have children, my understanding of parenthood was very limited. This enabled the parents to use my presence at the sessions as a way to teach me about parenting, with the dialogue between the parents and researcher often ending with the parents saying, *"it's all ahead of you"*. It seemed as though the parents could comfortably speak about their experiences as a way of increasing his knowledge of parenthood.

Second, I sought to encourage dialogue and reflection around parent-baby communication and parenting practices through a series of photography activities. I chose photography as it has been demonstrated as being useful in engaging participants in meaningful reflection around specific experiences through powerful means for promoting storytelling and reminiscence (Crabtree, Rodden, & Mariani, 2004). Furthermore, collaborative photo taking and sharing activities have been noted to promote personal and social ties (Fleck & Fitzpatrick, 2009). The latter was particularly important given that one goal of the Little Monkeys sessions was to enable parents to meet other local parents. Photographs also seemed an appropriate medium for the participants, as they are an important component of how parents mark a child's life and share development with family and friends. I also sought to incorporate video activities as a research tool as it was considered that videos might provide the researchers with a more detailed understanding of how parents actually engaged with their children when compared to photographs.

All of the workshop activities were conducted as part of the sessions, with parents able to freely join in or leave as they, or their child, desired. Activities in these sessions focused on parents' developing photographic skills, such as lighting and framing shots using their own camera phones, and our polaroid cameras. Parents then practiced these skills at home, bringing in photos that included 'self portraits' with their babies, or for example photos of their babies with key family or friends. I then printed these photos in the following sessions for discussion and group sharing. Through the taking, printing, and sharing of photographs, the parents would reflect on the activities their daily life was comprised of when caring for a young baby. These conversations highlighted what was involved in being a parent, the moments of enjoyment that can occur during the day, and the challenges that had to be regularly overcome as a new parent.

Figure 5.2 Two parents talking about a photograph printed during the play session, sharing the story of the photograph.

5.2.3 *Data collection and analysis*

Throughout these sessions at the community center, the three researchers moved between groups of parents, joining in with conversations or striking up new conversations, looking at and talking about photographs they had taken and offering advice on how to take and print them. These conversations, parents telling stories through photographs, and our observations during the sessions provided our data. Following each session, the three researchers immediately met with each other to discuss observations and field notes and identify recurring themes and patterns. Upon the completion of fieldwork at the centre, the combined insights from the notes and follow-up discussions were analysed through a thematic analysis (Braun & Clarke, 2002). Full ethical review was conducted and approved by the Faculty of Science, Agriculture, and Engineering at Newcastle University.

5.3   Findings

This section highlights three core themes, each with a number of sub-themes. In this section, I detail these themes and provide an understanding of how parents play with their children, the difficulties they encounter when playing with their children, and their views on technology. It is shown that parents use their smartphones in a novel way to engage in play activities that are

laden with the values of close communication, shared gaze, and physical interaction – the mechanisms through which play supports development. However, it is also illustrated that for many parents, playing does not come easily. Instead, a lack of confidence coupled with a difficulty finding useful ideas results in many of the parents struggling to play with their children. Finally, how technology, especially smartphones, brings both support and challenge to many of the parents is highlighted.

Figure 5.3. Emma, a staff member at the centre, sits in the middle of the room and plays with one of the children.

5.3.1 *How parents play with their children*

Analysis of the data provides a detailed understanding of how parents play with their children, including a novel use of smartphones to facilitate communicative play between mother and baby during the session. The parents value singing as a way to foster very playful experiences for both the mother and baby. Implicit in both of these is how they provide a space for the mother to talk (or sing) to the baby about what they and the baby are doing, while continuing the eye contact, shared attention, and close bodily contact so important as developmental mechanisms in play.

5.3.1.1 *Novel communicative play using a smartphone*

Sarah and Amy are both first-time parents at the age of 23. Sarah, the slightly older of the two, has a 7-month-old son called Joshua, while Amy has a 5-month-old son, David. As well as being a first-time parent, Amy is also dealing with the end of her relationship with David's father. Both mums have been friends for a number of years. They always arrive at and leave the sessions together, staying together for the duration of the group. By the time we met, Sarah had been attending Little Monkeys for two months. Amy was new to the group, with our initial meeting also her first session.

Both Sarah and Amy were engrossed with the polaroid-type cameras that we had brought with us. Neither had used these types of cameras before, and Sarah approached one of the researchers and asked if they could have some photographs taken using the camera. Sarah and Amy then posed for individual photographs with their babies while also posing together for others. While the photographs were being taken David started crying very loudly, making Amy noticeably uncomfortable, her face quickly reddening as she glanced around to see if anyone had noticed. She immediately reached for her phone and began talking to David using complete sentences in a higher pitched, friendly voice: *"David, what is this? It's a phone!"*. While still crying, she led David's attention towards the phone, prompting Amy to continue her description of her actions: *"What will we do...will we take a photograph? Yes, let's do that!"*. Amy continued to narrate her actions as she held David on her knee with one hand, while holding her smartphone, forward facing, in front of them with her other hand. David quieted slowly, ceasing crying as she took the photograph and smiling as Amy held the phone close to him saying: *"look David, who is that? That's you and mummy"*. The whole process lasted no more than a couple of minutes but had the effect of completely changing David's mood and making him content once again. Amy sighed with relief: *"glad he calmed down so quickly"*. Once David had settled down fully and Amy seemed relaxed once more, the researcher asked her about using the process of taking a selfie as a way of calming David. She explained:

"It was something that I just found by accident once. It was about two months ago, we were at home, and he was just crying and crying and I didn't really know what to do. So I just grabbed my phone, which was the only thing near me, and began to take some photos of him. That worked a bit but then I just made it a game or something, I started to just kinda play with him using the phone, talk to him in a baby voice like you just heard and he seemed to really enjoy it and calm down fast. Now it's the first thing I do."

Sarah, who was sitting beside Amy, nodded throughout this story. She added that she too had used this technique with Joshua when he was upset, although she thinks that she began to use it having seen Amy do it with David. As Sarah put it:

"It's just so easy, really. My phone is always right beside me so when he gets upset like that, I can just grab it and start playing "the selfie game" as I now call it with him. It's saved me a lot of trouble already!"

Taking a self-portrait is not solely an effective method of quickly calming a fractious baby. Rather, the act is laden with communication as it results in eye contact, emotional engagement and bodily closeness. This, too, was something the other mothers did. Melanie, Kate, Eva, and Clare always sat together also tended to socialize beyond the session. When the idea of playful selfie-taking was introduced to this group, Clare, a 34-year-old mother to a 15-month-old daughter, Lucy, explained:

"Lucy is a little bit older than most of the kids here so she can be quite direct with what she wants. Sometimes she'll see my phone lying on the coffee table and she'll pick it up and bring it over to me to take a photo of us together. It's probably one of our more common games that we play."

As Clare told her story, Melanie's daughter, Lisa, began to cry. Melanie is 34 years old, with 6-month-old Lisa being her first child. Melanie was sitting on the mat with Lisa lying on her back directly in front of her. Melanie quickly reached for her phone, leaning in close, and in a similarly friendly, high-pitched voice to that used by Amy, said: *"Oh Lisa, you want to show them what we do? Will we do that? Okay!"*. Melanie moved closer to Lisa, shifting between holding eye contact and looking at her phone while saying: *"what's this, baby? A phone. Will I take our photo?"*. Lisa stopped crying as Melanie placed her head beside Lisa and pointed to her phone. Melanie quickly took some photographs, showing them to Lisa and saying: *"Look Lisa, who is that?"*

While a smartphone may sometimes be deemed inappropriate when caring for young children, here we see an example of how its features facilitate communicative play. Taking a picture enabled both David and Lisa to see themselves with their mothers. Amy and Melanie also used the photograph taking activity as an opportunity to talk about what they were doing and what the baby is doing, while continuing eye contact, shared attention, and close bodily

contact. These coordinate to produce a very playful experience for the babies and their mothers, while also providing opportunities to engage in communication.

5.3.1.2 *Singing as playing*

As the *Little Monkeys* session was designated as a play session for children under two years old, it provided a very useful opportunity to explore how parents play with their infant children. The most prominent play activity used in the session was singing. For example, ten minutes before the end of one session, Kirsty said loudly: *"right, who's ready for the sing-song?"* and placed the mats together in the center of the room. The parents and their babies moved to these mats and sat in a circle around Kirsty. The sing-song began with Kirsty choosing a song, beginning to sing it and moving her gaze from one baby to another as she performed the actions to go with the song. The mothers then started singing the song along with Kirsty, each mother following her gestures and maintaining eye contact with her own baby. For Kirsty, the sing-song served two purposes:

> *"It's a useful way for some of the mums who come here to learn some new songs that they can sing. It's easy for me, I've been doing this job for a few years now and also I've had children already. So I know a lot of these but I didn't know any of it when I first became a mum. It can help some of the younger, first-time mums who either don't know any songs or maybe just aren't confident enough yet in what they do know."*

Similarly, Melanie considered singing as one of the most important acts of play that she could do with her baby:

> *"I'm always singing with Lisa because it easily does everything. She hears words, we look at each other, and I hold her arms and legs to make her dance. It's one of the best things any mother can do."*

For the mothers, singing does not simply involve the song. It is an act of play, replete with the shared gaze, physical closeness, and intimacy that decades of developmental research has indicated as the mechanisms that make moments of play such strong drivers of child development.

5.3.2 *Why do parents find it difficult to play with their children*

While the *Little Monkeys* session was filled with the sights and sounds of parents and children playing, this did not always come naturally for many of the parents and there were many reasons for this. Some of the parents did not feel confident in their ability to come up with ideas for play that they considered useful for their child or felt inadequate when comparing themselves to others. This was coupled with the sense that it was hard to find ideas for play. Central to these difficulties was an absence of confidence, feelings of inadequacy, and uncertainty.

5.3.2.1 *What constitutes play?*

While a few mums were confident about what to do with their very young infants, many did not share this sentiment. Kate and her husband, John, have been married for five years and Dylan is their first child. John is a member of the armed forces and spends large portions of the year away for work. He has recently left for another deployment and Kate has found it difficult to adjust to him not being at home to help. One area where Kate really misses John's influence is in coming up with games to play with Dylan. While printing some photographs of Dylan and John swimming together, she spoke about the challenge of actually knowing how to play with her son:

> *"It's meant to be something we just know instinctively but it's not that easy for me. Maybe I'm not that creative but you see it with Melanie. She seems to always have another game, another song, or another idea. I don't know where she gets it all from. My husband is similar but probably not as creative."*

Kate's worries escalate when she thinks too much about what she should be doing with Dylan. She has concerns about the effect of not knowing games or songs that might be good for Dylan's development but then loses time with him while searching parenting websites and forums for new play ideas that she could use:

> *"I'm always searching for new things to do with him. It takes up so much time to find something and often I very quickly rule things out that I don't think I'd be able to do or at least wouldn't do in a way that would be good for him. I've even looked at bringing him to play sessions and play groups, like sensory play, but these are so expensive."*

Kate, however, seemed to be causing her own lack of confidence. She would often

compare herself to the other mothers in the session, and consider them to be natural mothers. Her opinion of herself was less flattering, viewing herself as someone who has so much to learn, and who finds being a parent so difficult. In one conversation, she noted how she was *"sometimes envious of Melanie and how it all seems to come so easily to her"*. Yet, for Melanie, this was not easy. She, too, sometimes doubted herself and what she was doing but she believed it was important that she was just present with her daughter. Kate wants to *"know Melanie's secret, how she is so good at this"*. But Melanie's belief was that responding to her child's interaction, in any way, was important rather than the content of the response. This suggests why Kate, and other parents, may be struggling to play with their children. Kate sought to find the perfect thing to do with her son when it was time to play, while Melanie simply believed it was important to respond and be present with her daughter. This suggests that many parents struggle to understand what constitute play and how they should go about playing with their children.

5.3.2.2 *Missed opportunities for play*

Missed opportunities to play were noted during the sessions. In one session we saw Samantha and John join Sarah and Amy sitting on the mats at the back left of the space. Samantha and John are a young couple, both in their mid- 20s, who are parents to Amelia, a 4-month-old girl. While not close friends, Samantha and Sarah know each other through mutual friends, meaning Sarah provided a familiar face for them to join on their first session. As Samantha spoke to Sarah, John had placed Amelia on the mat in front of him and begun to look at his phone. Shortly after their arrival Amelia began to cry, prompting Samantha to suggest that she might be hungry and asking John to feed her. John placed his phone on the mat and quickly retrieved a bottle from the shoulder bag Samantha had been carrying and picked Amelia up. Holding Amelia on his knee, John positioned her to face away from him, holding the bottle in front of her mouth to begin feeding her. Amelia quickly became quiet while feeding from the bottle, with John remaining silent throughout. Once she had finished, John put her down on her back on the mat, saying *"there you go"*, wiped her mouth and returned to his phone. Shortly after this, Sarah began to feed Joshua who also had become restless. Sarah, too, reached for her shoulder bag and took out a baby bottle. Holding Joshua close and maintaining eye contact with him she began *"guess someone is hungry, right? Mmm what's this Josh?"*. Sarah continued to talk to Joshua while feeding him, occasionally breaking away to contribute something to the conversation ongoing around her. As Joshua came to the end of the contents of the bottle, Sarah said, *"was that nice, Josh? Are you full now and happy again?"*. Sarah then placed Joshua back

on the mat beside David, maintaining eye contact and talking to him a little more, while cleaning his face.

5.3.2.3 *Needing relief, help, and support*

The *Little Monkeys* session provided parents with a chance to gain much needed relief, help, and support. Sometimes this could be quite practical support, such as needing someone to physically look after your child for a few moments. For example, Monica is a 34-year-old mother of a 9-month-old daughter, Alicia, and a 10-year-old son, Oliver. At one session, Monica was concerned about Oliver being unwell while at school. Despite being a little sick, he had still wanted to attend school that day and so she agreed that he could go. However, during the Little Monkeys session, she received a phone call from the school to say that he had become worse. With Alicia due at a doctor's appointment after the session, Monica was attempting to arrange for someone to collect Oliver. While on the phone to her mother, Alicia, who had been sitting on the floor in front of Monica, started to cry. Monica looked away from Alicia to better hear the phone conversation, but reached down and placed a hand on Alicia's cheek and began to stroke her face. However, Alicia became progressively more upset, crying more loudly to get her mother's attention. Kirsty, who had been talking to another parent nearby, quickly moved over to Alicia, sat on the floor with her and began to talk to her and maintain eye contact with her. This calmed Alicia very quickly, allowing Monica to make arrangements for someone to collect Oliver, and return her attention back to playing with Alicia. In other cases, it can be emotional support. For example, when Kate was having a problem with her employer, she was received support from both one of the other mothers and a staff member. Leaving her son Dylan with Melanie for 15 minutes, she spoke to one of the advisors in the children's centre about how to deal with an employer who had altered the hours promised to her. This highlights the complexity of many parents' lived experience as they seek to juggle caring for their child, supporting their development, fulfilling responsibilities to other children and juggling work commitments, and the difficulty in finding relief and support when they might need it. The *Little Monkeys* session offers many of the parents the opportunity to find this support and relief, whether that is from another parent or a staff member and highlights the value of such support in their own parenting practice.

5.3.2.4 *How parents develop skills around play*

Given the challenges many of the parents face when trying to play with their children, the *Little Monkeys* session provided a valuable space where they could find relief, help, and support. This could be offered either by another mother or by a member of staff. For example,

Melanie appears to act as a mentor to Kate during the sessions. In one session we saw Melanie, Clare, and Kate sitting together on the mats, playing with their babies. Melanie started playing with Lisa and saying to Clare's daughter Lucy: *"come on Lucy, will we show everyone the game we play?"*. With Lisa already laying on her back in front of Melanie, Clare placed Lucy lying on her back also. Melanie and Clare began singing a song together, while moving their daughter's arms and legs in motion to the tune of the song that they were singing. While Melanie and Clare sang the song together, Kate edged closer to them with Dylan, to carefully watch what they were doing and gradually mimicked some of the movements. Once the song was finished, Melanie turned to Kate and asked her if she would like her to sing it again, slowly, to teach her the movements. Kate quickly agreed and moved closer to Melanie, placing Dylan on his back beside Lisa. Melanie and Clare went through the song and routine again, more slowly this time, carefully guiding Kate through the routine so that she too could learn how to do it with Dylan.

For Eva, mother of 5-month-old Emily, the issue was more about not having the mental space to devote to finding new play ideas:

"I find that when something is on my mind, like issues with work, or issues with my son, who is 8, or even just when I'm too tired that I really struggle to come up with new ideas. That's when I find it useful being here. I can just join in with whatever is happening. But if I'm ok, happy, and not stressed, then it is so much easier to think of something new to do."

Attending the session also proved a valuable way for Eva to quickly learn some new activities and not need to worry about coming up with something new if she did not feel able to. This search for ideas was a regular aspect of each session in the group. The mothers attending would take time to share with each other the different activities they had found and often engage in these together with their children during the session. This proved particularly useful for those lacking confidence in their own creativity or feeling too pressured to come up with a new idea. They could take these activities away with them and they became an important part of their daily routine at home when caring for their baby.

Technology makes a positive contribution to the mothers' lives by supporting them to share photographs and videos of their babies develop or easily access a wealth of information. However, this could sometimes result in negative experiences and perceptions of technology use. Parents sought to balance sharing content with close family and friends and concerns about control. Frustration also arose when attempting to make video content, which seemed to

require more effort from the parents than photographic content. The parents also reported feelings of judging themselves negatively when accessing parenting forums or being judged negatively by health professionals for any use of technology.

Our findings provide a detailed observational account of how parents play with their infant children, the challenges that many parents encounter while playing with their children, and their perceptions and experience of technology use. We see parents' novel use of smartphones to play with their children and the preeminence of singing as a way to play. Central to both of these activities was shared gaze, talking and communication, close bodily contact that are highlighted by decades of developmental literature as the key mechanisms that facilitate development during moments of play. These vignettes also illustrate the difficulties many parents experience when trying to play with their children: they do not feel confident, cannot find ideas they consider viable, and miss opportunities to play due to being distracted by other concerns. Technology, particularly smartphones, provides easy sharing of developmental milestones and access to information for the parents. However, while many parents wanted to create, share, and consume video content, they considered video-making cumbersome. Finally, many parents were concerned with judging themselves negatively in relation to others on parenting forums or being judged negatively by health professionals for any use of technology while caring for their children.

5.3   Requirements For Design

Four main design requirements can be derived from this fieldwork with parents and staff in the children's centre. From this, I was able to understand some of the challenges that parents can face when caring for very young children on a day-to-day basis. It became clear that at the heart of the session was sharing the burdens of parenting with other, local parents who had similar experiences and backgrounds. Sharing information and knowledge was crucial to the parents who attended the *Little Monkeys* session. They often shared ideas for play together, teaching each other, and learned different activities that they could use to engage their infant child during long days at home. The ideas shared revolved around simple songs or activities that could be played using only very simple toys or making use of household objects as. Consequently, an important design requirement that can be derived from this fieldwork is that technology ought to help parents share ideas for play and learn from each other.

A second design requirement was that it should involve low cost activities that could be made using resources from the home. Many parents used existing parenting forums to search for ideas but were very critical of the ideas presented, suggesting they were too

expensive, unrelated to them or too complex, complaining that they could make them feel insufficient as parents. Many parents also complained about the high cost of formalized play activities, such as sensory play, suggesting that they were not feasible as regular play activities. This suggests an important design requirement for an interactive system designed to support parents to play with their children. Specifically, it should encourage parents to share ideas for play that were simple, required little to no financial expense, and could be easily assembled either from items available in the home or in local, inexpensive supermarkets and shops.

Furthermore, it is important that any interactive system shared ideas from other parents of similar age and background. The parents in the *Little Monkeys* session spoke about how they often used YouTube as a way to search for ideas. However, this often proved to be a frustrating experience. While many videos existed offering guidance, medical, educational, or research professionals in the United States often created these. The parents did not enjoy these videos, considering them to be too long and more akin to being told what you are doing wrong. Instead, the parents wanted to know what other parents, just like them, were doing with their children and how they could make this part of their own play activities. Consequently, an interactive system should bring together parents of similar or shared backgrounds where they can learn from others who are likely facing the same experiences.

A final design requirement relates to the parents' motivations for joining the *Little Monkeys* session, where they could connect with others, share their difficulties, and potentially learn from others' mentoring. While the session was ostensibly a play session for children, it also served as a place where parents could come together, meet each other, and share care responsibilities, with one parent often being seen caring for another parent's baby to give them a break or an opportunity to talk with the staff at the Centre. It was also frequently observed during the sessions that *Little Monkeys* provided a space for the parents to come together and talk about any problems they may be having in their life. This proved particularly important for two parents at the session who were experiencing difficulties planning their return to work and trying to negotiate an appropriate solution with their employers. However, social support was not just valuable when facing specific challenges. Parents often shared their local knowledge together, suggesting possibly interesting activities or events that may be occurring or useful services in the area that other parents may wish to avail of. Additionally, many of the parents simply enjoyed the opportunity to be out of their home and the stimulation of talking to other adults, often finding long periods at home with their child to be lonely. This social support appeared vital for the wellbeing of the parents while also providing them with potential mentors from whom they could learn. Thus, helping

parents connect with other local parents and find social support is an important requirement for the design of an interactive system to support parents' play with their children.

5.4   Summary

In this chapter, I presented the findings from an in-depth experience-centred inquiry in to play in a children's centre. I have explored parental play with infants and toddlers in the context of a play session in a children's centre. For the parents at the centre, play with children under 2 years old tends to involve simple interactions, such as eye contact, shared gaze, touch, and talking. However, the study has suggested that many parents can find it difficult to play with their children and suggested some reasons for this. Parents can lack confidence in their own ideas, wasting time searching for activities they can use and subsequently missing the opportunity to play with their child. Other barriers to play can also prevent this, such as not recognizing a spontaneous chance to play or having other external life concerns, such as work pressure, financial concerns, or needing to focus on the needs of another child.

Reflection on the findings suggests four major design requirements when seeking to design to support parents to play with their children. With the sharing of information and knowledge between the parents so crucial to the success of the *Little Monkeys* session, it is important that any interactive system ought to support parents to share their own ideas with other parents and learn from their ideas also. However, it is important that the activities shared are inexpensive and could be made using resources available locally or in the home. The parents in the *Little Monkeys* session reflected on the perceived high cost of play activities and valued the activities that could be made quickly, simply, and inexpensively. The third identified requirement is that the system should support parents of similar backgrounds or shared experiences to come together, given the plethora of existing resources that the parents could not easily integrate in to their own lives. Finally, it is important that any technology design enables parents to find social support from other parents, whether this is having someone to talk to during difficult moments or having someone who can act as a mentor.

In Chapter 6, I introduce the *Digital Toybox*, a technology designed to probe the space for HCI to contribute to parenthood. This is an online platform where parents can come together, share ideas for play, and learn from each other. The results of a five month deployment of the *Digital Toybox* and evaluation of its use are then presented.

Chapter 6. The Design and Evaluation of the Digital Toybox

6.1   Introduction

This chapter introduces the *Digital Toybox*, a technology designed to probe (Hutchison et al., 2003) how HCI might support parents to play with their children. It begins by describing the design concept of the *Digital Toybox*as a platform that supports parents to share ideas for play, connect with other local parents, and learn from their ideas. The three-phase deployment process of the *Digital Toybox* is then described, outlining how four one-to-one in-home workshops were conducted with parents and their children. These workshops served to engage the participants in the co-creation of the platform also, exploring a prototype design, and suggesting ways of improving it. These also explored the motivations for contributing to an online platform to share ideas for play, understand the types of play they use to engage with their children across the day, gather initial feedback on the design of the platform, and to populate the platform with some content for parents to engage with as they join. The findings from a 5-month deployment and subsequent exit interviews include patterns of use, identifying some of the challenges the parents faced in finding and sharing content, considerations over who they were sharing content with, and the difficulties in maintaining active participation over time, particularly as children moved towards the third year of life.

6.2   Design Concept of the Digital Toybox

The *Digital Toybox* aspires to become a space where parents can come together and specifically share their favoured activities, much as they physically did in the Little Monkeys playgroup. In developing the *Digital Toybox*, the creativity that parents' show in developing activities through which to engage with their child proved inspirational but the difficulties, challenges and lack of confidence that some parents face in undertaking this work remained prevalent. That parents, as has been well articulated in the literature already (Gibson & Hanson, 2013), make use of online resources to find answers on their journeys through early years parenting but these were often considered unsuitable for their needs. In response to this, I wanted to make a platform that would support the creation and sharing of early-parenting resources that would feel familiar, non-judgmental and local to the parents I was working with. There are tensions in achieving this vision that needed to be probed as part of moving forward. For example, while the parents wanted local videos of parents like them showing how to play and engage with their child, they were reticent about sharing these videos with others, and particularly those that they did not already know. In addition, it was a challenge

for parents to create videos of themselves engaging with their infants, as well as hard to remember.

The *Digital Toybox* was designed to probe (Hutchinson et al., 2003) the space for digital technologies in support of the everyday work of parents' engagement with their infants. Something like an 'instructables' for parenting, the Digital Toybox is a simple online platform through which parents can document and share their current favourite ideas and activities for playing with and entertaining their infants, as well as learn from the activities other parents recommend. Parents can choose whether to detail their favourite ideas as either photo-based or video instructions, as well as supplement these accounts with text. The parents can also show their appreciation for an activity by liking it as well as adding commenting underneath an activity provided. The platform can be accessed by registration only, with new members invited by parents or Children's Centers currently using the platform. The design of the platform was iterated through the initial one-to-one workshops, where parents were able to discuss what they would most wish to see. For example, 3 of the parents described wanting a weekly activity, set by another parent, that would be the "Activity of the Week", with each user of the *Digital Toybox* encouraged to make their own post in response to the activity.

6.2.1 *Imagining the Digital Toybox in use*

Hazel had her first child, Sam, 18 months ago. The first year passed by in the blink of an eye, as Hazel found her feet in the daily routine of nappy changes, feeding Darren, and endless visitors to her home. She now feels more on top of the daily routine of care that Darren needs but, with less people coming to the house, she can sometimes find herself at a loss as to what to do with Darren. The words of the health visitor ring in her ears, saying she needs to play with Darren as much as possible, but Hazel always worries that she is not doing enough. She finds it very difficult to come up with ways to play with Darren, losing her focus as she thinks that what she is doing is not enough. She has tried to search for ideas on YouTube but did not like the tone of these videos, which felt more like lectures about what she was doing wrong than the friendly advice and suggestions she wanted. While she used motherhood or parenting forums, she felt that these could often seem competitive and left her feeling worse about her own parenting skills than when she began.

The play worker at her local children's centre recently told Helen about the *Digital Toybox*, creating her profile on the platform, and sending her an email with the web address and log-in details for the *Toybox*. Hazel quickly grabs her tablet, checks the email and goes to the web address. She was surprised to see that there was a lot of content created by other mothers and fathers, who were all around her age and from the same area. She was happy to

see that she was not alone in sometimes needing help finding ideas to play with her son. One post catches her attention, called the "Matching Activity", posted by Amanda, which uses colourful, simple plastic shapes, some paper, and some pens. Amanda's post explains that she bought the shapes in the local Poundland for £1 and that this is a favourite activity for her and her daughter. She decides to try this activity, stopping by the store later in the day to pick up the shapes.

After her trip in to the store, Hazel is very happy having played this new activity with Darren. He enjoyed picking up the shapes, talking to his mom about them, and sometimes mimicking their actions if he recognized the shape, pretending the butterfly was flying around the room. Darren also loves to draw, so he picked up many of the shapes and started to draw around them on the paper, with his mom talking to him and laughing throughout. Seeing how much Darren was enjoying this activity and how easy it was for Hazel to join in and talk with him, she decides to snap a photograph and upload it with a comment to Amanda's post, thanking her for sharing the idea and commenting how much Darren enjoyed himself. Later that evening as Darren sleeps, Hazel logs back in to the *Digital Toybox* to look at some activities for the coming week and notices that Amanda has replied, thanking her for her comment and expressing her happiness that she found it useful. Hazel feels better knowing she has somewhere she can turn to for ideas when she is finding it difficult and hopes to add some of her own as she feels more comfortable.

6.2.2 *Design processes*

The *Digital Toybox* was designed based on the requirements derived from the fieldwork conducted in the *Little Monkeys* play session. Initially, it was planned to deploy the *Toybox* with participants from the same case study. This would have continued the "designing with" approach adopted in that case study, as it was co-created through dialogue with those participants. However, between the design, development, and deployment of the *Toybox*, the children's center went through a period of rapid change. The staff members who had been involved in the original *Little Monkeys* session and so important to the development of relationships moved to other jobs and were replaced with new staff. Additionally, many of the parents from the original session had moved on as their children had passed the age threshold for the *Little Monkeys* session. After initially joining the new staff and families in the *Little Monkeys* session, it quickly became clear that I would need to recruit externally as the staff were not able to facilitate my relationship with the families as they were just building their own relationships with them. Consequently, participants were recruited externally for the

design and deployment of the *Digital Toybox*. This shifted the focus of the final case study from "designing with" parents to "designing for" parents.

6.3   Method

The deployment of the *Digital Toybox* involved three stages. The first stage involved individual, in-home workshops conducted with four parent-child dyads, which were used as a means to introduce the platform, gain feedback on it, and to populate the platform with some initial content that parents could engage with as they signed up. The second stage involved a five month deployment of the platform, with a total of 14 parents engaging with it. The final stage involved exit interviews conducted with five of the parents from the deployment stage. Participants were recruited through flyers posted in children's centres and through adverts on parenting groups on Facebook. Given the delay caused by having to recuit new participants, selection criteria were loosened to include parents of children up to three years of age, living in Newcastle upon Tyne. Full ethical review was conducted and approved by the Faculty of Science, Engineering, and Agriculture at Newcastle University.

6.3.1   *Individual workshops*

Four individual workshops were conducted in-home with parent-child dyads to gather initial feedback on the design of the Digital Toybox, explore potential changes to this design, and also to begin populating the Toybox with content. Participants were four mothers and four children (three girls, one boy; aged 21-30 months). Recruitment occurred through flyers posted in children's centres, nurseries, and cafés around the city and posted on social media.

Figure 6.1. Sally and her daughter sharing some of their play activities with the researcher.

6.3.2 *Procedure*

The workshops involved four main sections, lasted for approximately 2 hours, and revolved around the researcher, parent, and child playing together. The first section introduced the project, explaining the motivation behind it, and describing what had been done so far. The participants also used this time to speak about themselves, their backgrounds, and their motivations for participating in the study and joining the *Digital Toybox*. The second part of the workshop explored the ideas for play that the parent used with their child, where these ideas come from, with the participant asked to share some of her and her child's favourite play activities with the researcher by playing together. In the third part of the workshops, focus moved towards creating content to be used to populate the *Digital Toybox*. During this time, the parent used the platform to record and upload photo- and video- content of her child playing together. This enabled discussion around the types of content parents may desire on the platform, including the types of content previously valued when searching for inspiration for play activities. The final phase of the workshop involved the mother working with the researcher to create an activity challenge that could be shared with other parents on the *Toybox*, asking the parents to attempt to recreate or reimagine the activity in their own way. The participant thinks about one of their favourite activities, breaks it down in to smaller steps, and shares this on the profile. Over the following weeks, the participant and other parents share posts about their own attempts at this activity as a way of fostering engagement

on the *Toybox*. The workshops were all audio recorded, and transcribed, with photographs taken throughout the session. Each workshop was also partly video recorded.

6.3.3 *Deploying the Digital Toolbox*

The *Toybox* was deployed for a period of five months and had 14 participants – four core users who posted new content between seven and ten times each over the course of the deployment, three of whom participated in the initial workshops. Three members were infrequent posters, adding content between three and five times each, including one from the initial workshop. One participant posted new content once across the deployment. The remaining six participants logged viewed content but did not create any new content. Log data was collected throughout the deployment illustrating how often participants used the platform, times and dates of all logins and posts, new content created and number of comments posted,

6.3.4 *Interviews*

Interviews were also conducted at two stages during the study. A first set of interviews was conducted with three participants after the third week of the deployment. At this stage these were the only registered users for the *Digital Toybox*. The interviews focused on understanding the parents' experience of, and motivations for, using the platform, the types of play that had been shared, and their early perceptions of the *Toybox*. These interviews also formed part of the iterative design of the platform. For example, at the third week stage, the parents had begun to comment on each others posts but they also wanted a more direct, private means of communication. Based on this, a function to allow the users to send private messages to each other was added. Interviews lasted for approximately 90 minutes and occurred in the family home with the mother-child dyads. The interviews were audio recorded, transcribed and coded.

A second set of interviews was conducted with 4 parents at the end of the study. These were also in-home interviews, lasting approximately 90 minutes, with both the mother and child present. While all participants were invited to participate in an interview about their use of the platform, only four participants agreed to participate. Three of these participants had been involved in the first set of interviews, with one joining later in the study. The interviews sought to unpick the parents' experience of using the platform, particularly focusing on reasons for adoption, engagement, and disengagement. They also sought to explore the impact of the platform on their parenting practices, particular whether there was evidence of types of play being shared together.

6.3.5 *Data analysis*

This multi-modal dataset was analysed thematically and narrative was applied to synthesize and summarise the data to enable the production rich individual case studies of each participant. These are presented in a semi-structured format and address the participants' motivations for adopting the *Digital Toybox* platform, their use of the platform over the course of the deployment, and their subsequent disengagement from the platform towards the end of the deployment.

6.4   Findings

In this section, I present the findings from the deployment of the *Digital Toybox*. This describes how platform adoption was driven by personal experiences, a desire to help others, and to learn new ideas to help their own child. However, ideas shared tended to take one form, the Activity Boxes, with the tone set from the initial posts to the platform. Towards the mid-way point of the deployment, use of the platform began to significantly tail off as three of the most active participants had begun to socialise beyond the platform. This sections starts by presenting the narrative of Amanda's experience of the platform, followed by Sally, Jessica, and Helen.

6.4.1 *Amanda*

At our first meeting, the initial one-to-one workshop, Amanda was 34 and had been married to her husband, Paul, who was 36, for eight years. Emily, 21 months when we first met, was their first child after many years of trying. Both Amanda and Paul had long wanted children, each coming from a large family and being aunt and uncle to seven nieces and nephews in total. Amanda, Paul, and Emily live in a detached bungalow house, where two enthusiastic Yorkshire terriers, Max and Sam, greet visitors. Stepping in to their home, you immediately step into a child's world. There is a play area at the back of the living room, behind the sofa, where a large green rug allows Emily to sit and doodle on a blackboard that runs the length of the wall. A large toy stove and oven sits against the far wall of the play space, with a children's toy oven, tea pots, teacups, saucers, and plates. There is a small table and chair sitting against the near wall of the play space, with some paper and crayons for Emily to use to draw as she wishes and many small soft toys scattered along the floor. A playpen sits in front of the sofas, positioned slightly to the right of the television, allowing Amanda occasional respite during long winter days at home with Emily, as she acknowledges,

"I'll have to be careful to say it because if she hears it, she'll want to watch it but [leaning in, whispering] Finding Nemo is our best friend here. She loves it and I don't think there's anything wrong with sometimes putting her in the play pen and letting her watch something, especially if I need to get something done urgently".

Emily, however, spends most of her time with the two dogs, always offering them something, whether that is whatever she is eating or some of her toys. Amanda suggests that having the dogs in their home has proved very beneficial for Emily's development and made her a more patient and caring child than some of her nieces and nephews:

"I think we've been quite lucky with Emily and having both Max and Prince. In a way, while she obviously is our only child and our priority, she has had to share our attention to a lesser degree with the dogs. Maybe I'm biased but I think it's made her more open and more considerate. She's not very demanding, especially when I compare her to my brother's little boy. He never stops and is always demanding attention from his mum, whereas Emily seems really able to share attention with others if she needs to".

6.4.1.1 *Motivations for joining the platform: Wanting to help and feelings of inadequacy*

Amanda considers herself as someone who *"just likes to help. If I can do something that I think is good and might help other people, then I'll do it. I like being involved in those sort of things"*. The *Digital Toybox* is not the first academic research project that Amanda has participated in. During her pregnancy, she joined a study in Newcastle University's Medical School where teams of student doctors were assigned to expectant mothers and encouraged to develop a better understand of person-centred care by learning about the mothers' experiences beyond medical aspects of pregnancy and childbirth.

Amanda also has more personal reasons for joining the *Digital Toybox* platform. While Paul works full-time as an engineer for a telecoms company in Newcastle, Amanda returned to work as an Inclusion Support Officer on a part-time basis six months after Emily was born. Her job requires her to work with young people who are either struggling in formal education or who have previously left education, offering guidance and support as they seek to return to education or improve performance. Her working days are Tuesday, Wednesday, and Thursday when Emily is with a child-minder and it is her professional experiences that motivate her to participate in the *Digital Toybox*. Earlier in her professional life, she worked as a progress coach, working with boys who had been labelled troubled. However, she felt that many of the children she worked with were not troublesome but simply had not had the

support, interaction, and opportunity to develop that were afforded to other children. Seeing the *Digital Toybox* as an opportunity to help, Amanda notes:

"I work as an inclusion support worker. It's a multidisciplinary team with educational psychologists and others. I also used to work as a progress coach, which is learning and coaching, in a school for boys with behavioural difficulties, who are boys had been "naughty" ...I'm doing the air quotes but you can't see those on the recorder. And I'm like "hang on, some of these boys really don't need to be here" but they did not have that early experience that could have helped them. I just felt if someone had paid them more attention in those early years, then they wouldn't need to be here".

Her previous experiences had made a significant impact, given that she noticed how many of the boys she worked with had made notable progress when provided with coaching by Amanda and her colleagues. She said,

"some have made some really big progress. They became better in school, more social, less angry behaviour. I'm not saying it's all me, it's not. It's just finally these children had someone who was making an effort, challenging them but also supporting them. It's not the same as if it had happened when they were Emily's age because I think that would have completely changed the way their life went".

This experience means that Amanda places a great deal of pressure on herself to ensure that Emily has every opportunity to develop. During our first meeting, she speaks about the changes she and Paul have made to their home to offer Emily as many opportunities for play as possible.

"My mother thought we were crazy when we got this blackboard put in all along the back wall. She thought we were ruining the house. But I think it's more important that Emily has this place to write and draw, although it has brought some problems, she sometimes draws on other parts of the wall, which isn't so good. I'm trying to prepare her for school and to be ready to enter school. Everything that I do with her is about helping her develop cognitively, so that when she goes to school, she's ready, able to learn, and does as well as possible. That's my sole focus, just making sure she is ready when it comes to school time".

Amanda's focus on her daughter's cognitive development has resulted in her curating several activity boxes, where different resources are gathered together and ready to be used with Emily at a moment's notice. The activity boxes include a sensory box, with items such as scented candles, feathers, and different materials; a colour box, including a variety of items of all different colours; and an arts and craft box, including pens, paper, and an assortment of craft objects that can be stuck to paper or cut to shapes. Amanda is always quick to follow Emily's lead during this first visit to the house, handing down any box that Emily wants to use and joining in with her as she starts to leaf through the items in the box and begin to interact with them. However, despite the wealth of opportunity that Amanda provides for Emily, she still worries that she is not doing enough for her. As she says,

> *"Paul thinks I'm crazy but there is always so much more that I could be doing. I really worry that I'm not doing enough or that what I'm doing isn't good enough. So I'm always looking for advice, searching the Internet. We're the last of our friends to have kids too so I'm always calling them to get their ideas. I use a couple of groups on Facebook and adapt what I can. I'm very lucky because I work with some people who are qualified childminders or play specialists and I always try to get ideas from them too. I'll say it to Paul that I think I need to be doing more but he just looks at me like I'm crazy. I think he's just trying to reassure me though".*

This feeling of inadequacy, that she is not doing enough, has resulted in Amanda making significant alterations to her home. With her work highlighting what can happen when parents do not sufficiently engage with their children, Amanda appears to be always concerned that she is not doing enough and is going to let her own daughter down like others have been before her. It is immediately noticeable that despite the significant changes undertaken to their home and the amount of planning and preparation Amanda has put in to preparing opportunities for play for Emily, she still thinks that she could be doing more. This provides one of her main motivations for joining the *Toybox:*

> *"I am really curious to see what other mums and dads are doing because you can always learn more from them. I don't think I'm good at "playing" with her so I just try to have different things ready that she can pick up, look at, interact with in some way and then I can just share that with her and talk to her. I'm not sure how good any of this is so I'd just like to see what others are doing and maybe use some of that in my own activities with her, more natural playing rather than the structured things I have here".*

While Amanda fears she is not good at playing with her daughter, she inadvertently talks about how she always tries to be ready to interact with Emily's invitation to play. This, as Clarke-Salter (1973) points out is key to children's development. It is not that Amanda does not know how to play with her daughter. Instead, it is that she is perhaps not aware of what constitutes play – the close physical contact, shared gaze, eye contact, and vocalisations that can be both a normal part of parent-infant interaction but are more powerful during a child-initiated moment of play.

6.4.1.2 *Use of the platform*

Amanda was one of the more active users of the *Digital Toybox*, posting new content to the platform 10 times over the course of the deployment and commenting on the content posted by others eight times. In the second interview, conducted after 3 weeks, Amanda spoke about her use of the *Digital Toybox,* at first speaking about her comfort sharing content on the platform:

> *"I think it's fine. Like who can actually access the site? It's just you, me, and other parents. That's fine with me. I wouldn't really want someone who doesn't have kids seeing it because that's a bit uncomfortable. As long as access is tightly controlled then I'm happy for to share what I do with other people, even if I don't know them".*

She was prolific in creating and sharing content and, while keen to share content as much as possible, did find it to be very time-consuming. As she notes,

> *"I have tried to put something up at least once per week, sometimes more often if I can. But I have to be honest, I don't always think about it and sometimes I just don't feel up to it. It's a lot of effort if I do want to put something up".*

A prominent challenge for the parents when creating video content was how useful it was. As the parents tried to create and share activities that were sustained, they found it difficult to incorporate video in to explaining the activity. Amanda discusses:

> *"Have you had a look at the activities we have shared yourself? We make quite detailed posts, like those instructables things. They aren't complex or anything but there is a bit of explaining to do. I wanted to explain that through a video but I didn't really know*

how to do that. I didn't want to record a series of short videos detailing each step as that was a little too time consuming. So instead I made a post and photographs that were step-by-step and then I made a short video at the end of Emily enjoying herself".

Creating and sharing new content proved quite time-consuming for Amanda and often occurred in two stages across the day. She would document the activity she is playing with Emily at the time but then would have to wait, either for Emily's naptime or while she is asleep at night, to create and share the post on the *Digital Toybox*:

"You see, I can't really do it in the moment. I'll take some photographs while we are playing or record a video but then when it comes to putting it all together, writing the description, it takes time. So I have to wait until she's asleep in the afternoon or in the evening but even then, sometimes I just, other things happen and I forget about it. Or I'm just too tired. I think I posted early on and then just a few days ago. I do need to make some time for it but it's not much and I don't have to think too much about what I'm writing. It almost feels like a professional responsibility for me. My work needs me to talk about engaging with your children, providing suggestions for what you could do. I feel like I should back up that talk too".

This difficulty was reflected in the frequency of Amanda's posts. Where she posted twice a week for the first 2 weeks of the deployment, this became less frequent as time went on. Amanda also felt uneasy with the concept of play and frequently mentioned her discomfort with it. She suggests,

"I'm not good at 'playing' – if you ask me how I play with Emily, then I can't really tell you. I know the Toybox is about sharing how we play but I don't know, I just find that a bit uncomfortable. If you ask me to show you how I play with her, then I don't think I can. But I can show you the things we do, they are like activities but not play".

Amanda felt that she lacked a natural ability to play, often saying how she was not very creative and was envious of other mothers she had met who seemed more spontaneous and creative. Instead, Amanda created the activity packs that she keeps at home. The resources shared by Amanda mainly comprised of Emily engaging with one of the activity boxes, combined together in simple ways to provide a compelling activity for Emily. For example, the "Matching Activity", posed by Emily involves some colourful, simple plastic shapes.

Initially, Amanda drew around these shapes on a piece of paper, using the same colours as the shapes. After sharing a photograph of the shapes and their outlines drawn on the paper, Amanda's post describes the activity:

"I then sat with Emily and let her explore the shapes. She recognized the butterfly and enjoyed making it 'fly' around the room. Then she started to put the shapes on the paper. I was surprised by the number she was able to match, though I think the colours helped".

The shared resource is completed with two photographs of Amanda and Emily sitting together, as Emily matches the shapes to the outlines on the paper. In the exit interview, Amanda reflected again on her discomfort with the idea of playing:

"I did wonder if after being on the Toybox, seeing other parents' ideas and how they play, whether I would be more comfortable just playing, in like a more spontaneous or unplanned way but I don't really think I am. I still rely on planning in advance, driving Paul crazy thinking about what I can put together to use with Emily. It has helped, obviously there has been some really nice comments from some of the other mums about the posts I share. But I still need to plan and be prepared, otherwise I just flounder".

This suggests that the concept of play may be a burden for many parents. They are looking for the perfect thing to do but missing the value of just being present, active, and engaged, physically and mentally, with their child when the moment presents itself

6.4.1.3 *Disengagement from the platform: Finding relief, help, and support from others*

While Amanda was one of the more prolific contributors to the *Digital Toybox*, her use of the platform diminished over time, particularly as she developed a close relationship with some mothers from the *Toybox*. As she discussed in her interview during the third week, it was time-consuming to create and share content on the platform. It required Amanda to be playing with Emily, document the activity through some photographs or videos, log on to the platform, choose the "create content" option, enter a description and then attach media before completing the upload process. This did not prove feasible while playing with Emily and mostly relied on Amanda creating the post either during Emily's afternoon nap or when she was sleeping at night. However, this was not the sole reason for disengagement. Instead, some

of the users of the *Digital Toybox* became friends beyond the platform and started meeting in person. Amanda notes in her exit interview how this came about:

"I think it was around two or three weeks after I met you for the second time. There was a couple of other mums on there, Sally and Jessica, who, you know, we started commenting on each other's posts, then sending private. But then…it was probably Sally, I can't remember, and she suggested that we meet for a playdate the three of us and I just thought it would be nice to do it. I told you before about the children's centre and how they've changed the area boundary…so we can't go to the one nearby because we're outside the catchment and I didn't want to go to the other one as it's too far away. So I did miss that actually meeting other mums and talking to them and then they came up here to the house and it became a regular thing. It's been great because they have both become friends and I just feel a bit more comfortable, especially because most of my older friends have already gone through this stage with their children and I was worried I was boring them".

Ultimately, Amanda disengaged with the *Digital Toybox* and did not post any new content or comments after the tenth week. She did log in twice more after this point but did not feel a desire to contribute new content. Partly this was due to what she described as Emily moving towards "terrible twos" and becoming more difficult to engage in activities. However, Amanda mostly attributed this to the platform having served its purpose for her. She noted a feeling of guilt but also a sense that her relationship with Sally and Jessica had transitioned outside the platform:

"I do feel a bit guilty because I know you put a lot of effort in to this and I do feel like I'm letting you down a little bit. But I guess for me, there isn't really anything more for me in the platform. I didn't really take any new play from it – I'm not sure I learned anything new. But I did make these friends who I'm meeting often and we're sharing this together in person. This was good to meet them but it's not the same as being together".

This also illustrates parents' need for relief, help, and support. Where initially, the *Toybox* may have been a way to help others and find ideas for herself, ultimately it served to provide Amanda with new forms of social support through which she could share the burden of

raising a small child. She was no longer at home alone most days of the week, instead she was able to share those moments with other mothers who were in a similar situation.

6.4.2 *Sally*

Sally was also an early member of the *Digital Toybox*. Sally is 31, married to Simon, who is 37, and they have one daughter, Grace, who was 23 months at the outset of the deployment. Grace is also their first child and they live together in a quiet, semi-detached house on a street that Sally describes as having "remarkably few children". While Sally's home is filled with children's toys for Grace, these are all very neatly stored around the house, with several translucent boxes sitting around the perimeter of the living room crammed with toys for Grace. Grace is very shy and never ventures far from her mother throughout this first workshop and she quickly snatches up any toy that is on the floor, wanting it only for herself. Sally notes how the absence of other children in the area means that Grace is not very comfortable with others:

"We do sometimes have some trouble when her cousin's visit. It's my husband's sister's family. They have two small boys, age 2 and 4, and she gets quite territorial and possessive and doesn't really want to share her toys or us. It would probably be different if she was more used to other children being around but she's not. Like I said, I don't think there are any other children on this particular street".

6.4.2.1 *Motivations for joining the platform: what constitutes play?*

Both Sally and Simon are medical professionals and her career was a primary motivation for joining the *Digital Toybox* as she considers that it may be a very useful addition to her professional practice:

"I'm actually a pediatrician but I'm taking some time off now. I'm due to go back soon and when I go back to work, I'll be the community-based pediatrician for this area. And I just thought this would be a useful community resource to be a part of. It's not just for me and my daughter, it's for others too".

She was also, however, keen to learn new games she could play with Grace. Sitting on the living room floor, Sally was keenly aware of Grace's physical development and she was really interested in finding activities that would improve her motor skills and help her develop physically:

"I like things that push Grace physically. Bowling is a common one for us, anything that makes her use her limbs and develop physically. We have a little colourful bowling set with some very light pins and a couple of balls and we will sit here and she'll just roll the ball at the pins".

On hearing her mother talk about bowling, Grace goes to get the ball and pins from the box and points at them. Sally gets up and moves over to the box, taking out the pins and helping Grace arrange them, as they begin to play together. Sitting on the floor in front of her mother, Grace begins to roll the ball towards the pins knocking some over. Sally hands her another ball and she throws it again, knocking another over. Sally takes this opportunity to record the activity on a video and upload her first content and activity to the platform. However, her attention is divided between trying to write content and trying to play with Grace, so she decides to wait until later in the day to finish her post. After a few attempts, and having knocked the pins over, Grace walks away from her mother towards the pins and begins to tidy up. Sally notes:

"You must think I'm crazy that she's cleaning up but it's something that I've tried to teach her – tidying up afterwards is also part of playing. I don't want her to get in to the habit of just leaving everything all over the floor".

Despite her profession, Sally still seems focused on finding the perfect ideas that she can use to play with her daughter. This leads her to seek out specific activities that she can use with her. Yet, regardless of form, these activities are built around the same need for close physical contact, eye contact, shared gaze, and verbal interaction and the need to be physically present with her daughter when she displays the instinct to play.

6.4.2.2 *Use of the platform*

Despite potentially being a time-consuming process, Sally found that her motivation to create detailed posts continued across the first three weeks. The parents had a variety of reasons for using the system, including that it could help them plan activities to pass the day, that it might benefit the physical or cognitive development of their own child, or that it may be of use to other parents and children. For Sally, it brought some sense of accomplishment. During the interview on the third week, she notes this:

I never found myself thinking "oh I really should do this and put something on the Toybox". It's almost like I still want to feel productive. I'm lucky that I still work three days a week and Grace has her childminder. But even still on the other days it's just like I want to feel like I've done something, even though I know I have. I don't think I'm just doing this to help others. It's for me too – almost a record of what I have done that day or something.

Sally was one of the more frequent creators of new content on the *Digital Toybox*, contributing new content nine times and commenting five times on others' posts during the deployment. Similar to Amanda, she also noted that she struggled to talk about play, that it was something she also tried to avoid in her practice as a pediatrician, and that she also avoided mentioning it on her posts to the platform:

"I find that if you talk about play, it can be very difficult to explain what it is. I couldn't tell you now how I play with Grace. I can show you what we do together but is that play? One of the other mum's on the site has these really nice activity boxes and I prefer that term activity. If someone asks me what we do, I feel much more comfortable saying 'here are the activities that we do' and it's things like bowling. I was very conscious of calling that an activity when I shared the post".

Sally found that seeing other mothers' activity with their child was particularly useful and the activity boxes that Amanda had shared impressed her. She liked how simple these were but also that they were objects that Grace could physically interact with, move with, and improve her motor skills through using. During her exit interview, she discussed how Amanda's posts had influenced her own play practices:

"Amanda had some really useful ideas. One of her posts talked about how she made these different activity boxes or packs, I think she called them. They were just really simple household things or even leaves, feathers, or things you can buy in poundland. It was a collection of different objects and she used these for Emily to play with and enjoy. Grace really likes exploring different objects but I never thought of putting together something like this until I saw Amanda's post".

Inspired by Amanda, Sally created a resource discussing "Sensory Boxes". She begins her post by explaining that she saw this idea from Amanda originally, that Grace enjoys exploring

different objects and that boxes containing different materials were a really useful way for her to engage with her daughter, especially on days when the weather requires that they are stuck inside. Sally continues:

"The possibilities with these boxes are endless, you can pick any theme and tailor it to your child's interests. Grace loves Finding Nemo at the moment so I'm hoping to make an ocean/seaside box next."

Her post continues with two photographs of the "Natural Box", which she describes as containing items either from nature or made from natural materials. This includes objects like feathers, seashells, and acorns. The first photograph shows these stored inside a compartmentalized plastic box with the word Natural written in black ink on the front. The second photograph shows the contents of the box placed on the floor, allowing the other parents to see exactly what is in the box. As Sally notes:

"Current favourites are the peacock feather, often used to 'brush' the floor and the pebbles which Grace loves to stroke against her."

Despite some initial difficulties, the parents did find their comfort increasing with creating video content and they began to think more closely about the type of content they would want and how to make that. The videos that were uploaded were each between 20 and 30 seconds and captured their child lost in the moment of play, with the mother talking and encouraging from behind the camera. As Sally notes:

"After a lot of trial and error, I seemed to settle on 30 seconds for the video. It felt just about right and was enough to capture Grace in the moment really. She'd be playing and you'd see her and then I'd be talking away while holding my iPad. I don't know how useful they are, however".

However, she felt that she would feel more comfortable if they she more control during a recording process. She felt that having to record a video continuously limited the potential of what she could do. Sally says:

"What's it called, hang on, it's on my phone…to record videos. Vine, that's it. I think that's quite nice because you have a time limit..is it 8 seconds or something but you can stop and start recording within that 8 seconds. So you're not just continuously recording. Obviously that's too short for explaining the things we do together but if that was split over 30 seconds or a minute, I think actually I could explain things quite well. Those videos would be useful. You could see the whole process – this is what you need, this is how you put it together, here is Grace playing".

Sally was also comfortable sharing this content and was reassured that it was an invite-only network, meaning new members could only be added by existing members:

"I don't really mind sharing the videos or photos with other people on this because it's just for parents and you need to register and be invited either by you or by one of the parents on it. I think if just anyone could sign up, then I'd be much more cautious but this is only for other parents. In a way, someone knows everyone on it so it's okay. And we're all going through the same thing, with the same concerns."

This was something she re-iterated in her exit interview at the end of the study. She was comfortable because the group was private and was only there as a tool that might help others. However, she would have concerns if it was open membership:

"There are things like Mumsnet, which I'm not sure I'd join. I think anyone can join that really and so I wouldn't be interested in posting there about Grace or what we do. But this is different because it's a local thing and you have to be invited. I suppose I can see the problems with that too because it has become a little bit stale now that we're not posting so much anymore. If it was easier for others to join, it would probably continue to grow".

6.4.2.3 *Disengagement from the platform*

Sally captures an important point about the *Digital Toybox*: that use of the platform diminished significantly around week 9 of the deployment. As Amanda mentioned, she, Sally, and Jessica transitioned from friends on the platform to being friends in real life. Rather than sharing ideas and activities through the platform, they did so in person. The platform members also had children around the same age and they were not meeting new parents with

younger children who they could invite to the platform. Consequently, the platform did not grow with new members. For Sally, however, this was not a problem:

"We spoke about this one day, me, Jessica and Amanda. We didn't know each other before we joined this and we may not have met. So it's been good to get to know each other and be able to share some of this together. Especially as Grace has also become more comfortable around other children. She's happy to share things now and loves being with the girls. As much as I think it's good for others to use the platform, and I will definitely share some of the new ideas I learned with my patients, my time using it has come to an end. I feel like I've moved past that now".

This excerpt suggests that, on one hand, the platform may have become stale for the mothers. There were no new mothers joining after a certain point and also the most prolific contributors had used the platform to lead to more intimate, closer relationships with some of the other mothers they had met on the platform.

6.4.3 *Jessica*

Another early member of the *Digital Toybox* was Jessica, who at the time of our initial workshop was a 29-year-old mother to 20-month-old Izzy. Jessica had been married to David, 30, for three years with Izzy also being their first child. David and Jessica were relatively new to Newcastle, leaving their families and friends behind in Cardiff to move just before Izzy's first birthday due to David's new job. They live in a colourful, detached house, with a small back garden, in a suburb of Newcastle with different toys, games, and stuffed animals decorating the floor from the hallway through to the kitchen and living room. Jessica talks about how the street where they live has many families but that most of the children are much older than Izzy, with Jessica also feeling like she is significantly younger than the other mothers on the road and a little bit isolated:

"I'm used to being surrounded by my family, having my mom and sister really close by. Not to mind David's sisters too. We've been together since we were in school so we were all very tightknit. So this is a bit of a shock, eventhough they're all just a phone call away".

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6.4.3.1 *Motivations for joining the platform*

When talking about her motivation for joining the platform, Jessica discussed how she does feel a bit isolated and was hoping to meet others who might be in a similar situation while also learning new things that may benefit Izzy:

> *"We've lived here for 10 months now and I still feel like I'm not fully settled in. I don't really know the area or the different things that might be happening that would be good for Izzy. I did go to the children's centre once for their playgroup but it wasn't very comfortable. Everyone was nice and friendly but it was cliquey and I'm not great at imposing myself on others. I just thought this might be a good way to get to know some people here, even just virtually, and even learn a little bit about different things that might be happening. And it's always good to get new ideas to use with Izzy".*

It seemed that, for Jessica, joining the *Digital Toybox* could be a way to find social support and to feel connected to others who may be going through similar experiences, while avoiding the discomfort of having to be physically present and attempt to join conversations. Jessica was also reticent to share any of the activities or ways she plays with Izzy during this initial workshop, saying that she did not really know anything useful and was hoping that this platform might provide her with those ideas.

6.4.3.2 *Use of the platform*

Jessica was a regular visitor to the platform, logging in almost every day for the first six weeks. She primarily browsed and commented (7 comments) on activities rather than contributing new content, which she did only twice, and was very complimentary of the activities posted. She said:

> *"I thought the sensory box was great. I can't remember who posted that but it's some really simple things. It's either Amanda or Sally. I think they both did. Izzy always picks things like that up when we are out but I never thought of gathering them together like that so we could use them at home. I really admire their creativity."*

Jessica began to incorporate some of the ideas she saw on the platform in to her own play activities with Izzy. She was particularly appreciative of Amanda's initial post about the colour activity box, noting how she too had started to create activity boxes like this:

"I love this idea. I've begun picking up bits and pieces that Izzy really likes. She saw this really colourful dish brush in Asda recently and I just picked it up and it's now part of our colour box. She likes to brush her play area with it and makes me help her by moving things out of her way!"

During the interview on week three of the deployment, Jessica appeared more comfortable with the idea of sharing content on the site and was keen to document video content of some of the activities that she had engaged in with Izzy. She was particularly keen to document through video, as that was the kind of content she preferred to view when looking for ideas. However, despite her clear preference for videos, creating them remained a challenge. As Jessica notes:

"I really wanted to make videos and share those because they are always what I look for. I don't normally like to read very much when I'm looking at something...I don't really have time because you know, I'm always thinking where is Izzy, why is she quiet, or I'll have to run after. So instead I just look for videos that I can understand quickly and follow. I made so many videos but then I'd look at them and think that's awful, there's nothing interesting there and delete it. It would just be her doing something but then she'd stop doing it and look at me if I was behind the iPad".

However, it was not just that Jessica felt that videos were difficult to create. Instead, she was also worried about whether it was the right thing to do or if she was setting the wrong kind of example for other parents. Jessica discusses:

"Maybe I am thinking about it too much but shouldn't I be involved in the activity? If I'm behind a camera making a video, is that the best way I can be with Izzy? Will others who look at my posts think "oh I just need to do these things and sit back?"

Interestingly, Jessica was the only one to express this concern. Whereas others considered the process of creating and sharing content to be too cumbersome, they were not worried about momentarily stepping out of the play activity or of the example they may be setting for other users of the platform. Yet, as Clarke-Salter (1973) suggests, Jessica may be right to have this concern. Rather than the specific activities that she needs to engage in with Izzy, being

present, actively engaged, and responsive both physically and mentally are crucial to making the most of opportunities to play and aiding her daughter's development.

6.4.3.3 *Disengagement from the platform*

While Jessica did not post new content frequently on the *Digital Toybox*, she was a regular commenter on the contributions of others. However, this also noticeably diminished after week six. In her exit interview, she noted:

> "I haven't really used the Toybox in quite a while. I think probably a month or more. I don't feel like I need it anymore. You probably know already but I'm friends now with Amanda and Sally and we meet at least once a week the three of us and sometimes more. It depends who is around – me and Sally are around more so we meet up for coffee together sometimes too. But that has been really good. I was on my own before them".

For Jessica, the benefit of using the *Digital Toybox* had been an opportunity to meet other mothers who may be having similar experiences and this resulted in the development of friendships beyond the platform. However, this was not the only reason that Jessica had stopped using the *Toybox*. After meeting with Sally and Amanda and seeing them play with their daughters, she was struck by how different it felt than what was communicated through videos and photographs. At the conclusion of the study, she spoke about how her concerns about how others receive the videos had grown:

> "I know it's limited because it is just recording a video or taking a photograph. But it's completely different. I still think it's because they have to leave the moment to actually make the video or the photograph – like I stop playing if I have to do that. They don't have to stop playing if they are not filming it. So it probably made me more worried that some people might see these examples and just copy them completely. Would they do that? I don't know but I suppose when I think back to when I first had Izzy. If I didn't have my family around me, who had gone through this before and could show me stuff, I probably would have watched these videos, copied them and thought that was it. And that might actually not be good".

6.4.4 *Helen*

Helen, 36, is married to Ken, also 36, and at the outset of the deployment their son Sam was 30-months-old. Helen and Ken have been married for six years, with Sam being their second child. They also have an older daughter, Sophie, who is 7 years old, and attending school during the fieldwork. Helen describes their home as "very busy and showing the damage of two hyperactive children and two working parents". After Sam was born, Helen moved from working full-time as an accounts director for a small company to being part-time working three days a week:

> *"I remembered what it was like with Sophie. I took a full year off when I had her and while it was nice, there were also times where I was going a bit crazy with baby brain. I probably listened more to my mom than I should have, who was a bit shocked that I wanted to go back to work at all. So I took the first year but it did get difficult towards the end. I knew I wanted to go back to work but not full-time and luckily I was able to switch to a three-day working week".*

6.4.4.1 *Motivations for joining the platform*

Helen currently works Tuesday-Thursday and, while it is the best solution for her, it also brings different challenges in terms of not being able to make it to activities and events at her local children's centre. There is quite good service provision at the Children's Centre but Helen feels that it does not suit her very well:

> *"I think we're lucky in that the local children's centre is quite good. They do have lots of activities for children Sam's age but the problem for me is that most of these seem to be on Wednesday and Thursday, which are the days when I'm working. I did think about trying to change my working week but this is the best option with Sophie as well. I would like to go more and meet some other parents who have children around his age as there aren't many here".*

This foregrounds one of Helen's motivations for joining the *Digital Toybox*. She was hoping to meet parents of other children around the same age as Sam while also expanding her own knowledge:

> *"I've obviously been through this before with Sophie and people seem to think that I should just immediately know what I'm doing but I actually find it completely different.*

Ken is better at this because he can understand better what a little boy might like to do. They just grapple and he's happy. I find that I'm trying to do the same things with Sam that I did with Sophie and he does seem to enjoy it but there's probably better things that I can do".

While hoping to learn new ideas that she can use with Sam, she is also hoping that joining the *Toybox* might help her meet other parents who have boys of a similar age as Helen worries that he does not get to play with many now. She considers the street that they live on to be relatively quiet and while other children do visit their home, these are mostly Sophie's friends:

"I do wish there were some other boys on this street because it would be nice for him to have that but there aren't and he mostly just ends up playing with his sister when she will let him".

6.4.4.2 *Use of the platform*

Helen was a frequent creator of content on the *Digital Toybox* creating seven posts sharing new content and commenting 5 times on the content posted by others but Helen noticed a different tone to the content she shared in comparison to that shared by the other users:

"I think it was pretty clear to me that I was very different to the others who would post content on the site. They all seemed really prepared. Maybe I'm doing them a disservice but I got the feeling that they put a lot of effort in to getting the right shot, preparing these huge activities that they would do, and then sharing it with others. I don't think it was showing off or anything like that, this is just what they do. I don't really have the time to be as organized as them so for me it was just seeing what Sam is doing and trying to respond to him. I'd try to capture a short video and just show how I was responding to him more than what he was doing".

Despite not feeling as organized as the other users of the platform, Helen was a frequent commenter on the posts the others created, always being very grateful and making sure to thank the poster for sharing her idea. She felt that, since she had two children and was more experienced, she could encourage them as much as possible:

"I remember the doubts that I had when I first had Sophie. My mum and Ken's mum were getting phonecalls almost every hour of the day asking for advice, help, or even just reassurance. I don't know anything about the others but I'm sure some are feeling similar if they are first-time parents, so I did want to try to be as reassuring and helpful as I could be".

However, at the start of the fourth week, Helen became a less frequent visitor to the *Toybox*. Where she had created around two new posts per week for the first three weeks, she only created one post in week four and didn't post any further content on the site after that. She explains that she was not really contributing anything positive or helpful nor was she gaining anything of real value for her, so she decided to cease using the platform. She hinted at this in our second interview during week three:

"I'm glad to comment and contribute but I'm not sure if what I'm sharing is useful. I don't really want to spend a lot of my time making these posts if they are for no one but myself".

The other main contributors to the *Toybox* all were first-time parents with young daughters. Helen, with Sam being her second child, felt that she did not have much in common with the others, did not think she could contribute much that would be of use, nor that she could learn much from the posts of the others. In her exit interview, she reflects on how she sometimes felt like an outsider to others discussion:

"You could see sometimes that three of the mums on the Toybox were becoming quite close. They would always comment on each others posts and it just seemed like they had developed a nice relationship. I think the type of things that I was looking for were different to what they wanted and I couldn't use their ideas with Sam. They were nice and there was always an encouraging comment on posts I made and I did likewise. And I did try with one of the activity boxes but he really didn't show any interest in that. But I think that was probably the point that I stepped away from it. I just didn't see it as being helpful for me anymore".

6.4.4.3 *Disengagement from the platform*

Helen's experience of the *Toybox* proves very different to the other participants. While she started out enthusiastically posting content, this slowed quickly when she did not think her

content was potentially useful for the others or that the content that was shared was relevant for her. Where Amanda, Jessica, and Sally became disengaged with the *Toybox* once their friendship transitioned beyond the platform, Helen's experience was less positive and she disengaged once it became clear to her that it would not meet her needs. She notes in her exit interview:

"I do think this is a good idea and I'm sure it has been nice for some of the others but it just hasn't worked for me. It did feel a bit stale quite quickly because there weren't any new members being added. I was hoping to use it to meet other similar parents who had young boys but that just didn't happen. And I think when I realized that the content wasn't really right for me and there wasn't any new people joining, I just decided that I could use my time in a better way".

Helen's experience of the *Digital Toybox* appeared to be significantly less positive than the other parents. Having considered herself as someone who could advise and support other parents given that Sam is her second child. However, Helen never felt able to connect with the other parents who used the platform and did not perceive the content of the posts to be useful for her. She did create her own activity box for her son to use but felt that he quickly lost interest. Instead, she wanted some ideas that were more active or more energetic:

"Sam is always running around and he loves it. I was hoping for something more, what's the word, more energetic. These ideas are all nice and lovely but they seem a little bit constrained. I put up one video of a small treasure hunt-type activity that I did around the house and Sam was running around like crazy, laughing, while trying to find the clues. And I posted a short video of this with me laughing in the background too. I think that was actually the last thing I posted because there was even no comments or anything on it. It might have been different if there were more parents of young boys on it".

In sum, while Helen joined the *Digital Toybox* in the hope of being able to share her experiences with others and support them, potentially connecting with other parents of young boys with whom Sam could be friends with, this did not occur. Instead, she disengaged from the platform, disappointed with the content of the activities posted and feeling that they did not match her needs.

6.5   Summary

In this chapter, I presented the findings of the parents' uses and experiences of the *Digital Toybox*. This was based upon a rich, multi-modal dataset that incorporated one-to-one workshops with parents at the beginning of the deployment as a means to co-create the platform and begin to populate it with content, interviews after three weeks with the first set of users of the platform, and exit interviews with four users of the platform at the end of the five-month deployment. I came to understand that the parents' motivation to join the platform was influenced by their past personal and professional experiences, alongside a desire to do all they could to support their own child, and an interest in connecting with others and learning from them. Four participants who would frequently post new content and comment on the content posted by others regularly used the platform, with three of those participants becoming friends and socialising together frequently over the course of the deployment.

While the platform was initially popular, use tailed off towards the mid-way point of the deployment, partly as a result of the parents who had begun to meet each other in their community. Additionally, some of the participants referred to the *Digital Toybox* as becoming stale, with no new participants joining the later stages of the intervention. This also resulted in the types of content posted not being very varied, with frequent posts of different types of activity boxes by the parents. This kind of content did not suit all users, however, with Helen noting a preference for more energetic activities that she could use with her son. Ultimately, the participants disengaged with the platform when it either no longer served their needs, such as when they had started meeting socially, or when it was felt that the platform did not offer anything of value to them. However, the analysis highlights a pre-occupation with the form of activity in terms of playing, rather than focusing on simply being present, aware, and actively engaged with one's child. The parents were concerned with finding the perfect activity, with only Jessica highlighting a concern with stepping out of the moment of play and the potential negative impact on her daughter. I further discuss the implications of this in Chapter 7, the final chapter of this thesis.

Chapter 7. Discussion and Conclusions

7.1   Overview

In this final chapter, I revisit the research questions posed at the outset of this thesis and discuss their interpretation in light of existing research, practice, and policy. This chapter begins by arguing for parent-infant play to be considered an important potential focus for HCI research and design. This is followed by a discussion of how parents find it difficult to play with their children and what this means for HCI and child development research, as well as service provision. Consideration of the challenges, and importance, of engaging fathers and community organisations in this research follows. Three potential avenues of future research are suggested, including designing for spontaneous play between parents and infants, developing novel approaches to engage fathers in research and design around parent-infant play, and exploring how service design may encourage the integration of technology designs into existing service provision. The chapter then concludes with reflection on the contributions of this work.

7.2   Expanding the Design Space for HCI in Parenting Practice

In this section, I respond to the first research question, which asked *how is parenting understood in HCI and how has this shaped the design of digital technology interventions*. I presented a literature review of HCI research relating to parenting and parenthood and argued that parent-infant play may be a space to which HCI can make a useful contribution. The literature highlighted that the nascent HCI literature on parenting explores i) how parents use technology when caring for their children (Gibson & Hanson, 2013), ii) how parents and families negotiate technology use in their home and with their children (Hiniker, Schoenebeck, & Kientz, 2016), iii) design interventions to support the record keeping of important milestones and moments of development (Suh et al., 2014), iv) tracking health data (Hayes et al., 2014), and v) supporting communication between non-traditional families or those separated by distance (Yarosh, Tang, Mokashi, & Abowd, 2013). Notable here is that the design interventions mostly focus on specific application areas, with less consideration given to how technology designs may impact day-to-day parenting practice.

To this end, I am proposing parent-infant play as a potential avenue of interest for HCI research to explore. This is prompted by recent studies exploring digital interactions for infant children (Hourcade et al., 2015). The research contained in this thesis acts as a first step towards understanding how technology designs may facilitate parent-child play and ease the difficulties many parents face when playing with their children. It is worth noting that this

study, and particularly the *Digital Toybox*, remains an initial exploration of how HCI may support parent-infant play. Specifically, it had limited success in terms of sharing ideas for play, with one participant noting how she did not learn any new ideas for play from the platform. It may be that online health communities naturally experience cycles of adoption, use, and disengagement (Massimi et al., 20014) as people move from one stage of life to the next. However, a more likely explanation is that the types of activities shared did not entice participants to remain involved. The first post on the *Digital Toybox* shared the idea of an activity box, which was a collection of inexpensive materials and objects that could be found around the home or in local stores. This appeared to set the tone for subsequent posts, with the majority of posts also illustrating different types of activity boxes created over the course of the deployment. It may have been, as one participant suggested, that parents wanted different, more spontaneous and energetic types of play rather than pre-planned activity boxes that may require a level of planning and coordination beyond the capability of a busy parent.

A more varied approach to play could potentially have been incorporated in the *Digital Toybox* had a children's centre or professional play staff been involved in the deployment and able to provide more distinct recommendations for different types of play. It is plausible that the parents on the platform did not have the confidence to break from the existing theme of the content on the *Digital Toybox*. Potentially having more varied recommendations from a professional or organisation may have resulted in a wider range of content being shared on the *Toybox* and resulted in more long-term engagements from parents. Nonetheless, the aim of the deployment of the *Digital Toybox* was to probe how HCI might support parents to play with their children and, as such, it is aimed to be starting point that is critiqued, built upon, and adapted by other HCI researchers with an interest in digital technologies to support parenthood.

In sum, this thesis argues for parent-infant play as an important focus for future HCI research addressing parenthood and parenting practice. Previously, HCI research has addressed parenting in terms of understanding use of existing technology as part of parenting and within families. Significant research and design has also explored how bespoke technology design can support parents in a variety of specific application areas, such as monitoring health data, maintaining communication in divorced families, or tracking developmental milestones. While the latter involved monitoring children's development through posts on Twitter, little research has considered the role technology design might play in supporting children's development. This thesis argues that play is a potentially viable mechanism to support children's development and discusses ways that HCI might attempt to

support parent-infant play through closer collaboration with play professionals and organisations in the services and systems designed.

7.3   An Experience-Centred Understanding of Play

In this section, I reflect upon the findings in relation to the second research question, which explored *what constitutes an experience-centred understanding of parent-infant play*. Perhaps the most consistent finding across all three case studies was that parents consider playing with their children to be difficult. Despite this, it was apparent that the way the parents play with their children aligns with both academic literature and the guidance provided by children's services and suggests what an experience-centred conceptualization of play may look like. What both academic research and these practical guidelines share is a definition of play as a creative activity between parent and child. The parent is always physically close to the infant, often holding or touching her. They are sharing eye contact together as they play, talking either through the parent explaining what he or she is doing to their child or mimicking the babbling of the infant as a way to have a conversation together. While there are numerous examples of this occurring in the data, the parents seem distracted by the need to find specific ideas for play or forms of play rather than being present, in the moment, and physically and mentally engaged with their child when the opportunity to play arises. There is potential for this experience-centred understanding of play to inform both technology and policy design in terms of supporting play between parents and infants.

Nonetheless, even the most confident parents felt that it was difficult to play with their children. This resulted in many of the parents, particularly in the last case study, focusing on creating activity packs that could be used with their child as a way of engaging with their children. However, as Levenstein and O'Hara (1993) note, real play is important to chilren's positive developmental outcomes rather than play that is designed with a specific educational purpose in mind. It is open to question whether the types of play in such pre-planned activity boxes provide the types of play and stimulation that the children need to support positive development. As Clarke-Salter (1973) says, it is important that the parent responds when the child initiates play, as that is the key to healthy development. Whether pre-planned activity boxes provide the types of interaction needed is unclear. This opens up a potentially interesting landscape of opportunities for design. Recently, attention has recently turned to how HCI might support more spontaneous moments of play between a parent and child (Marshall et al., 2015) enabling the parent to engage in play when the moment arises rather than relying on pre-planned activity boxes. One potential way to approach this may be through the use of augmented toys or Internet of Things environments (e.g. Giacarrdi).

Interactive children's toys may prove compelling tools to help parents to play with their children in the moment. This could include toys connect families with young children together, sharing traces of each others play in their respective homes, and enabling shared play. In the second case study, it was clear that the creative making and telling of stories was an important weapon in the play armoury of young children. While children less than three years old may lack the verbal skills to tell their stories, playing with networked, interactive toys in collaboration with parents may facilitate the creation and telling of stories across a number of families and households. A potential focus for future HCI research may be the development of interactive networked toys that can be used in one home by a parent and their child to create and tell a story and this story is then shared into another home for a second family to pick up and take the story forward. These shared traces of play would not require the level of pre-planning and organisation needed for the activity boxes. Instead, they would likely provide a more compelling experience for the parent also as they collaborate with their child to create a story that builds upon the play of another home and is shared back with them. Similarly, pressure sensors embedded in play mats that are networked to a play mat in another home may indicate when a family in one home are playing. These play mats would offer parents the chance to play with other families, responding to their movement on the mat with movements of their own. Noting how the participants in the *Little Monkeys* case study valued being able to play with their children in pairs or groups and considered it to be more enjoyable, this may provide an enjoyable way for parents to share moments of play with other families and feel connected to other parents in a similar situation, despite not being physically together. These examples highlight how HCI may be ideally placed to support parents to make the most of spontaneous opportunities for play as they arise, where play is just for an end in itself.

This may also have significant implications for work in child development and developmental psychology (e.g. McDonald, 1993). While it is widely acknowledged that parents experiencing depression can face difficulties when it comes to playing with their children (Downey & Coyne, 1990), there is scant research showing similar difficulties in non-depressed parents. Nonetheless, that parents find it difficult to play with their children was a common theme across all case studies of this thesis. It must be acknowledged that having a child in hospital, and all the worries and concerns that brings, may have impacted the ability of the parents in the first case study to focus on playing with their children and be fully immersed in play. Yet, this theme continued in the remaining two studies also and across a wide range of parents, ranging from first-time parents in their early 20s to parents in their early 40s with more than one child. This suggests that play may be difficult for many parents,

whether depressed or not. Given how crucial parent-child play is to children's healthy development (Shonkoff & Phillips, 2000), further research is needed to explore the difficulties parents may face when playing with their children and suitable interventions need to be designed and implemented. While therapeutic approaches exist to help build positive relationships between parents and infants (e.g. Kennedy, Landor, & Todd, 2011), this suggests it may be possible to intervene at an early stage by identifying issues in play that lead to non-attuned interactions.

Related to this, the finding that parents find it difficult to play with their children may also have some implications for the practical guidance provided to parents by services and organisations. The literature review highlighted that the guidance provided to parents gives some examples of how they could play with their children and why this is important (e.g. Action 4 Children, 2015). While this is obviously very useful for many parents, there is no acknowledgement that some parents might find it difficult to play with their children. It is plausible that this may negatively impact the confidence of any parents who are finding play a challenge, particularly as it may reinforce feelings that this is their failing and not something other parents also experience. Focusing more on the experience of playing, responding to the child, being physical close by, touching each other, sharing gaze and eye contact, and verbally interacting may provide a more useful understanding of play that can enable parents to engage fully and be present when their child initiates play.

In sum, a significant contribution of this work is an experience-centred understanding of play. This highlights that while many parents may find it difficult to play with their children, this may be driven more by a focus on the form of play rather than the function. This finding has important implications for research within HCI and also child development, and also may impact the guidance children's organisations and services provide to parents. By focusing more on the experiential elements of playing, it may be possible for HCI researchers to reduce some of the burden parents are placing on themselves to find meaningful ideas for play. This may prove a highly interesting and productive space for HCI researchers interested in parenthood to explore. Finally, for children's services and organisations, there may be a need to acknowledge that playing with a child can be daunting but that being present and responding to your child are more important than the form of the play.

7.4   Challenges with Designing For vs Designing With

The final research question explored the *differences between designing for participants* and *designing with participants*. This discusses how it was difficult to engage participants in the first and third case studies as they adopted a "designing for" approach as opposed to a

"designing with" approach. Following this, the difficulties of collaborating with partner organisations is explored, particularly addressing questions of responsibility and ownership of bottom-up, community-based initiatives.

7.4.1 *Difficulties engaging participants when "designing for"*

A significant challenge of this research involved engaging participants, and larger organisations, in projects where I was designing technology for participants. With HCI increasingly moving towards long-term community-based engagements with local councils and organisations (Olivier & Wright, 2015), reflecting on how productive relationships can be formed from the outset of the study is imperative. These projects increasingly see universities and research groups working with community organisations in response to important societal challenges and questioning how the research conducted within them can bring benefit to local citizens, organisations, and councils (Olivier & Wright, 2015). Yet, there is little guidance provided on how to establish collaborative relationships that these projects need to thrive.

The first and the third case study involved designing technology for particular users. In the first case study it was with a children's hospital and in the final case study, with parents in the local community. Yet, there was significant difficulty in terms of engaging the participants in each of these case studies. The first case study, a collaboration with a children's hospital and children's charity, featured significant tension between the play specialist and researcher. Underpinning this tension was the framing of my involvement in the project. This collaboration came about through the charitable organisation's interest in improving play provision and opportunities for play for the children in the hospital. However, this led to some concern among the existing play specialist staff, who were concerned that my involvement reflected a perception that they were not doing their job correctly. That my first meeting with the play specialist was the day that Magic Land was deployed did not enable the establishment of a relationship and the development of shared goals. This created some tension with the play specialist, which was most clearly illustrated by the limited use of *Magic Land*. Rather than being an active, engaged, co-creator of the research, the play specialist was being a subject of research. This resulted in low motivation to engage with myself or with Magic Land.

The second case study proved a more successful collaboration with a related organisation. The children's centre supported my involvement in the *Little Monkeys* play session, introducing me to the parents, talking about the motivations behind the project, and allowing me to speak with the parents about what I hoped to achieve through this engagement. In this collaboration all stakeholders met prior to the fieldwork, discussing their

goals, and establishing a shared aim for the project. Additionally, it may also be important for the researcher to comfortably shift roles during fieldwork, from researcher to community or organization member, or volunteer. Transitioning between these roles ensured that I could also provide some support to the organisation, supporting the over-worked staff in preparing the space before the play session and cleaning afterwards.

While HCI has long been interested in participatory, cooperative, and user-centred design processes (Muller, 2003; Simonsen & Robertson, 2012), recent discussions on Action Research (AR) may shed light on how HCI researchers can conduct rigorous research while also ensuring socially meaningful, collaborative research (Hayes, 2014). By positioning the researcher as a friendly outsider expert in facilitating communication and research activities with community partners, AR encourages the community or organization members to become co-researchers and co-designers to address issues that are meaningful to their own lives. It is possible that, in the first case study, rather than being a co-researcher, the play specialist considered that she was the research subject, whose working practices were being carefully studied and critiqued. Adopting an AR approach may have facilitated a more productive relationship with the play specialist, positioning her as a partner in a research process that was aiming to understand how technology could be used to provide better play opportunities for the children. Yet, even when organisations are involved as partners in these long-term, bottom-up engagements, there are questions around responsibility for the initiatives. Do these initiatives remain the responsibility of the researcher or do they pass to the community organisation or institution? Here, I reflect on the deployment of the *Digital Toybox* and frame this within the AR approach.

A potential failing of the *Digital Toybox* was that it was not initially designed with the people who ultimately used the system. Initially, it had been hoped to deploy the *Digital Toybox* in collaboration with the Children's Centre who participated in the second case study. However, the period from the end of the second case study to the start of the deployment of the *Digital Toybox*, witnessed a high level of staff turnover at the Children's Centre. Of the three core staff who were involved throughout the second case study, one was promoted to a new job with different responsibilities, another left on maternity leave, and the final staff member returned to University. The outgoing staff members had been involved in the session for two years and knew many of the parents who would come to the session from living nearby. Furthermore, I had developed a strong personal relationship with both staff members over the course of the fieldwork. Two new staff members joined the Centre to as their replacements but were both new to the Children's Centre and also new to the local area, meaning that they had to develop their own rapport with the mothers who came to the *Little*

Monkeys session. Consequently, they were more focused on engaging with the parents, getting to know them, and developing the rapport required.

It is likely that this significantly impacted the potential of getting users for the *Digital Toybox*. The new staff members were focused on becoming proficient in their new jobs, getting to know many new names and faces, and learning about the families they were working in aid of. Consequently, they were less able and less interested in promoting or sharing a research project that was adding to an already heavy workload. It is possible that if some of the existing staff members had remained in place, their familiarity with the aims of the initial project and with the researcher may have led to the *Digital Toybox* being discussed in the play sessions and shared among the group. However, the staff turnover significantly changed the dynamic of the play session, with the newer members focused solely on getting to know their service users and becoming more proficient in their own work practices.

This raises an important point for HCI research as it moves towards technology designs to support civic life. It questions who is responsible for these bottom-up initiatives? The success of the relationship in the second case study was built upon my personal connection with the staff and parents, developing across the 12 weeks of fieldwork as we all got to know each other. This meant that, while my presence was supported and approved by the organisation, it was two specific staff members who, alongside me, took responsibility for the project by welcoming me in to the playgroup and ensuring I was introduced to all parents and given an opportunity to engage them in the research and design activities. However, once they moved on from their roles in the session, maintaining the momentum of the research proved challenging and resulted in new recruitment strategies being created, without any organisational involvement. Yet the first and third case study did not feature this buy-in. Despite the parents in the third case study signing up to participate, their participant remained an evaluation of an already designed technology – designing for them. Had they been involved in the initial design stages, it is possible that they may have been more engaged, interested, and that it would have better fit with their needs. Instead, it was designed to fit with the needs of a different community.

This highlights the importance of having involvement from institutions or community organisations who are completely bought in to the purpose of the project, rather than it being driven by a small number of individuals who are part of the organization and vulnerable to changing circumstances. It is possible that if the children's centre had taken responsibility for the *Digital Toybox*, integrating it as part of their service provision, it may have been easier to maintain a cyclical intake of new parents who could be invited to join the platform when they visit the children's centre. Furthermore, the children's centre may have been able to provide

more distinct recommendations for the types of play that parents should seek to create and share. These may have resulted in the platform remaining active, gathering new members and providing more compelling and varied content for the members. Therefore, it is important that, as HCI seeks to move towards more long-term, community-based engagements, researchers begin to consider the level of involvement of institutions and organisations, ensuring the design outcomes are integrated into existing service provision.

7.4.2 *Summary*

A particular challenge of this research was engaging participants in the design and research. However, the nature of the research design is likely to have impacted this. The first and third case study focused on designing technology for participants, with only the second case study involving designing with a participant group. This second group exhibited significantly greater ownership and interest in the research and comfort with me as a researcher. This is worthy of consideration by HCI researchers and designers who seek to design for aspects of parenthood. Exploring ways of engaging participants in the earliest stages of research to ensure that they are co-creators is important. Additionally, ensuring committed involvement from community organisations or institutions is also crucial to this work. Specifically, it is important to address how the outcomes of HCI research and design can be integrated as part of these institutions service provision.

7.5 Future Research

Three potential areas for the continuation of the research detailed in this these are recommended. This includes exploring how design can support spontaneous play, focusing on engaging fathers in research and design around parent-infant play, and integrating service design approaches to technology design outcomes to ensure integration and sustainability of the designs.

7.5.1 *Designing for spontaneous play*

The previous chapter detailed the evaluation of the *Digital Toybox* and the types of play shared by the parents on the platform. It was found that one type of play was mostly shared and this revolved around the creation of activity boxes, incorporating inexpensive materials and objects that could be found around the home or purchased in local shops. However, when interviewed, one participant commented that these posts were not particularly compelling and did not meet her expectations of the content. It was also noted how the creation of activity boxes was very time consuming and required significant planning in advance, which may not

be possible for many parents. Consequently it is argued that further studies should be conducted that explore with parents the potential for digital technologies to support them to respond to spontaneous opportunities for play as they arise.

It is expected that the designing for spontaneous play with parents and children may surface significant challenges for HCI and interaction design research. Primary among these will be defining unstructured, spontaneous play and identifying its characteristics, while it will also be difficult to identify when an opportunity for such play arises and how these qualities might be supported through existing technology. In-depth experience-centred research may be needed to identify, document, and define unstructured play as it occurs with parents and this may prove to be particularly challenging given the spontaneous nature of it. Consequently, exploring how creative design methods could be used to capture and understand these moments of play will be a notable challenge.

7.5.2 *Methods for working with fathers*

The research presented in this thesis has primarily focused on engagement with mothers' lived experiences of parenthood and, particularly, how they play with their children. While some fathers were present, there was limited engagement on their part in the research and design activities. Consequently, the consideration of fathers' perspectives on play may be lacking. Broadening the focus of this research to specifically engage fathers may provide interesting insights in to how to design for play, especially considering how fathers are often considered as more natural play partners for children than mothers (Lamb, 2000). Eliciting fathers' perspectives proved to be a significant challenge in the present research, with the father often deferring to his partner when talking about aspects of childcare, including play. However, this may have been effected by the context within which the study occurred, being situated in spaces of childcare and healthcare, which may traditionally be perceived as spaces related to a mothers more than a father given the slow pace of change of gender roles in the family (Lewis, 2013).

Consequently, a potential research study might investigate fathers' approach to playing with their children but in spaces that are more associated with men than women. This could occur in a playgroup for fathers and their children or even in the home. This might raise significant challenges for a research team, specifically focusing on how the more boisterous and emotionally arousing traditionally associated with fathers (Lamb, 2000) can be documented, captured, and potentially supported through technology design. As these may be complex, multifaceted, and occur spontaneously, it will be a significant methodological challenge to achieve this goal.

7.5.3 *Integration of service design in HCI and interaction design research*

A significant feature of the work presented in this thesis was the collaboration with partner organisations during the design process. Yet, this collaboration did not continue in to the deployment of the *Digital Toybox* and, as was argued above, may have significantly contributed to the drop in use of the platform. Broadening the focus of this research to a service design perspective may enable the development of a shared service user and service provider understanding of the goals and missions of both the service users and children's centres (Yoo, Zimmerman, & Hirsch, 2013). This may encourage service providers to integrate design solutions in to their existing service provisions and, ultimately, take responsibility for the long-term deployment of these technology designs as part of service provision. However, this may prove to be significantly challenging as a research endeavor, given the financial constraints and limited staffing faced by many children's centres and public services organisations currently (Olivier & Wright, 2015).

A potential research study could engage both the users of the children's centre's services and the service providers as co-researchers to co-create meaning in terms of the services available in the children's centres. This may highlight potential ways that the centre may be able to support parents in a way that is more meaningful for the parents. Alternatively, given the significant financial constraints facing children's services in the UK, research could also explore how service users could become active service providers in the children's centre, supporting the delivery of services in the local area. This approach may ensure the sustainability of the potential design solutions created through collaboration with the children's centre, ensuring responsibility for managing the service remains in the community or organization.

7.6   Conclusions

The research presented in this thesis explored the design and evaluation of technology for promoting play between parents and their infant children. While research on parenting remains a relatively new area of interest for the HCI community, I described how the field has recently begun to address important aspects of parenthood. These include studies that explore the use of existing technology in parenting practice, the rules parents set for their own use of technology, and those they set for their children. Other work has examined how digital technologies can be designed to support parents to monitor health data, maintain communication when separated from children over a distance, or track developmental milestones, I argued for a shift towards exploring how HCI and technology design may be able to support children's health development by facilitating play between parents and their

children, which is known to be a significant predictor of children's development, and new avenue of interest for HCI research to pursue.

I provided insights from close collaboration with a play specialist in a children's hospital, gaining an understanding of how children play and described the forms this play took when in the children's hospital. This highlighted the differences between child-led, technology-based play and the more traditional, analogue play preferred by the play specialist, where child-led play provided free reign for the children to create and share creative stories that reflected aspects of their lives outside of the hospital. This was in stark contrast to the traditional methods of play, which resulted in the children quietly completing pre-determined play activities that limited the choices they had. Significantly, this study also illustrated that many parents find it difficult to play with their children, with some relying on the play specialist for advice and suggestions.

Responding to the finding that for many parents, playing does not come easily, I described an in-depth, experience-centred inquiry into parental play conducted at a play session for children less than 2-years-old at a children's centre. In describing how parents play with their children, I provided a rich and nuanced account of parental play. This illustrated that parents are already using technology in novel ways to engage their child in play that is laden with communicative values, such as being physically close, repeated touch, eye contact, shared gaze, and the use of vocalisations. However, I also highlighted some of the challenges that parents face when it comes to playing with their children, including lacking confidence in their own creativity and ability to create, find, or appropriately deliver play opportunities for their children. The *Little Monkeys* session acted as a crucial source of social support to the mothers, where they could share the burdens of caring for a young child with others of similar backgrounds and experience, or seek out advice from other parents, often exchanging new ideas for play that were simple and inexpensive. Based on these findings, I distilled a set of four design requirements for digital technologies to support parents to play with their infant children. These requirements were as follows: technology design ought to support parents to share ideas for play and learn from each other; it should share activities that are inexpensive and easily made using resources from the home or local shops; it should bring together parents of similar backgrounds and experiences; and should enable social connection.

I introduced the *Digital Toybox*, a technology designed to probe the space for HCI to support parents' play with their infant children. I described the design concept of the platform and illustrated how it should be used. I then detailed the results of a five-month deployment of the *Digital Toybox*, which resulted in the collection of a multimodal dataset gathered through

workshops, log data, and interviews with a selection of the users. I described how participants' motivation for joining the platform was derived from their own personal and professional experiences, often alongside a desire to meet other parents who were in a similar situation to them. I further discussed how the parents mostly used the platform to share one specific type of play – the activity boxes, small collections of inexpensive materials and objects, following a specific theme that could be used for children to interact with. Furthermore, I explained how use of the platform ultimately tailed off as three of the primary users of the platform became friends and begun to socialise together, leading to eventual disengagement with the platform. For others, disengagement occurred due to the content not matching their expectations.

Discussing the significance of the findings, I argue that exploring how technology designs can support parents to play with their infant children may be an important contribution to the nascent HCI literature on parenthood. I note how this research provides an initial attempt to provide a design response to this challenge but one that had limited success, given the lack of variation in the content posted. I proposed that deeper engagement with children's centres who may provide more distinct recommendations for play could provide a way of refining and improving the platform. However, an important contribution of this work is to sensitize other HCI researchers to the potential of technology design to positively impact parent-infant play, opening up the space for further research, particularly in terms of facilitating more spontaneous forms of play. I also identified an experience-centred understanding of parent-child play that may prove a more fruitful way to think about play. I detailed how this focuses on being present with your child, being physically and mentally engaged, sharing eye contact, gaze, and verbal interaction.

Finally, I described the challenges faced when trying to engage parents and organisations in such long-term design engagements and explored the implications of this for HCI research. I discussed how it was particularly challenging to engage with participants when the design process foused more on designing for the participants rather than designing with them. Furthermore, I elaborated on the challenges of collaborating with community organisations or institutions and the significance of reflecting on this in light of HCI's increasing interest in these long-term design engagements. Specifically, I brought attention to the question of who is responsible for sustaining long-term, bottom-up initiatives and highlighted how organisational buy-in to the *Digital Toybox* may have been important to enticing new cycles of members and could have encouraged the posting of more varied types of play on the platform.

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Appendix A. Data Collection Strategy for the Magic Land Deployment

During the course of the deployment, I conducted fieldwork visits to the Royal Edinburgh Hospital for Sick Children (Chapter 4). This section includes the data collection strategy developed to guide the project.

1) Logs

The logs can identify which application is opened and how long it is opened for. We're also getting a screenshot of what is being done by the user after every button selection, which should also us to see whether the children are actually engaging with each application or if it is just being left open and not really used.

This may not be as relevant for the water application though, which might potentially be used for relaxation and not actually interacted with as much. The interviews with the play specialist and also the play sessions we partake in will help us identify this though.

The logs will also help us identify the level of use of the system overall rather than relying on the interviews with the specialist.

2) Audio Feedback from the Kids

The record feedback button provides 10 seconds for children to tell us what they think about Magic Land. I've left this quite open on the information sheet ranging from telling us how they felt when using it, what they most liked about it, what they didn't like about it, or how they would like to change it to make it better.

3) Interviews with Play Specialist

Here, I was thinking about focusing on the motivations for and perceived benefits of use, alongside any drawbacks the specialist may have felt when using it. This could focus on:

- The way it has impacted upon the wellbeing of use, particularly looking at the perceived effects on emotional, social, and psychological wellbeing.
- The basics of use (i.e. motivations for using it with children – what did the specialist see as a potential benefit of using it with individual children).
- What types of play has it been used for (storytelling, relaxation, roleplay) and has it opened up any new opportunities for play between the specialist and the child).
- What particular benefits of use have they seen from using Magic Land?
- What drawbacks have there been?

- What other things would they potentially like to be able to do? Or other uses for technology they can imagine within the setting?

4) Play Sessions with Kids

I was hoping to probe experience of use here in the sense of whether the child enjoys using Magic Land and if so the things they enjoy about it, the things they may not enjoy so much, and what they would like to change.

I also thought it could be interesting to follow the drawing intervention approach to working with kids here where we ask them to maybe tell us about what they are drawing or how they are playing and what it means to them, particularly trying to look at what scenarios, stories, environments they are imagining and playing out. This might help us explore how Magic Land is actually benefitting the children by understanding the role it is playing for them.

Finally, looking at other things they might like technology to do or other kinds of play they wish they could potentially engage in through technology.

Appendix B. Sample Thick Description of the Magic Land Sessions

Given the sensitivity of the design and research context and the potential to record others who wandered in to the playroom, it was not possible to audio record the fieldwork visits. Instead, these visits were rapidly documented in field notes and written up immediately after the session. This section contains a sample thick description from the first visit post-deployment to the children's hospital.

BACKGROUND

Kevin and Gavin an interview with Lorna during this session to understand how Magic Land had worked during its first week in the playroom, how many children have used it during the week, which applications have been most interesting, whether Lorna had used with in play sessions with the children there, and whether the children have wanted to use it specifically. The session also sought to explore what Lorna herself has thought about it, whether it is a help or a hindrance, and if she had chosen to use it with particular children, what had guided that choice.

PARTICIPANT

Lorna is the play specialist in Ward 1 and has been for x number of years. She feels that her role has many facets: to give comfort and support to the kids who are in hospital, provide reassurance and comfort to kids who may be visiting their siblings in hospital (or waiting while their parents do so), and also enabling parents to have a little time to themselves while going through the stresses of hospitalization of their children. Lorna really enjoys what she does and, while sometimes finding it challenging seeing kids so ill, she derives great meaning and pleasure from her role in comforting them and making them happy. She also feels that it has become easier over the years to deal with some of the more negative emotions she can experience from seeing the children's illnesses. Lorna seems to enjoy a position of seniority within the ward with nursing staff members always seeking her advice on issues regarding particular children, including how to maybe calm them down if they are upset or on games that would be good for them.

PROCEDURE

The interview was conducted in the playroom on Ward 1 of the Royal Edinburgh Hospital for Sick Children. The hospital has been open for over 150 years and is situated just outside the city centre. It offers acute medical and surgical care, specialist surgical and medical care,

haematology and oncology, day care and critical care. The outpatient department caters for 34,000 patients a year. However, plans are in place to build a new children's hospital, which will be situated beside the Royal Infirmary of Edinburgh in 2017.

The playroom, monitored by Lorna, is a small, packed space, which provides a variety of toys that are mainly of use with younger children. Available toys include a car racing track, a large collection of dolls and action figures, a small kitchen set, paper, crayons, and pencils. Other toys like Lego and jigsaws are also available but these are generally kept in locked cupboards for which Lorna has the key. This is to prevent children using these unsupervised as there is a danger of the smaller pieces being swallowed. The room also contains a television, attached to the corner of the wall, a computer, a small table and some chairs for the children. The computer has access to KidsNet, an intranet that enables the kids to access specified games and websites. Magic Land has recently been installed in the room, attached at eye level for children to the wall. The computer itself is kept within a locked cupboard, with Lorna having the key.

The interview lasted for 30 minutes, inclusive of some interruptions, and ended when Lorna was called away to care for one of the children on the ward. The interview was audiorecorded with both researchers taking notes of interesting thoughts or questions. Initially, Lorna seemed to be disguising her complete thoughts about the system or providing only answers she felt that the interviewees would want. However, after the initial stages of the interview, she became noticeably more comfortable and more willing to criticise MagicLand or illustrate reasons why she would or would not use it.

INTERVIEW

Answers are reconstructed based upon the notes taken by Kevin during the interview process.

Q. How has it gone so far?

It's been very useful I think, especially the water one. The sound from that one is great and seems to distract the kids a little bit. I often see them standing there just watching it or maybe pressing on it a little bit.

I would say that there has been a complete mix of ages, I've seen a 13 year old use it and the youngest has been 3 so yeah, I'd say a complete mix of ages. And also I've even seen adults on it too. I've also seen adults sitting at it.

Was it something the kids wanted to do themselves?

The kids were very keen to do it themselves. I think it's just an age thing isn't it. They're keen and they are not frightened of it. They know what to touch and what to…they're all so used to screens now. It's not like they were standing at the back wondering what to do. They were right in there, very hands on, yeah..

It's difficult to hazard a guess how many kids have used it because I'm not here at the weekend or evenings. I would say 4 or 5 a day but that's probably on the low side because I don't see the kids on the evening.

G: Do they have a break and come back to it or are they very continuous use to the end?

From what I've seen, they go and come back. I haven't seen any sitting there for a long time. I'd say they dip in and out of it. Nobody has come and look for me to say it has crashed or anything so there has been no interruptions that way.

It would be good to have it to automatically shut down at a particular time at night and then have it turn back on automatically to have it start up in morning but other than that it's absolutely fine.

What is it left on?

I think it's usually left on the fish actually, and it's probably myself that's been putting it back to the other screen so that they see there's a variety to choose from and that's probably stupid because the kids would do it for themselves. But I think maybe a few times I've actually pressed the little man in the corner so that it goes back to the homes screen so that they can see the variety of options. But as I said that's probably stupid because the kids would find it themselves anyway. I think it's just a thing of me going past and pressing the button to tidy it up. So maybe I need to just back off and leave it and see what they would do.

Have you done many sessions with kids where the two of you would play with it?

I haven't, it's been really busy this past week. They really have just been sitting with it and doing it on their own devices. I always hear the water in the background – I mean I'm not based in here all the time but if I'm in and out, I do have a look and would say the fish. And maybe I think if there's a new child on the ward who has just come in and I'm showing it to them, then maybe it's me who is edging them towards the water because I like it.

It's just the noise I like about it and it's just easy for them to put the fish in. And the kids love the real fish tank. I mean it's one of the biggest distractions on the ward. You see adults sitting with babies on their knees, you just see all ages looking at the fish. That I would say is the biggest distraction on the ward – the fish tank. It encourages children to walk. We have a little girl on the ward just after spinal surgery and it encourages her to walk. She's walked the whole length of the ward just on the coaxing that she's going to be able to feed the fish. So I got her out of the bed and she walked the ward. So I use it as a form of bribery as well to feed the fish and get them moving. And physio use it as well to get them to walk that wee bit further. It's an incentive "huh, I get to feed the fish today if I walk that bit further". So the fish tank is a big draw on the ward and I think and I don't know if that's why I like the fish here.

Do you think Magic Land and the fish one here has had any noticeable effect on the kids who use it (does it have any calming effect)?

I haven't seen that but from personal experience I would say that it would. I haven't seen that in action but from personal experience, I would say that yes it would. It is a nice distraction if they have been in the treatment room or if they have had something done, then it's a nice distraction for them to come in here and just sit and chill out and use the screen. As I say in the short space of time I've had it, I can't say it's been done but as a play specialist it's something I think would happen.

We get a lot of special needs children on the ward as well and they come in here on a wheelchair. It's another thing for them. You get fed up with cds on all the time you know so again it's just something calm and relaxing for them to enjoy. It's that it provides something different because painting and drawing you can do with paper but not with this. Although I have seen children on the painting and drawing ones and leaving messages so they have been used.

Interviewer points out kids leaving their name

I don't know why they are doing that, whether they want to put their mark on it. When you come in here, you're just a number in here sometimes so maybe it's been quite nice for them to just put their own name and their own stamp. I saw my own name on it but I don't know who did it. I saw it when I came in and that's nice and rewarding. It may have been [name] who did that.

I: This may not be very suited for the older kids?

No, I would say the older kids maybe have used it and it's just because they are so used to the touchscreen. Also, it's the older kids, who are often here in the evening so I can't really speak for them. The older kids, I mean you can see from the set up in here that it's not really for them. So they tend not to come through during the day and so it's at night that they tend to come in watching football or Eastenders or Corrie.

I think doing something with music would be good for older kids. I know that they also like radio lollipop at night – the radio station that's in a lot of the children's hospitals and it's popular with the older kids. Interacting with music in some way would be good. And that might be good for the special needs children too. This morning I had a little boy in here who has special needs and he was just playing and hitting the drum (very simple toy shaped where you touch a side, light flashes and it makes noise). I mean it's a very simple little thing but he was enjoying it so maybe something that has a visual element and creates sound. I mean I know we can use any of the toys with them but they really need sound or light to create a response for them. And a lot of the time, these kind of toys run out of batteries. So maybe if there was a program that does something with light and sound on this.

[Presses drum to play the sound].

The special needs kids also like the rainmaker toy and that again is a bit like the rain on here. It's just along stick like thing and a little thing bead like things drop down and a lot of special needs see it as a very calming thing for them.

I: So distraction seems quite popular. Has Magic Land been chosen ahead of the other toys here or has it just been one of many?

I think it's just one of the group in here. It's just part of the playroom. It's an activity that is there. I think in this day and age, toys are going this way, sadly for me, with the ipad and everything else. A few weeks ago I had a 4 year old girl who wanted to do a jigsaw so with me being that old fashioned I took her by the hand and went to the cupboard and was saying "oh we'll go to the cupboard, we can pick the box, get it on the floor, turn all the bits out, you know and me getting quite excited and you see the colours". No, she just wanted to get her Dad's ipad and tap a scree nand there was her jigsaw and I thought your missing out on all this. I don't know, maybe it's me with an age thing, but I think kids are getting it wrong but that's what they want, they want this instant but to me they're missing out on going and choosing, looking at all the boxes in the cupboard, choosing one, getting on the floor, feeling all the bits in their hand and feeling all the bits turning it over seeing them talking about all

the bits they are turning over and then doing the jigsaw. But no she just wanted this and it was done in seconds. And that was it that was it over "right what's next?" and she was looking for the next thing. Whereas if she had done it my way haha you know it would have taken a little while and we would have chatted but that's just you know the way that kids are doing it nowadays and I just don't know.

Well, they are just looking for instant with all this touch screen. All this technology is just taking children to look for instant gratification. I mean there's a big big shift in the way children play because they are used to this screen dilemma as I'm calling it and it is a big thing. There's not as much conversation you know and I mean with a simple thing of a jigsaw, sit down with that child, take her from her bed to the cupboard and do all that, there was going to be lots of conversation between me and that little girl but she chose to do it on an ipad by herself really. So where was the conversation going to be? The conversation is lacking with the screens.

I: Question about child with down and using MagicLand?

IF I had a child who was down and needed some support, I wouldn't leave them on the screen like that on their own. I'd pull up a chair beside them and do it with them. I wouldn't just leave them at that screen. I'd strike up a conversation with them. It's too insular, do you know what I mean? When It's there on its own, you're always going to get people coming in on their own to use it. So from that side I don't think it will work. It's not to do with the size of screen or anything, it's just not good for it.

[Mention of other form of tabletop]

I would say if it was in the tabletop form it would be better. They have the potential here to just pull up a chair and be on their own. I suppose if it was in a table setting, the potential is still there for them to pull up a chair if they were here on their own. They would still be on their own doing it. I don't think it would make much of a difference. It would be interesting to see if there's a way that children have to go get another person to play with something on the screen – so that they couldn't do it alone. It would have to be a two-player game or something like that.

I: Question about link to materiality and form?

The kids like to get messy. I mean yes they can paint on there but it's not the same as dipping your hand in and dragging your hand across a page. Kids like to get messy. And in this environment we encourage the kids to get messy. A lot of the kids, if they are in here long-term they are here for months on end and it's a very sterile environment. And very quickly the kids become that way as well – they don't like to get messy. So as a play specialist, we encourage messy play as much as we can. As far as messy play goes, we often do syringe painting in the play rooms so that we are taking the fear away from medical equipments. A syringe to a child is a scary thing but if you fill it with paint and start making lovely pictures, you know pictures and that, then you are taking the fear away so we do still like the kids to be hands on and messy. And the kids like to do that, they like the stirring of the playdough and making the playdough you know from start to finish.

[Interruption – nurse asking for music cds for one of the children].

I: How do you decide how to use messy play?

It can be to do with the mood that they are in because children in hospital have got a lot of different emotions going through their heads. And if they are angry, then that comes through in the colour of paint and it's a way to bring those negative emotions out. I use the hammer on the doctor game and stuff like that. They need to get rid of their emotion because they can't take anything else on board until they get rid of that emotion. So I'm really very aware of the different emotions that come up in children and getting them to express it. And anger is one of the big one and they can't cope with everything thrown at them until they get rid of that. It could be through a good messy play session or it could be using a hammer and hammering the doctor or nurse or physio.

I: And in that situation, where do you think Magic Land comes in?

I don't think it does. Ehm, the paint, they could use the colour in the pain certainly, they could do that but I don't know where that would come in. With what's on it right now, I don't think that there's anything that would make a diference. They could write things because we always try to get them to write down keywords so they could write things on the screen. I haven't seen them intimidating the fish or anything like that. No, I haven't seen anyone using that. They seem to think the fish is quite calming and relaxing.

Appendix C. Sample Field Notes from the Engagement with the Children's Centre

Notes from second visit to Ashington Children's Centre and first photo workshop – 22 May 2014.

Researchers present: Kevin

Staff: Sarah, Rebecca, and another female staff member (check name).

The session started quite awkwardly. I arrived 10 minutes before the beginning and were again greeted by Sarah and Rebecca. The weather was particularly appalling, however, and led Sarah to fear that not very many people would turn up. Once I arrived, I quickly put all of the equipment and resources in to the kitchen, organised the polaroid cameras, and began to speak to the staff as it was only my second visit.

The room was once again set up in the same way as the previous week. It was a relatively quiet session, with much less of the "regulars" turning up than the previous week. I used the opportunity to get speaking with some of the new people to tell them a little bit about the project and what I hoped to do. One women was immediately interested in taking part, talking about the selfies she has already taken with her baby and asking if someone to take a photo of her and her baby using the polaroid cameras. I used this opportunity to tell her about what we are doing. She seemed quite reluctant and asked if she could let me know next week whether she would join in. I assured her this was fine and provided her with an information sheet.

Overall, there were 11 families (mainly mums, two families of both mums and dads, and one with just dad and daughter). Only 6 of the people we had spoken to the previous week were there, which the staff said was very unusual and which they attributed to the bad weather.

First Sub-Group of 3 Mum's (4th later joined)

At this point, Sarah (staff member) said that some of the group from last week had arrived and wanted to know if we were doing the photo workshops. I went to speak with them. I brought a polaroid with me and sat down with a small group of three mums (Cheryl, Rachel (?), and one other (Emily?)). We started having a chat about how their week had been and then we spoke about the project. I mentioned that I come around to different people today to have a chat about taking some photographs. With their permission, I started taking some photographs using the polaroids just to document who I was talking with..

We then started talking about taking photographs. Cheryl showed us some of the selfies that her and her husband have taken with their daughter, talking about what the photos show, and the three mums started talking about how they take photos and what they use them for. Emily, in particular, said that her husband was in the army and so was away a lot. In this sense, she took photos mainly as a way of communicating with her husband, to show him how their daughter was developing on a day-to-day basis. During this time, another mum came and joined the group. At this point, two of the mum's started taking selfies on their phones. I mentioned about the printer and how we could use that to print off these selfies for them to keep or to form a collage with. I also mentioned how we had brought the polaroids for the parents to use to document what was happening. However, this wasn't very effective.

In hindsight, as the polaroids are quite big and the mums often do not have two hands free to take these photos. In this sense, the polaroids didn't work but parents might be more inclined to use their own phones next week which are more lightweight and don't necessarily require as much effort or a second hand free.

It was noticeable that the parents were in constant communication with their babies about everything that was happening. It wasn't baby talk, rather full sentences but said in a more playful way and with a softer voice. When we were talking about the idea of taking photos, both Cheryl and Rachel immediately started talking to their babies about what was going to happen "will we have our photo taken? Won't that be fun!". Emily (black hair and baby with lots of black hair) was much quieter than the others when it comes to talking to her baby. She was the youngest mum in this group, with Rachel also having another son and so being more experienced. We took some photos of the parents playing with and communicating with their babies, also singing a song and dancing with them, and always interacting with them throughout the time.

The photos seemed like a useful, fun activity, particularly for building rapport. In the first instance, the polaroid gave us something to talk about. The three mums in this group started reflecting about polaroid cameras, how much they like them but how expensive they are now likely to be. We were then able to take some photos of the parents and babies together on the polaroids, which we gave to them. I think this session really focused on building rapport, getting some documentation, and also piquing interest in what we are doing. We need to do a few things to make this better – such as bringing samples of the end product (passepartout, feedfinder, and A4 example book). However, these activities did really bring in a very comfortable environment and gave us something that we could discuss and have a chat.

People were incredibly comfortable with us. This group proved quite easy in comparison to others, who were a little less comfortable, perhaps down to shyness. However, people became quite interested in what we were doing, asking if they too could get involved.

Second sub-group of two young mums

I also recognised two other mums who I had spoken with the previous week and, at this point, went to speak with them. One had been coming to this session for a couple of months, while the other had just joined the previous week. They arrived at the session together and left together, seeming quite close friends.

I showed them the polaroid camera and started taking some photos for them as they asked. I had just a brief chat with them again, talking about what types of selfies they liked to take. One mentioned how she used selfies as a way to cheer her baby up. She said that if he was too upset, she would often take her phone out, hold him quite closely and start talking with him while taking selfies of them together. She was bottle-feeding her son by now so I didn't feel comfortable asking her if she could take one then. Both her and her friend said that taking selfies always involved a lot of talking and communicating with their baby, carefully talking about their phone, what they were doing, using complete sentences, asking questions (i.e. when taking out their phones "what's this? It's a phone.."), and doing so using a higher pitched, friendly voice (described as "baby-talk voice without the baby-talk"). They also said that they take quite a lot of selfies of them and their baby, often sharing them on Facebook for friends and family to see there. It was something they did both for themselves and for their babies, in the sense that they found it an easy way to orient talking and communication with their babies.

I then began to feel that both mums had their hands full trying to feed their babies while talking to me, so I thanked them for their time, explained about having the printer next week and encouraged them just to take as many different types of selfies of them and their baby as they could, showing the different ways that they communicate together, before moving to another group.

It seemed that selfies acted as an easy method of mum-baby communication, after talking with these two young mums. They felt that selfies were quite an easy way to give them something to focus on with their babies, talk about as they were doing. They felt much more comfortable doing this, especially when their babies were upset. It was quite an easy way to cheer them up but seemed to just be another method for them to communicate again.

Other Participants

Another person interested in taking part was Melanie, a mum in her late-20s to a young son (12 months). Her partner is away with the army also, while she is a primary school teacher. Melanie also mentioned that photos, and especially selfies) were a really important way of communicating with her partner while he is away and helping him to feel closer to their son. Melanie had been late to the session because her son hadn't been very well this morning before they left the house and so it was quite near the end of the session before I was able to speak with her.

Much like last week, she had spent the session just playing with or watching her son, not really as part of a group. Her attention was completely focused on him, talking with him about what he was doing all the time. After some small talk about whether he was better, she mentioned how she had sent a photograph of the two of them together to her partner this morning. She spoke about how, if he is upset, taking out her camera phone for a selfie is always a way to calm him down and immediately make him smile and happy. She talked about how she is always talking to him while she does it but insists on using full sentences when she does so. She feels it's a really good way for them to communicate together as it is something she can physically base the conversation around. I started documenting this conversation through photographs, leading to the little boy looking directly at the camera as soon as he saw it. At the same time, another mum, who had sat quite outside the group on her own asked if she could have a polaroid of her and her baby taken together.

The staff began to re-arrange the room so that it would be ready for the nursery rhyme song time, so I very quickly mentioned how we would have the printer with us next time and that if she could take some different selfies of her and her baby together during the week, we could print them and use them to form the collage. Once the room was set up, the song time began and I sat to the side of the room. I took this opportunity to take some photographs of this session, focusing only on the mum's who had agreed to take part in this study. A number of cushions were placed together on the floor and the mum's and babies formed a circle around Rebecca (staff member). Rebecca led this, always looking at a baby, singing to him or her and doing the actions to show what she was singing (i.e. wave goodbye). In this case, the level of communication between mums and babies was so obvious as they really maintained eye contact with them, moving their hands, dancing with them and singing to them. It was also noticeable how the dads were not involved with this, mainly sitting around the outside of the room. One was just using his phone while the other read a paper or magazine. Another dad,

who was there alone with his daughter, did sit on the outside of the group for a little bit of this brief song time but didn't really get involved in singing any of the rhymes with his daughter (perhaps he didn't know them), instead just watching before leaving before the end. The session then ended before we packed away the polaroids, tidied up after ourselves, and had a quick chat with the staff, offering to clean up before leaving. Staff reminded us that there was no session next week (29th May) because of half-term.

Reflection on the Sessions

This session seemed to focus mainly on rapport-building rather than any real data gathering. We used it as an opportunity to get to know the mums a bit better and for them to get to know us. The polaroids were actually quite useful as a way in to these activities. The novelty of them gave us something that we could talk about and marvel over the instant photo once it had developed. The quality of the image was also an opportunity for discussion. The mums, particularly in the first group, spoke about their memories of using polaroid cameras and how their parents had often had them in the house. This was quite a good introductory activity, especially when we took the photos. They weren't very good, however, as a way of self-documentation. The mums didn't have enough hands free to actually pick up a polaroid and take photos. I think that next time, we will still bring the polaroid but also encourage the parents to self-document the sessions using their own phones and print to the printer. This part is particularly important – we need to think about how we can better encourage self-documentation.

We did manage to very quickly build quite a good rapport with both the staff and the parents. Part of this came from laughing at my terrible photo taking. I also mentioned my dad and how he used to joke about my terrible photo-taking. There is also something in the fact that we just sat on the floor, also playing with the babies and talking with the mums. Getting so involved seemed to make it much easier for us to connect with them. Particularly in the first group, these parents were a little bit older and were more comfortable with us, very open and not shy. The younger parents were a little bit more shy than these. It feels though that the most crucial feature of rapport building was that I also shared something about myself. There is still some work to be done here, however. Some of the parents might have felt a bit unsure who I was in particular as a 29-year-old guy and what I was doing there. I was able to explain this in terms of Madeline being a new mum and that this influences a lot of what we are doing. I also said how we have a little tradition of doing work that supports new mums (i.e. feedfinder). I feel we need to make this a lot more concrete for the next time however to

really illustrate why I am there. For example, I should put Feedfinder on my phone and show it to some of the parents, also bring along an actual passepartout using some of the photos we took this week to show what the parents will have at the end of this. I also want to bring along an A4 booklet showing different passepartout designs that we have made using the laser cutter to give some samples and ideas of what we could do. These will hopefully make people more interested in being involved but will also perhaps better relate our reasons for being there, which the parents may currently be a little unsure of.

Appendix D. Plans and Materials from the One-to-One *Digital Toybox* Workshops in the Family Homes

Introduction

The workshop involves meeting Sally and her daughter, Grace, who will be 2 next week. It starts at 9.30am and should end between 10.30 and 11.am.

Workshop Plan

Section 1: Introduction to the Project and Me

10.00 – 10.10: The workshop will begin with a brief introduction to the project and also to me – telling a little bit about my background and why this is interesting for me. I'll also spend a couple of minutes talking to Sally about why she was interested in this and what she would hope to come out of it. I have created some cards to act as prompts to scaffold the workshop and introduce these here.

Section 2: Coming up with Ideas

10.10 – 10.30: During this time, I'll talk with Sally about where she gets her ideas from when it comes to playing with Grace – are they things she comes up with herself or does she use different online resources or learn from friends? I'll also ask her to show some of the things she really likes to play with Emily.

Section 3: Making and Sharing Ideas

10.30 – 10.50: This time is for recording the videos. So I'll talk to Sally about the duration of the video. For example, if she was searching for something to inspire her play activities with Grace, how long would she like the video to be? If she has previously searched for ideas, it would be interesting to know what those videos look like – are they really high quality, well produced instructional? Or are they more like just other parents recording and sharing what they do in a much more DIY way? I'll then ask her to record one or two videos of her favourite activities using the site and upload them. During this time, I'll also ask her about who she would be comfortable sharing them with, what issues may affect her desire to share them?

In this time, I really need to get at her motivations for sharing something – what might encourage her to share videos? Is it tied to her personal values? Or is it some form of social obligation?

Session 4: Her Favourite Ideas

10.50 – 11.00: The final activity will look at creating an "instructable" (instructables.com). I'll ask Sally to talk through another two games she plays with Grace and break it down in to steps that we could then share with others as a weekly activity.

11.00: Suggest about sharing it with some friends, whether she has any questions, and conclude the meeting.

Appendix E. Glossary of Terms

Parent	The term parent is used interchangeably with primary caregiver in the research. Both refer to the person responsible for looking after the child at the time. Parents were not always present during the research, instead it was occasionally a grandparent.
Primary Caregiver	Primary caregiver refers to the person who has responsibility for the child during the moment of care. This is used interchangeably with parent. However, it was used to highlight that it is not necessarily the parent who needs to engage in this interaction with the young child. Instead it is whoever has responsibility for the child's care at that moment.
Play	Throughout the thesis, play is used to refer to moments of engagement that are initiated by the child and involve being present, close physical contact, shared gaze, eye contact, and verbal interaction.
Play Specialist	Play specialist is used throughout the first case study to refer to the member of hospital staff who is employed on each ward to support children and parents as they adjust to the time in hospital. Play specialist is used to denote that the professional has training in play rather than any therapeutic or counselling training.