TECHNOLOGY AND THE FAMILY CAR: SITUATING MEDIA USE IN FAMILY LIFE

A thesis submitted in partial fulfilment of the requirements for the degree of

Doctor of Philosophy

By

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Abstract

The thesis describes how family life is organised in the car, with a particular focus on exploring the role and use of mobile technology in this setting. The objective of this research is to use the insights from video ethnographic data collected with families to discuss how social interaction between family members may be situated to technology use. Drawing from the notion of 'ordinary work' discussed in ethnomethodology and applying this to naturalistic video data of families in cars, the thesis demonstrates how family activities are locally produced, drawing on background knowledge and common-sense understandings of family members' work. Using methods from conversation analysis, the research demonstrates how transcribed instances of talk can reveal how parents and children produce their actions and talk to jointly produce activities in relation to media use. The analysis presented in this thesis demonstrates how the family car provides an opportunity for parents and children to come together, and engage in mundane family activities of talk and play while using a range of mobile devices. The thesis draws on richly documented and closely analysed episodes of interaction to demonstrate how family life unfolds in the accomplishment of activities in which interactions are situated, orderly and observable.

The production of family life within the car involves talk and embodied action that is artfully placed within interactions between parents, children and technology. The analysis elucidates how the features of negotiation, collaboration and coordination around device-use are placed alongside driving activities. The contributions of this thesis lie in providing a descriptive analysis of the social organisation of family life through technology, developing an understanding of family technology use in a mobile context and highlighting elements of interaction that will inform the development of insights for the design of technology that is sensitive to the nuances of family life, mobility and technology practices.

DEDICATION

I dedicate this thesis as a gesture of gratitude to the most important people in my life who have made the journey of the PhD infinitely more rewarding. This work is as much yours as it is mine.

My family in India: my parents, Priya and Vasant, my sister Mayuri, my brother-in law Jayanth and my loving grandparents. I have been blessed with such an inspirational, supportive and loving family. Without your love, prayers and well wishes I cannot imagine that I would have got through this. Thank you for unwavering support in realising my dream even though it meant moving miles away from you.

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Publications

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Table of Contents

In memory of my dear grandfather who unfortunately did not see the completion of this thesis. Your love for your family and your joy in the simple and ordinary things in life is a true inspiration for this piece of work.

Chapter 1 Introduction

1.1 Setting the scene

In the same way that peering at someone's front yard gives us an idea of who might live there, stepping into a family car brings similar sorts of associations of a 'lived space' in which the activities of family life reside. For example, one might find in a family car an array of CDs overflowing from a case, a half-used packet of tissues lodged into the storage compartments in the door, a lone action figure lying in the backseat, an umbrella lying forgotten on the floor, or children's hairbands stretched over the gear shift. Being in the car as a mobile, embodied practice shapes both a family's experience of travelling together as well as their experience of the world around them.

Over the last few decades, this aspect of family life has seen significant transformations due to changing patterns in mobility and technology use. Both in Western populations as well as at the global scale, families increasingly rely on mobile technologies embedded in cars to carry out care practices and manage multiple activities. Cars enable people to bring with them work, leisure and duties of care thus leading to highly flexible patterns of moving and fulfilling responsibilities. While the car enables people to travel between different places, mobile technology seems to further enhance their mobility. For example, mobile phones and wireless digital technology enable the planning or re-scheduling of activities 'on the go', prompting many users to use them during travel time.

In the UK, car travel continues to constitute the largest form of transport in terms of distance (DfT, 2013). Despite challenges like congestion, high cost and rush-hour panic, family car journeys are more and more associated with the necessity to be mobile. Increased family car travel is evidenced through sustained reliance on the car as a secure and flexible way for conducting everyday activities (Murray, 2009, Jain et al., 2011). According to the National Travel Survey (DfT, 2013), children aged 5-10 years are twice as likely to travel to school by car compared with older children. Furthermore, an increasing percentage of leisure trips made by car have resulted in families spending even longer time together in the car. The automobile thus becomes a socially rich and appealing site to study both family life and technology use.

The "family" and the "car" have independently been the foci of study in Technology Studies for some time. Previous work has built on conceptualising visions of what the

future home (Harper, 2003) or car would look like, focusing on how portable and wireless technologies could support the interactions of users in the future . At the time of this research, part of this future had already been realised since families are making use of portable technology such as mobile phones, gaming consoles and tablet computers. In turn, cars have also been transformed by technology to integrate a range of mobile devices even as essential features of their integral design. Even during this research, new mobile practices emerged and a growing number of products became available to support time spent in the car. Further to the increasing use of entertainment devices in the car, smartphones have started displacing SatNav devices for navigation, and new specialised services like Car Mode, Ford Sync and Apple CarPlay have become available. Future plans in the market include even more opportunities to use technology for entertainment and automation especially, with the concept of driverless cars being tested and debated widely at the time of writing this thesis.

There is therefore good scope and timing to study family interactions in the car centred on technology for activities such as coordination, entertainment and navigation. Technology use within family is particularly of interest as it has captured interest within fields of human computer interaction, studies of family life and the social studies of technology. The research will seek to inform these areas by adding to our understanding of how drivers and passengers cope with the demands placed on existing interactions with mobile devices.

1.2 Motivation for the research

This thesis is inspired by the idea that technology interactions are situated within the social conduct of individual users within a setting. Designing systems for users involves the study and unpacking of interactions, issues and concerns to provide a complete understanding of the car's setting in use. To make these systems useful and truly assistive, we need to build an understanding of what people are doing *when they are using* these technologies. This rationale follows previous work within the social conduct in technology studies literature (Heath and Luff, 2000). At the same time, the research is set within the context of the growing ubiquity of technology with everyday contexts such as the family and the car. Research on lone drivers indicate that cars have significantly changed the ways in which they support work (Laurier, 2004, Hislop, 2013) as well as play (Östergren and Juhlin, 2006, Juhlin, 2010). Yet, there is still a dearth of knowledge on how using technology while being mobile reshapes family life.

An additional motivation came from my interest in the organisation of family life and the role of technology rather than the car as an object of study. My personal interest inclined more towards how the car supports the configuration of family life and lesser on the attitudes towards the car or the car's environmental impact on society. In reading the literature, I began to realise that it is because of the particular activities that it supports that families choose the car as a more suitable mode of transportation. Hence, the car should not be seen as a neutral space but one that supports particular movements within family life around patterns of kinship, socialising and working (Sheller and Urry, 2000, Sheller, 2004, Redshaw, 2007). In studying interactions between passengers inside the car, researchers encounter cars to be considered as 'activity spaces' (Goodwin and Goodwin, 2010) associated with particular social activities such as conversations, homework and play. The inside of the car, with its unique spatial configurations, provides for a setting where interactions may be restricted between drivers and co-passengers. When family members are constrained by the confines of the car (where interactional resources are limited), activities need to be managed using adaptive interactional resources within these spatial configurations.

Unlike the driver, passengers such as children or other adults are able to engage in a range of activities like entertaining themselves, engaging with the environment, as well as when the opportunity presents itself, to assist the driver. As a result, individuals share driving experiences within the car as co-passengers or navigators, while driving itself is a practice that involves shared cultural meanings, associations and practices (Redshaw, 2008). One such practice supported with the car is that of parenting. In families, cars play an important role in facilitating carrying out family responsibilities. This is the main reason why much of the geography literature around the cares-capes of parenting has focused on the car as a site for parenting practices (Dowling, 2000, Bowlby, 2012). In the next sections, I will discuss the motivations in studying the family car as a mundane setting for technology use and the value it adds to the understanding of family and technology practices.

1.2.1 Making the commonplace visible: studying everyday family practices

Being a family or *doing* being a family is something that is a taken for granted part of everyday life. Defining what 'family' means has been a growing challenge for researchers in social science as the dynamics of what a family represents has changed over time (Murray and Barnes, 2010). One long-standing approach is to study family as a system

(Bowen, 1966). In regarding family as a system, it draws one to its features of structure and tasks. Structure refers to how the individual members compose the family unit, including the patterns of interaction and behaviour that govern it. In essence, the family as group of interdependent individuals can (1) possess a sense of shared history; (2) experience emotional bonding; and (3) engage in meeting the needs of individual members and the whole unit. For the purposes of the current research, I describe these interdependent individuals to consist of parent-child units, extending to include both single and dual parent families.

More recently, there is a shift in studying families to examine the lived accounts of routine activities of family members. One useful approach to studying families is Morgan's term 'family practices' (2011b). By this, he refers to the regular set of activities that form a part of everyday family living. The family is characterised by routines and habits and everyday practices that constitute its everyday running. It is in this *"doing of family"* that this research is concerned. Social scientists study the family as a unit from the view of their interest in the habitual features of everyday life. For the members of the unit of a family, the activities and routines that form the natural order of their lives are often taken for granted and not something, they reflect on consciously. Research oriented to studying everyday phenomena aims at unpacking this taken-for-granted feature. For example, in spending time with families and observing their routines, researchers are made aware of the routines and habitual patterns of family members: organising activities of children, coordinating with a partner or child minder, preparing materials for particular activities, etc. Qualitative approaches such as ethnography and interviews have been valuable tools in the study the phenomena within the family life. The empirical findings are then interpreted through a range of different perspectives that explain the ways in which family life and routines are unpacked. I will touch on those pertinent perspectives before bringing focus to the current study's own orientation.

In describing the composition of everyday life, Lefebvre (1984) places emphasis on the focus on *recurrences* as an important feature-of everyday activities. Such an approach describes everyday family activities as studied through applying an understanding of the rhythms of everyday life. He describes that human activity comprises of mechanical movements, linear and cyclical repetitions of routines and practices governed by rational properties of time and space. When applied to family life, this view helps researchers

understand how families organise and manage everyday life through various temporal routines (Nansen et al., 2009, Kullman and Palludan, 2011).

Another perspective to examine human action is through the study of practices. In referring to the 'practice turn' Schatzki et al. (2001) provides a view of what constitutes a practice: "*practices have come to be defined, loosely, as sets of human actions that can be associated with each other in some way and that can form a category for sociological analysis"*. He describes that in order to study human action, we must pay attention to the objective temporal and spatial features of what constitute a practice. The study of practices can take place in a range of settings including home or office. Practices can also become entangled with the arrangements of objects. In applying this lens of practice to in her study of domestic practices in the home, Shove (2007) describes how practices are shaped through connection with material properties of the artefacts used in everyday routines. Observing home practices of cooking, home renewal and DIY, she noticed the importance of artefacts in the moral economy of the household. According to Shove, the reproduction of everyday life involves the active configuration and integration of complex set of material objects rather than incorporating isolated artefacts. In addition, effective configurations also rely on the meaningful and competent placement of artefacts. By applying the idea of practices, she discusses how technologies play an important role in the construction and reconstruction of social relations. Miller (2001b) also discusses how objects in the home act as facilitators for the enactment of practices. In this regard, ethnography can provide narrative accounts of meanings associated with these objects helping the researcher understand what is important in the lives of the people around them.

The perspectives discussed so far provide a view to obtain descriptive and rich accounts of how families manage time-space concerns and what material artefacts are used in the doing of family life. However, what is missing in these accounts are *how* these artefacts become relevant in enacting of family. In order to examine such an approach, there is a need for emphasis on describing how families interactionally accomplish being a family (Aronsson, 2006).

The current research uses Ethnomethodology (EM) and its cognate discipline of Conversation Analysis (CA), in order to unpack the social order that underlies the production of family life. Ethnomethodology as an approach to the study of everyday life is interested in the production of social order (Livingston, 1987, Lynch, 1994). According to ethnomethodological auspices, everyday life is organised by a set of practical actions

and reasoning that govern the enactment of everyday activities. Studying this involves the scrutinising of the distinct talk (CA) and activities conducted by members within a setting. A feature of everyday routine activities is that the individuals within settings use and develop ongoing inter-subjective knowledge of each other's activities (Sacks and Garfinkel, 1970). EMCA has been a useful approach to study the organisation of family activities such as family gatherings (Butler and Fitzgerald, 2010), technology-supported game play between family members (Aarsand and Aronsson, 2009a) as well as reading together (Rouncefield and Tolmie, 2013).

According to Garfinkel (1964), the practical accomplishment of routine activities is made possible through references to past associations and common sense understandings of each other as well as local resources available in accomplishing actions. Smooth running of social activities is dependent on participant's knowledge and expressed understanding of the each other's actions. For example, a child may understand that not complying with a parent's request to return a device will result in a set of unfavourable consequences, such as confiscation. This is based on both the prior experience as well as the situated actions produced such as parents' issuing a warning glance, stern or upgraded request. It is common-sense understanding that EMCA brings to the study of everyday phenomena makes it an appropriate approach for the study of family life in the car.

1.2.2 Technology saturating the family and the car

Technology is a significant feature of how we interact with each other and social relations within the family. A key feature of technology is its ubiquity, which refers to the quality of devices to become interwoven into our everyday lives. In order to study technology's role in everyday interaction researchers need to turn their attention to the organisation of social activities that constitute human-technology interaction.

An important point of departure is Weiser's (1991) vision of ubiquitous computing that discusses the transformation of everyday life through the embedding of technology. Drawing on this, early conceptualisations of the smart home revolved around how technology may be better able to support the needs of family routines in the home (Crabtree and Rodden, 2004, Taylor et al., 2006). A significant portion of past research envisioned how technology may better support families by making activities around domestic life more effortless. While the work of care and domestic duties around the home itself has not seen significant modifications, the way in which technology facilitates these

activities has had a significant effect. For example, tablets and smartphones with connectivity to the internet enable parents to immediately plan activities or navigate in the car, as well as presenting opportunities for children to remain entertained. An important way in which technology supports parenting is in supporting the coordination of activities as seen in the early development of awareness and calendaring systems that enable family members keep track of each other's activities (Khan et al., 2006, Brown et al., 2007, Brush et al., 2008, Neustaedter et al., 2009).

With the proliferation of technologies and access to internet, concerns arise within parenting controls over moderating ICT technologies (Information Communication and Technology) within the home. The consumption of technology within families is often treated with caution as parents pay conscious moral regard to how much time children spend on devices (Shepherd et al., 2006, Stephen et al., 2013). Parents express the need to develop patterns of regulation around how much of screen time is allowed in the home (Plowman et al., 2010). As a consequence, there is a need to study how regulations may be managed and when such restrictions may be implemented (Livingstone, 2007b) in a range of domestic settings including the car. With the introduction of new technologies into family homes, there are concerns around creation of solitary, virtual and physical spaces that separate family members from each other. Parents may deal with this by placing computers and game consoles in common spaces in the home to closely monitor the content and nature of game play (Brush and Inkpen, 2007, Aarsand and Aronsson, 2009a). In a survey aimed to understand how families may appropriate the daily use of technological artefacts in everyday life, Livingstone and Helsper (2007) identified multi-level issues including parental preferences in patterns of technology use as well as the need to monitor children's use of technology. Such studies identify and report on patterns and trends regarding technology. The findings may be further extended through the examination of phenomena from an interactional perspective that enables researchers to describe and unpack the ways in which families go about regulating technology, how they approach and cope with technology over-use. Such accounts are necessary to gain a full picture of the integration of technology into family routines.

The varying distribution of family activities also account for the increasing reliance on technology to support parenting. For example, families no longer need to manage and plan their work in one place-namely the home. While some planning may take place at home, mobile technologies enable both family routines of play, talk and activity to reside

anywhere the technological artefacts can be carried along (Line et al., 2011). This calls for the study of technology practices in a variety of settings, not simply restricted to the home and this returns us to the car as a site of technology use.

Moving on to the car, technology corporations such as Google and Apple have shown interest in the integration of smartphone technologies into the car. At the time of this research, the market was seeing the introduction of Google's CarMode and Apple's CarPlay (Swider, 2015) as well as integration of music applications such as Spotify (Warren, 2013) into car dashboards. These appear to be part of growing attempts to move forward the integration of mobile devices and connectivity into the car's space. While efforts in this direction are being carried out, consumer insights reveal that many of these systems continue to be mismatched to user behaviour either because they lack responsiveness, are distracting or far too complicated to manage while driving (Iliaifar, 2013).

Nevertheless, these developments suggest that cars of the future may be connected to each other, communicate with each other and have increased awareness of traffic conditions (Koslowski, 2013). This is further made likely with attempts at creating the connected 'social car', which enables the consolidation and incorporation of data and interactive features inside the car (Schroeter et al., 2012). For example, researchers have attempted ways to experiment with automotive life-logging systems by which a personality is given to the car that enables drivers to make on-going discoveries about their vehicle, driving environment, and social contexts (McVeigh-Schultz et al., 2012). The availability of connectivity has considerably extended the scope of how technology can support the car of the future. Bringing the 'Internet of Things' (IoT) to the domestic and automotive realm is changing the way in which people may be able to use their devices while on the move.

These recent developments in technology indicating the transformation of family life and car travel affirm the need to study these contexts as vital sites for production of social activities around technology use. Yet there is a need to account for these instances of technology use through the analysis of interaction to explain their effects, to look at their effectiveness and to consider implications for future designs that will better meet their user needs. The next section discusses how the study of human interaction and practices has become the focus of enquiry within technology studies.

1.2.3 Technology studies and a 'movement towards the field'

One of the ways in which technology design is centred on the users and their social practices is to directly study the settings in which technology is being used. For a long time, the motivation behind technology studies was largely focused on the need to provide innovative solutions to human problems, driven by a desire to build technology to replace, augment, or replace manual work. However, there has since been a paradigm shift in viewing the design and development of future systems. Now this focus on the social interaction within study of humans and computers has come to be called HCI's third wave or a third paradigm of HCI. As Harrison et al. (2007) explain, "*the third paradigm of HCI treats interaction not as analogous to information processing and transmission but as a form of meaning making in which the artefact and its context are mutually defining and subject to multiple interpretations."*

This view challenged the earlier model of human-machine relationships in which users were said to respond to machines in mechanical ways. Instead, with the increasing importance that technological objects bear for users, the shift of focus is on these meaningful values that they possess (Sellen et al., 2009). A key element of this turn has directed the movement away from the lab setting and towards the sites of technology use. For this, researchers began to draw inspiration from field studies within social sciences to support their work (Hughes et al., 1995, Tolmie et al., 2002, Crabtree and Rodden, 2004). The Fieldwork for Design movement within technology studies focuses on the sites where technology is to be placed in (Randall et al., 2007). Such endeavours attempt to study the needs and important routines of the setting such that technology can be better designed to support the complex social interactions that reside in that setting. Without this perspective, the accounts of 'sociality' or of ways in which we develop our interactions around the technology go overlooked.

The early studies on the use and effects of technology use on social behaviour involved the workplace. This drew researchers to the complex interactional organisation of work whose accomplishment was dependent on artful social interaction within technology-rich spaces. This motivated the testing of technology *in situ* such as the Active Badge trial at PARC (Want and Hopper, 1992) or in studying collaborative communication across office spaces (Heath et al., 1995) as a shift of focus to the study of naturally occurring work place interactions. The need to move towards the field arose from observing work in all its complexity and messiness. Growing flexibility in work sites enabled people to work

beyond their desks, prompting the development of devices designed with improved connectivity. In time, the development of mobile technology meant that people could carry devices into other spaces including the home. The home in turn, became a natural extension for technology use, supporting the need to move away from the lab and into the wild.

The home drew interest to researchers of technology because of its sheer simplicity and taken for granted features (Bell et al., 2003, Taylor et al., 2006). As a site, the home is quite different, as it does not fit the same utilitarian technology needs as the workplace. Instead, family life tends to be unpredictable, messy and affording much more flexibility (Taylor and Swan, 2005, Taylor et al., 2006). Hence, technology design may need to adapt to the unpredictability that surrounds the behaviour of family members and their artefacts (Tolmie et al., 2002). Similarly, the car has for some time seen as a fertile ground for technology design both for functional technology to support driving (Leshed et al., 2008) as well as entertainment (Juhlin, 2010). The family car, which the current research is concerned with, supports a complex pattern of social interaction as well as technological function. While posing an interesting locale to study family life, the use of technology in the family car is one that has not been explored sufficiently in earlier research. Although a challenging site to study *in situ*, the availability of a range of recording devices has made the study of this site possible.

1.3 Research Approach

The earlier sections set the background motivations to the research and provide an understanding into how the current work provides a motivating topic for the study of family and technology use. Moving further, this section will address the central concerns of the thesis and justify the choice of method and orientation enabled to meet the objectives set out later. Finally, the section describes the scope of the research findings.

1.3.1 Objectives and research questions

The research aims to study how family life is produced in the car, in and through the use of technology. The thesis draws on video ethnographic data on families using a range of mobile devices in the car with the intention to describe how the use of devices draws attention to the organisation of family activities. The data described here analyses the underlying features of family work such as orderliness, awareness of each other and the features of talk and interaction in a moment-by-moment analysis of family life in this

setting. The research investigates the family car as a distinctive setting for media practice. Through observational work of families using technology in cars, the research documents the varied domestic routines that take place during car journeys in order to develop insights for the future design of family-oriented, car-based media that are empirically grounded in examples of use.

The overarching aim of the research is concerned with studying the production of family life through technology use in the car. This aim can be further developed into a list of objectives and questions that help specify each objective.

Objective 1: To unpack the social organisation of family through technology in the car:

Research Questions

RQ 1. How is 'doing family' evident through the features of talk and activity that constitute the routine features of driving and travelling together as a family?

RQ 2. How do the instances of technology use by family members draw attention to the enactment of on-going family relationships in the car?

RQ 3. How do family members account for their actions by drawing on present and past resources in engaging and disengaging with one another, whilst using media?

Objective 2: Describe the role of technology in supporting the construction of activities between family members in the car.

Research Questions

RQ 4. How do families travelling together orient to the material and situated properties of mobile technologies during their use over the course of car journeys?

RQ 5. How do the temporal demands of journeys (the length of journeys and their progression) as well as the spatial constraints (arrangement of seats, limited mobility) interact together while travelling in the car impact on the ways in which families orient to technology use?

RQ 6. How does the data demonstrate the ways in which parents and children jointly construct technology-supported activities in the car?

Keeping these above stated objectives in mind, the research uses evidence in the empirical data to provide a description of the social organisation around technology use within a mobile context. The research provides a description of the practices and interactional

relevance of using technology in the particular setting of the family car. These findings then further provide implications to direct and inform the design of new technology systems for families.

1.3.2 Methodological Approach

The current study required an approach to a socially and technologically rich setting of the family car to help improve the understanding of social entanglements of technology, family practices and car's mobile nature. The main motivation for selecting a qualitative approach for this research is given its suitability to study people in their natural settings and to understand phenomena in terms of the meanings people bring to them (Atkinson et al., 1994). Keeping in line with the research's interest in studying family through the lived accounts, the analytical framework offered by Ethnomethodology and Conversation Analysis (EMCA) offered the best tool to address the research questions (Clayman and Maynard, 1995).

Together with ethnomethodology which unravels the orderly and accountable nature of a setting, conversation analysis provides an analytical tool to study the mechanics of sequential organisation of naturally occurring talk (Sacks, 1995). Unpacking the social organisation around a setting highlights the role of conversation in studying everyday life because first, everyday life involves social encounters that involve talk or interaction of some kind and second, the routine and habitual actions that individuals construct in their production of everyday life is made observable and describable through transcribing talk as well as non-verbal interaction. In studying everyday life, the current research draws on the two approaches as a means to unpack the practical organisation of family life in the car through a description of routine sets of talk and actions observed.

1.3.3 Scope of the research

The current study is concerned with addressing the family car as a topic of interdisciplinary study. The scope of the research extends to informing research mobility studies, social study of technology and extends the understanding of family.

A key focus of the current research is to describe how family life is socially organised through technology. This brings to the forefront the organisation of talk and talk-related activities such as gesture, pointing and bodily orientation while using devices to the scrutiny of the researcher. To this end, the use of video-based recordings of naturally

occurring data from families provides a detailed analysis of interactions between family members, their devices and the car's environment.

In adopting the EMCA perspective to the understanding of social conduct around technology, the study adds to a growing body of work within the CSCW literature that is concerned with leisure activities. It further presents a nuanced way of understanding family activities and the role of technology through a focus on phenomena. In contrast to studying the power relationships between parents and children, the study aims to discuss and describe what activities families engage in together and how these activities are produced.

1.4 Thesis overview

The thesis comprises of the following sections.

In Chapter 2, I set the background to this research by drawing on three disparate research literatures around technology, the car and family, drawing attention to what the current research attempts to address. In building a case for detailed studies of social conduct around technology, I discuss the workplace perspective and an extended interest on the understanding of leisure time, and particularly the study of family life. Next, I move specifically to the car as well as the family as sites of sociological and technical interest. Here I draw on interdisciplinary approaches within technology, mobilities, and geography and family studies. Finally, I summarise the highlights of the literature and draw focus on the current study's interest and value in studying 'family life' and technology.

Chapter 3 will provide the justification of my choice a qualitative, situated study of technology in the family car- through the detailed sequential analysis of interaction. I justify my choice of the EMCA approach and the ways in which my treatment of the data and analysis was in keeping with the main tenets of this approach. I then position the study against existing ethnographically informed tradition in technology studies. As such, the chapter further demonstrates the analytical process of organising, selecting and working through short video fragments to illustrate larger concerns in the data corpus.

Chapter 4 begins by presenting the first set of findings of the thesis. In this first data chapter, I introduce the role of talk situated within device use in the family car. I discuss how the presence of a device occasions parent-child talk. Within this, I focus on the placement of talk alongside driving demands and its emergent character as it is shaped around the biographies and past knowledge of family members and technological artefacts.

Moving further, I discuss how conversations about device management may also take place on account of these interactions. I describe how media management is carried out through the course of journeys: how offers of media may be made and negotiated as well as how issues of device pacing and disengagement may be dealt with.

In Chapter 5, I discuss the embodied and situated nature of technology use in the car, which presents opportunities for collaboration, and collaborative production of activities between drivers and passengers. I discuss how technology use can be jointly produced as a feature of family life in the car. In using examples from two sets of activities in the car, namely backseat play and collaborative navigation, I discuss how activities are constructed and sustained over the course of journeys. I show how the knowledge of family members, the features of mobile devices as well as the spatial and temporal factors interact with each other in carrying out activities.

Chapter 6 brings together the findings of this thesis, and is used to synthesise the primary contributions made. It shows how this thesis has significantly developed our knowledge of family, technology use and the relationship between the car's material environment and interaction. Because the research explores family interactions around technology as a situated, embodied interaction in the car, it is able to contribute to the understanding of family life as manifest through a number of activities as well as the ecology of in-car interaction in ways which other analytic approaches have not made possible.

Chapter 7 is a conclusive section that details the main contributions of the thesis. It highlights the research's relevance in developing an understanding of the social conduct around family members' use of technology within the mobile context of the car. The Chapter also positions the study and findings within the scope of future work while acknowledging some of the limitations of the current study.

Chapter 2 Connecting technology, cars and family practices

2.1 Introduction

This Chapter sets the backdrop to the current study by contextualising the study in terms of related past research. Before undertaking a study examining the role of technology in the family car, it is important to identify and discuss the areas that the research is building on. This thesis is set against the background of work done around mobilities, family life and technology practices. Therefore, before setting out how the work described in this thesis was conducted, we will first examine these strands of research independently. First, I start by discussing the importance of social conduct within studies of technology. Here the focus is on the growth of ethnographic approaches in studying technology and interaction rich spaces highlighting the family and the car as settings of socio-technical interest. Extending from this, I discuss the car studies literature: drawing on the social science perspectives, as well as the role of mobile technology in shaping mobility. Finally, I turn my attention to the family and the role of the car and technology in shaping family practices.

2.2 Role of 'Social Action' in technology studies

In recent times, there is a growing interest to support everyday life by supporting manual, human activity through technology means. In order to address, there is a need to understand how human conduct contributes to the organisation of that activity. Understanding how individuals work together and the observations of their work practices, provides a stronger impetus to develop and improve technical support systems. Ethnographic findings in organisational settings such as Sellen and Harper's (1997) work in the IMF and other work practice settings such as doctor's offices and construction sites (e.g. Luff and Heath, 1998), highlighted the need to consider the values associated with the physical properties of documents in work practice before making the transition to fully technology-based systems. The extension of such interest to organisational practices in the home similarly found the versatility of paper organisation systems such as noticeboards (Taylor and Swan, 2005) and calendars (Neustaedter et al., 2009) in inspiring the design of technology systems to support routines and practices of home life.

Further, where implementations of systems already exist, ethnographic approaches provide means to study the problems encountered in their use as not all technologies have effectively replaced human action (Brown and Laurier, 2012). In this section, I will discuss

how the movement of studying the sociality of a setting empowers designers and developers of technology systems to fit the needs of users. While focusing on social action within technology studies, the concern is with studies that aim at unpacking the situated and sequential nature of activities around technology use.

2.2.1 Naturalistic studies of work

Naturalistic studies enable researchers to study an individual or group's behaviour and activities in their ordinary setting. Ethnographic studies have their origin in anthropological studies wherein the researcher resides in and becomes a part of the site that he or she wishes to study. In technological research, fieldwork enables researchers to observe how people behave and identify the problems and improvisations made by members *in situ.* In contrast, laboratory settings control for extraneous factors and therefore do not allow for the observation of a range of interactionally relevant practices that may observable in a natural setting.

One of the most significant influences of anthropology into technology studies took place when Xerox PARC's anthropologist Lucy Suchman wrote her seminal work on observing human-machine problems (Suchman, 1987). Her role in identifying and making 'visible' what makes a technological artefact hard to use, challenged the predominant view of studying user's perceptions and cognitions in explaining human-machine relationships. By observing and articulating the ways in which people encountered technology (in this case the photocopier machine) she inspired a tradition that placed focus on the observable aspects of computer-mediated interactions. While the predominant view held at that time was that the user approached a machine in a systematic way i.e. with a set of plans, her observation instead was to highlight the situated nature of user activities-the idea that interacting with a machine in this case is influenced by locally produced actions.

Suchman drew inspiration from the ethnomethodological tradition, a view that focuses on the study of organisation of practical actions within everyday activities. Since her seminal work at XEROX, the area of *Workplace Studies* has since been the predominant approach to study collaboration and coordination activities of the workplace (Luff et al., 2000). This extended the study of work to other sites such as airport control rooms (Bentley et al., 1992), financial organisations (Harper, 1998) and underground control rooms (Heath and Luff, 2000). Workplace studies therefore began to modify the ways in which users were

defined by understanding the practices associated with particular technology interactions. As Luff et al. (2000) explain*:*

"The practical concerns and implications of workplace studies derive from an analytic agenda, an agenda which is attempting to re-specify technology with regard to human practice and social organisation."

These studies were motivated by the need to build descriptions of work practices in these settings and through these descriptions, to identify how knowledge of these practices may support systems design. This led to the uncovering of collaborative practices that enable workers to handle and communicate effectively through systems in order to accomplish work in a setting. Workplace studies have since evolved based on influences from the disciplines of sociology, social anthropology, cognitive science and to some extent computer science.

Since its inception, the sub-field that has been most influenced by the anthropological auspices within HCI is Computer Supported Cooperative Work (CSCW). The core concept of observational studies in CSCW is to unravel the socially organised nature of work (usually within professional groups) and feeding these findings into systems design (Schmidt and Bannon, 1992). This requires that interactions be studied in their natural context-whether this is in the home or in a workplace. In this regard, within ubiquitous computing and human computer studies, the value of in-situ studies is heavily emphasized (Tolmie et al., 2002, Randall et al., 2007).

Ethnographies within these settings have since been strongly influenced by an ethnomethodologically inspired approach in identifying opportunities and inspiring technology design (Hughes et al., 1994, Button, 2000). Such ethnographies are typically interested in building an account of the sociality of a setting. It is importance to stress here that naturalistic studies are not intended to generalise and therefore do not involve a large sample size. The aim of such studies is to build an understanding of what goes on within that setting. The next section will discusses how the findings of such studies have helped broaden our understanding of technology practices.

2.2.2 Technology, interactions and situated conduct

Situated conduct refers to the study of behaviours that are dependent upon their relevance to the 'situations' within which they are produced in. Through this, researchers are sensitised to the practices around which workers used every day practical reasoning and

action to accomplish activities in the workplace. Examples of these include fieldwork carried out in airport control rooms, the use of paper landing strips on the flight progress board (Bentley et al., 1992) or the use of gaze in monitoring the screen (Goodwin and Goodwin, 1996). The observations draw attention to the situated nature of work carried out in these settings as an essential feature of the organisation of socially relevant activities in accomplishing work. In the early 1990's this led to several observational studies of a range of workplace settings, which were then technology dense spaces (Button and Harper, 1995, Hughes et al., 1995). In describing ethnographic studies of situated conduct or technologies-in-use, Suchman et al. (1999) explains:

"They (ethnographic studies) work on the premise that to understand technologies ethnographically, it is required that we locate artefacts within the sites and the relations of their everyday use."

In a collection of observations from ethnographic fieldwork in operations rooms, Suchman (1997) arrived at a description of workplaces as 'centres of coordination'. She describes three key concerns from the observation of the practical accomplishment of work. First, she discusses that the *normal order* of an activity relies on the personnel's adoption of artful practices to manage and accomplish work while dealing with unpredictable actions dependent on the feature of next-ness within the interaction. Second, in that the workplace consists of many workers working together to accomplish activities, *division of labour* is an important feature of the social organization of work. This is made visible in the assignment of every worker to particular responsibilities, using specific technologies, assigned to relevant locations. As a result, workers were able to distinguish their responsibilities as different from their co-workers as well as working towards the joint tasks. They had a collective sense of responsibility to the work, expressed by a sense that "we are in this together". A third seminal concern that rose in her analyses is in observing the *organisation of the physical space* of the workplace. She observed that the physical space is in fact actively created and maintained by the set of interactions including gaze, monitoring of environment and arrangement of artefacts as constituent of members' work. Thus in observing the organisation of activities in the workplace, she was able to highlight the importance of studying the actions *in situ.*

These studies of situated conduct then started to extend findings to work that were already on-going in other complex environments. This included the growing popularity of video as a means of recording situated conduct (Jordan, 1997). Video became a particularly useful

tool to capture activities, while remaining relatively non-disruptive. In video-based study of underground control rooms Heath and Luff (2000), examined the social organisation of workers, drawing extensively on the interaction practices surrounding technological artefacts. These concerns included coordination practices between workers and the workings of cooperative systems. They began to be concerned with coordination work and awareness, which are now considered central concepts within CSCW. This included interest in the movement and articulation of artefacts within professional activities.

While these observations were first identified and explored in workplace settings, many of these key concerns are based on the notions of ordinary work with EMCA studies (Sacks, 1984). Extending from the workplace, other socially dense environments have since become of interest to studies of situated conduct. For example, Vom Lehn et al. (2001) describe how collaboration and awareness can be observed in the conduct of visitors interacting with museum exhibits. The rationale to study these leisure spaces as contexts of interactional relevance has been strengthened through the increased use of technologies to support social practices of leisure such as listening to music together (O'Hara and Brown, 2006) and visitor experiences (Brown et al., 2003, Heath et al., 2005). The home and the car are also relevant for the study of situated technology use. For example, in examining the organisational practices of home life, researchers (Crabtree and Rodden, 2004, Taylor and Swan, 2005) discuss how the home can be considered as "centre of coordination" where similar practices of orderliness, division of labour and physical arrangements may be observed. Similarly the activity of driving in the car may also involve division of labour as drivers may reduce cognitive load by relying on passengers for support in way-finding or answering a call (Forlizzi et al., 2010).

This section largely focused on the study of situated conduct within workplaces. It is essential to understand that the reasoning behind this is because most of the work and development around social studies of technology interactions primarily originated in the workplace. Further, the systems design tradition of ethnography has largely focused on the workplace with the exception of some research, which will be discussed in the sections that follow.

2.2.3 Ethnographically-based systems design

The value of ethnographic work in technological research has been largely associated with its value in supporting systems design (Button, 2000). The key idea behind ethnography's

role in systems design has been to ensure technology systems resonate with the human side of work. This recognises the call within CSCW that to begin with, systems *ought* to be designed to match human activity. Ethnography's role includes both as a *post facto* exploration of why systems have failed as well as the *scope* for inspiring new systems based on studying the social organisation of settings (Hughes et al., 1992):

"Directed toward system use and system design, this (ethnography) implies placing an emphasis on studying the functionalities of a technological system as they evolve from their incorporation into the socially organised work activities of those who use them; rather than, as in many cases, functionalities as the system's designers might imagine them to be." (Hughes et al., 1992)

Ethnographic research can support technology design by providing designers and software programmers a sensitisation to the artful practices associated with routine, everyday practices whether these reside in workplace or domestic contexts. This vision of ethnography is not necessarily oriented towards the creation of new types of technological or consumer artefacts. Researchers carrying out this tradition have argued that ethnographic findings should be treated as ways of presenting social interactions within technology use as a part of producing everyday action, not as problems to be eliminated. In this there is a strong emphasis on the analytical orientation of the ethnography (Button, 2000) that informs the systems design. Frequently, the ethnography that is carried out within systems design is within the tradition of ethnomethodology (EM) (Crabtree et al., 2000). An important feature of the ethnomethodologial practice is not only in the description of practices of *what* people do but also *how* they do what they do, i.e. the 'interactional what' (Crabtree et al., 2000) of these complex actions.

Ethnographers of the EM tradition have also responded to criticisms around how ethnography has limited explicit design outputs (e.g. Crabtree et al., 2009) or the ability to generalise findings (Crabtree et al., 2013). It is important to re-iterate that the aim of ethnography in systems design is to support the work of the designer and not to replace the designer with an ethnographer (Dourish, 2006). In this sense, it is frequently recommended that ethnography is done concurrently, in which the ethnographer and the designers work closely together in discussing the findings of fieldwork and their relevance to the setting (Hughes et al., 1994). Thus there is a strong need for interdisciplinary teams of designers and ethnographers to work together (Dourish, 2006). In referring to the role of ethnography in the design of ubiquitous computing, Dourish and Bell (2011) suggests that ethnographic work aims to *'engage'* with technology design. Here technology is seen *"a site for social*

and cultural production of relationships and everyday interactions" (Dourish and Bell, 2011).

This calls for studying the social systems that support technology interactions. The realisation of the value of ethnographic work as a tool for studying cultural and social practices of technology use helped extend its application to a variety of settings. This led the movement of systems design away from the sole focus on utilitarian technologies, beginning instead to support leisure activities as well.

2.2.4 From work to leisure

With its first application in studies of professional work settings, ethnographic approaches within CSCW studies have since pushed these work-life boundaries as technology pervades and has become a part of everyday life. This led to a growing interest in 'ludic' or play or leisure activities (Brown and Bell, 2004). Further as argued by Brown and Barkhuus (2007) work and leisure share much in common, as both involve people as well as technology supported interactions. This then led to an increased interest on the home and leisure activities as sites for technology use. This involved both field explorations of existing practices of domestic activities and technology use as well as field trials of playful technologies. Unsurprisingly, because much of work that constitutes a setting refers to production of routine activities, within the home, features of coordination and communication between members became the central features of technology support features (Hughes et al., 2000, Crabtree and Rodden, 2004, Taylor and Swan, 2005).

To this end, ethnographies in this style describe how the study of the social ordering of the home may inform the design of new technologies; in addition to this, they demonstrate how existing technologies are incorporated into household routines and interactions. Hughes et al. (2000) carried out an early ethnographic examination of family practices in order to develop systems to support family life. The researchers encountered the strong role of social order in coordinating and sustaining family routines. The arrangement of household activities around the various technologies reflected the routines that family members engaged in every day. This focus on the social and practical arrangements of the home had implications for inspiring and informing design for familial settings and in developing novel digital systems that operate in very different ways to that of the workplace. Extending this, in their ethnographic observation of the home, Crabtree and Rodden (2004) systematically discuss three important aspects of media organisation in the

home. First, they describe the *ecological habitat* which refers to spaces in the home such as tables or shelves where members go to access media or where the media reside. Second refers to *activity centres*, which describe the spaces where the use of the media and technology happen: including the couch, or the bedroom. Third and final are *coordinate displays*, which refer to spaces such as fridge doors, and kitchen noticeboards where the information is placed and displayed as a reminder for carrying out relevant activities. The researchers go on to discuss how the sequential and practical nature of family activities effectively connects these spaces in order that routines are effectively managed. Similarly, Taylor and Swan (2005) studied the existing domestic organising systems, describing how systems used by families to organise activities and tasks around artefacts in the home were shaped by the social organisation of family members and their work. Their findings were consistent with Crabtree's study of the role of information artefacts in the household's organization. Going further, they discussed how family's artful practices in organising household routines could inform digital organisation systems such as intelligent fridge surfaces and virtual organisers.

Another approach to studying domestic settings was in introducing new technologies or technology probes into families and discovering how communication patterns were adapted around them. Hutchinson et al. (2003) introduced two probes into homes: the "MessageProbe" and the "VideoProbe", to explore communication in the household and identified two important features within their use. The first related to a functional pursuit in using them to coordinate family routines and second, was a ludic pursuit wherein the desire was to use the devices as tools to playfully engage within a close set of family members through game play, making faces and drawing caricatures of family members. Similarly, Lindley et al. (2010) tested a novel playful messaging device called "Wayve" within a small group of families. Implications of the findings for the design of domestic technologies entailed that to test the devices' full potential, the device had to be accessible at a particular time and occupy a space in the home where family members would pass by and leave/read messages. Likewise, in their study of the "Family Window" deployment, Tolmie and Crabtree (2008) discuss the importance of householders' orientation to probes, their manner of introducing it to visitors and family members' ownership of the device as important considerations in understanding the provocative nature of field deployments. Deployment studies in homes are valuable to help researchers reflect on how technologies may become incorporated into the fabric of household routines. Given that homes and the

car are already been filled with a range of technologies, there is a need to turn attention to how interaction is conducted around existing device use.

In line with CSCW's growing interest around the 'ludic' or playful, leisure aspects of technology, the prevalence of leisure technologies in the home, including gaming consoles led the increased interest to study the home as a site of technology consumption. Technologies such as the Wii and Xbox designed for joint play have gained the interest of CSCW researchers in studying collocated practices around how users play and communicate while using these devices. Data collection in these studies may involve a combination of interviews, focus groups and observational work around gamers. In this vein, (Voida and Greenberg, 2012) explored intergenerational gaming between children and their parents and grandparents. In observing conversational exchanges during game play, the researchers found that family members took up various roles such as decision-makers (who were usually parents) and negotiators (who were usually children). Along the similar line of interest another study examined the dynamics of sibling play (Go et al., 2012), where researchers sought to study how brother-sister pairs engaged with each other in play. Following with interviews with the participants, the researchers observed the sibling pairs while they played a range of paper-based and console based games. Such studies focus on how relations between players, as displayed through parent-child relationships and sibling relationships are manifest through gaming practices. Scrutiny of such technology-mediated interactions sheds light on how scaffolding on learning occurs between older and younger players as well as how varying competencies between players instil elements of healthy competitiveness over the course of gaming.

Based on the studies discussed, there is important role that the social organisation of family can tell us about the design of technology as well as highlighting a distinct need to study and support the social interaction fostered through technology use. The focus of family-based technologies to be strongly based on play and leisure calls for a greater need to study the complex set of interactions between individuals and devices.

2.3 The car as a field-setting

The car is seen as a vision of consumption, as a fully working material object. There are a number of associations made with the owning and driving of a car. Urry (2000) defines the culture of 'automobility' as the desire for owning a car, as well as the freedom and intense flexibility that comes with its ownership. It seems to transform the driver in the driver-car

relationships (Urry, 2004). Automobility has also changed social approaches to travelling, doing family life, doing community and occupying leisure time. Without the car, groups of individuals find navigating long distances or difficult terrains challenging. In the light of this, the car may be a sign of separation between those who have access to mobility versus those who do not (Davey, 2007). This research is concerned with how the people inside it transform the image of the car and how they occupy the interiors. While examining the car as a site of study, it is a space that places particular constraints on face-to –face interactions between drivers and passengers. This means that drivers and passengers need to adapt their actions so that they effectively manage conversational activities in the moving car. The sections that follow trace the movement of research interest away from the material properties of the car and towards the complex social organisation of drivers and passengers within the car space and then discusses how technology has led to the transformation of mobility.

2.3.1 From the outside to the inside of cars

There are particular associations made with a car's physical properties. The image of the car may be shaped by gender as some geographers have pointed out. For example, family cars driven by women tend to have a greater focus on safety and child-centred features (Sheller, 2004) while other studies point to how racing cars are a symbol of freedom, thrill sometimes synonymous to independence in men (Redshaw, 2007). In some cultures, cars may be a symbol of national identity (Edensor, 2004). Ethnographic work on the interiors of the car reveals what the upholstery of the car may say about the people who inhabit the car space. For example, cultural anthropologists have been interested in how the material properties of the car and how it may portray images of the car as being 'feminised' or 'masculinised' (Miller, 2001a).

Aside from the car's symbolic and material properties, research has also focused on the interiors of what goes on inside the cars and between travellers. The inside of the car presents itself as a complex interactional space to study. Studying this space is largely made possible by the adoption of video cameras to support the recording of what happens inside the car. It is within these endeavours that the current research is motivated. Laurier et al. (2008) in a seminal commentary, explore the social configuration of driving and passengering in discussing the incidences of 'driving together' as family members and commuters. Drawing from video extracts of a variety of different journeys, the authors describe how driving can also be observed as a socially ordered activity in which

passengers and drivers converse with each other. These conversations are often set up as arrangements of visibility where passengers and drivers monitor the moving environment outside while adapting their talk and activities on the inside. The findings also point to how the car may act as a natural facilitator for talk ranging from serious topics to the more mundane topics traditionally restricted to the dinner or breakfast tables. For families, the car is observed to be a socially dense space presenting opportunities for the development of dialogue between parents and children.

This dialogical space resounds with the current research's interest with the configuration of behaviours of the car's passengers who develop specific norms, ways of behaving, interacting and sustaining interaction within its confines. This brings to attention to explorations of particular features of talk and activity in the car. Researchers interested in the interactional organisation of the car see the car as a social space where drivers and passengers engage in social activities: including talk and non-verbal activities such as gaze and pointing.

To a significant extent, talk in the car may be instigated by the environment such as, talking about the prevailing traffic conditions (Laurier et al, 2008) or conversations surrounding the destination(s) (Haddington et al., 2013). In some cases, conversations may be imported from other situations like work or school to the driving context (Laurier, 2004; Goodwin &Goodwin, 2010). Beyond co-present talk, mobile phones in the car allow for communicating with distant conversational partners. Nevile (2011) in his study of routine family journeys found that mobile phone calls that are either received or initiated by drivers and passengers draws the attention of all present in the car. Even when it does not directly address the driver, by his/ her orientation, the driver's shift of gaze and concentration from driving, express interest in the call and its potential relevance to the journey. This micro-analysis of talk and actions of how passengers and drivers manage their activities towards each other as well as the road ahead provides an in-depth look into the social organisation of in-car activities.

Cars also provide a novel site for studying interaction between the organization of talk and the emergent environment (Goodwin and Goodwin, 2010). For example, a trip to drop children off at school may be dominated by conversations relating to completion of homework or after school activities whereas a drive to a park or a leisure centre may create a completely different atmosphere of interaction in the car. The moving space of the car and its changing environment influences the course of talk and activities amongst

passengers. This in itself makes the car a unique site of social enquiry as social interactions are constantly formed and reconstructed based on the exchanges that take place within and outside the moving vehicle. Such explorations of talk and activity within in-car interactions seem to indicate that the presence of passengers in the car transforms driving into an interactional and social activity.

2.3.2 Social navigation and the car

A very particular way in which talk and activity can be directed between drivers and passengers are by engaging in is social navigation. By this, I refer to the ways in which co-passengers orient to need to discuss the sequencing of an upcoming turn within the trajectory of the car journey. These instances do not necessarily involve the Satellite Navigation (SatNav) technology, focusing instead on solving concerns around turns and routes as an emergent, conversational activity.

In discussing the importance of mobility to the production of in-car activities, Haddington and Keisanen (2009) show how the selection and negotiation of routes is carried out between passengers over the course of journeys. Focusing on the multi-modal features of communicating while engaging in a joint navigational activity, they discuss how the mobile nature of the car impacts on the ways in which passengers use bodily gestures to orient to each other and the route-making over the course of journeys. Familiarity amongst drivers and passengers may also have particular impact on the ways in which way finding emerges as an activity between drivers and passengers. Laurier et al. (2012) present findings of navigating while in the presence of family members. In describing how familiar individuals orient to and dispute with each other while navigating, they outline the emotional contours of way finding. Using examples from family travel, they discuss how the arrangement of sequences in which family member's express emotional responses to particular cues in the environment in the sequence of navigating a familiar route. In describing way finding as a family activity, the authors discuss how family members' prior experience with each other and particular routes become relevant to the unfolding of car journeys.

A characteristic feature of navigating in the car is that because of its moving nature, the placement of talk and action has temporal significance on navigation. In analysing video segments of driver-passenger pairs Haddington (2012), found that the initiation of navigation is based on the moment-by-moment understanding of the relevance of

navigational instructions to the driving context. This detailed approach to studying navigation points to how participants display their understandings of navigation socially as a topic for conversation as well as an activity that is dealt with collaboratively between passengers and drivers. This contrasts with findings from car simulation studies that discuss navigation solely as an individual, cognitive activity. Instead researchers find that drivers and passengers often rely on their inter-subjective orientation to navigation as an impending activity as well as one that is being produced in the moment (Haddington, 2012).

Extending this understanding to the context of family units involving parents and children would further enrich the knowledge of navigation and way finding as a socially organised activity in the car. Further, technology features a significant role in activities in the car and warrants further exploration in the context of navigation. The importance of mobile technologies on mobility is covered in the section that follows.

2.3.3 Mobile technologies and the transformation of mobility

Sociological studies of everyday life have pointed to the ways in which mobility offered through the car has transformed the ways in which mobile technologies are integrated into the everyday practices of individuals and groups (Green, 2002, Urry, 2003). The presence and use of these technologies further transforms the ways in which spaces, rhythms and patterns of everyday life may unfold. This section discusses the broad concerns regarding the role of ICTs in experiencing time-space dimensions. Here, research points to how mobile technologies transform the ways in which people experience time-space concerns and work-life boundaries.

Early work on the use of mobile technology in cars significantly focused on the support of mobile work. In an early study examining the role of ICTs for mobile workers (Perry et al., 2001) suggests how the ability of anywhere, anytime access is an important concern for those who are heavily reliant on distant communication while being mobile. The findings had important implications for the design of portable technology for workers. They highlight the need to support collaborative of work as the mobile worker using talk through the mobile phone to co-ordinate events in their local environment with remote recipients. Extending from this (Brown and O Hara, 2003) report of how the availability of good connectivity and technology portability has led to an increasing use of “third spaces” between home and work as workplaces. They found that not just the car, but spaces

between the home, office and car such as cafes were being used as work sites. These studies highlight an early indication of the breakdown of barriers between work and leisure.

In the increasing popularity of mobile technology, the prevailing assumption was that they would soon replace the need to travel. While the development of technology did reduce travel over time, technology does not necessarily replace the need for face-to-face interactions. Particularly for families, the car seemed an ideal solution to resolve time-space concerns. While in the car, mobile technologies seem to support and enhance the movement of people. Families tend to fit device use into key points during travel time: for example, in the pre-preparation for a journey, while taking breaks between journeys or even to 'micro-coordinate' pick-ups and drop-offs between family members while in the car (Jain et al., 2011). A parent who is running late at work may be able to communicate with their spouse/ child minder using their mobile phone and can therefore alter and stretch the time needed to wrap up their work.

What is now evident in examining the role of ICTs in the lives of people is the embedding of devices into the fabric of everyday life. While devices have not markedly changed patterns of travel, indeed people continue to commute by car or train, they seem to enable postponing or stretching of time for individuals. There is also evidence to suggest how travel time is used to entertain or relax drivers and passengers while travelling from one point to another. Here, being able to connect to iPods or mobile phones to catch up on conversations seem to important ways of inhabiting travel time (Bull, 2005). While being stuck in a vehicle, the mobile phone provides the opportunity to transport into other space-times and so make the journey more enjoyable and a moment of relaxation. Interesting practices observed in car travel included using the return to home commute to call one's spouse to 'spend travel time enjoyably' (Schwanen and Kwan, 2008). While these studies enrich our understanding of time spent in the car, much of the focus has been on a lone worker travelling while this is likely to change significantly, when it is a family spending time together in the car. From a technology point of view, the car is a space where technology can be well supported, however the technology requirements of lone drivers tends to vary from that of family units. There is therefore a need to build accounts of what the requirements of family settings actually are: the concerns of multiple users, the focus on entertainment versus functionality and the complexity that such requirements entail.

Overall the studies discussed in this section support in describing the complex, challenging context of the car as an interactional space. While the studies have helped in understanding the arrangement of social relations, the body of research can further be strengthened through a detailed investigation and understanding into how 'family units' incorporate technologies into the car. A relevant contribution made by the research on mobility and technologies is in providing descriptive accounts of space-time constraints imposed by peoples' everyday activities between work and leisure and the role that technologies play in stretching these boundaries. In studying the impact of these technologies, it is important to recognise that online activities are always grounded in the physical world and physical spaces that people occupy. Therefore technologies cannot be studied in the absence of these materially and socially rich environments (Schwanen and Kwan, 2008). Next, I present some of the studies that have attempted to study technology use within the car's environment.

2.4 Studies of in-car technology use

In studying in-car technology use, a wide range of different methods has been adopted by researchers. The first of these discussed here, deal with experimental approaches to studying technology's effects on driving, while focusing on the demands it places on the driver's cognitive state. In contrast, *in situ* studies use methods of participant observation and interviews to unpack the organisation of observable, social activities around technology use. The latter orientation is in line with the current study's interests as well. In situ studies may also involve the introduction and evaluation of technology probes as a way to ascertain how users may orient their behaviour around them.

2.4.1 Statistical evidence

There is a considerable body of literature on car safety and distraction involving simulated driving situations. These studies involve driving in controlled settings where a limited set of interactions is evaluated. A significant number of studies have focused on the distraction caused by mobile phones in driving (McKnight and McKnight, 1993, Alm and Nilsson, 1995, Strayer and Johnston, 2001). Reporting on these findings has been seminal to demonstrate understanding of cognitive load of drivers in using technology while driving. The approach adopted in several of these studies is to examine driving behaviour in a simulated environment, where the participants invited into a lab setting carry out a set of tasks while using a driving simulator.

A number of simulator studies have used the findings of experimental studies into providing insight for how technology can be better designed to reduce the cognitive demands on drivers. Manalavan et al. (2002) tested the feasibility of a signalling system to warn remote callers of the driving conditions during a phone call. They found that callers tended to speak less when they received warnings that the recipient was driving during the call. The design of warning systems was explored further in another study where researchers (Iqbal et al., 2010) observed how drivers respond to receiving phone calls while driving. In discussing the influence of phone conversations, the research stresses on the potential value of designing in-vehicle systems that strikes a balance between driving safety and sensitivity about users' communication needs. They argue that a shift in designing car-warning systems that is more nuanced in approaching hazards while driving.

The increasing popularity of in-car infotainment has led to studying the strain on visual attention of the driver as another line of enquiry in experimental studies. In a recent example of studying users' patterns of interaction with in-car touch interfaces, (Lasch and Kujala, 2012) examined the relative distraction effects of the various scrolling techniques such as buttons, kinetic and swipe as well as screen orientation. Swiping was found to be the least distracting technique, while the level of information presented in menus was perceived to be a significant distraction to drivers. However, some significant differences exist in user preferences of and the measured outcomes of in-car system screens. While examining the scope of Heads Up Displays (HUD) for the car (Kim et al., 2011), HUDs were considered far more favourably by users than voice-based systems and dashboard systems. Whist this was the case, the measurement of distraction across the three indicated that voice-based systems caused the least distraction.

While these studies reveal important issues to address in designing in-car interfaces, there are certain factors that are overlooked in such studies. These include, first, the impact of driving along with passengers and how this may affect multi-user input; second, there is the issue of how touch interactions may differ if they involve users' smartphones or tablets in the car, which are used more dynamically as they are mobile artefacts. Further, there is also the caveat in interpreting results in terms of the disparity between user perceptions about technology use and measures of distraction.

Other experimental studies have addressed some of these drawbacks by trying to move out of the lab setting to a quasi-natural driving setting. Some examples of this include studies pertain to partially controlled set-ups including following a pre-planned route during which

researchers observe the behaviour of drivers. Patten et al. (2004) studied how drivers coped with answering experimenters' pre-scripted questions over mobile phones while driving on a pre-planned route. They conclude that the content and complexity of the conversation had a greater negative affect on the drivers' ability to allocate or direct their attention between tasks while driving. Apart from mobile phones, studies have also looked at examining how travellers interact with navigational devices. Leshed et al. (2008) used an experimental set-up with pairs of familiar individuals to observe how they would navigate routes based on assistance provided. They examine the ways GPS users engage and disengage with the environment outside their moving vehicle. Although the route was pre-selected, the role of familiarity and knowledge of each other proved to be interesting insights gained from the study. While these studies address some of the limitations of simulator studies, they are still limited in their scope of studying diverse driving phenomena and contexts of technology use.

Experimental approaches to the car help to understand the use of technology in controlled settings and avoid the dangers that may surface while testing technology use in natural driving settings. While this has some benefits, such accounts fail to address the complexity of social interaction that surrounds the use of technology in the car and the variabilities of road conditions and driving environments. Studies involving simulated settings also overlook the natural, iterative ways in which users operate devices, which can limit the range of interactions being observed. The next section deals with studies that address the shortcomings of these studies by focusing on the *in situ* observations of technology use.

2.4.2 Naturalistic studies of in-car technology use

Ethnographic approaches to car studies have been of sustained interest in adding to the body of interdisciplinary research within HCI. Primarily these have aided in the understanding of designing of collaborative systems. They provide descriptive accounts of how social interaction around technology may aid in understanding the design of in-car technology. Mobile phones and in car navigation systems have been the foci of several enquiries within human interactions with technology devices.

Given that the early use of mobile technologies was situated within in the study of mobile work, this section introduces early examples of how technology supports mobile work in the car. Laurier (2004) carried detailed ethnography by travelling in the cars of mobile workers. In his account, he describes how the mobile workers' organisation of the car

space facilitates making phone calls, organising notes to recuperate time otherwise lost while travelling. The mobile workers displayed a number of ways of coping and managing with interactional work of initiating calls. They developed a systematic routine of organising their activities when in the car. For example, they had routinely set up their devices to accumulate voicemails, which were re-played while in the car, and the necessary follow-up calls were carried out. Similarly, Hislop (2013), in his study of business people travelling by car, found that engaging in work-related communication activities, whether by phone or email, was something that business travellers continually strived to do, on all stages of the journeys they undertook. They seemed to find the car as a good space to receive calls often citing it as even more preferably to the office.

The widespread access to mobile devices over time compelled the need to extend the study of these devices in mundane driving situations. In their early study of mobile phone use in cars (Esbjörnsson et al., 2007) extensively describe how drivers initiated and managed calls while driving. In their analysis, they describe how drivers situate and adapt calls to the needs of driving. Based on the driving conditions, they were able to communicate the traffic conditions to the distant conversational partner by talking when the traffic eased up and pausing talk while the traffic built up. The researchers refer to this as using the term "interactional adaptation", as the activity is done in and through collaboration with other people. Referring to this, Mondada (2012b) termed the conducting of simultaneous activities while driving as "multi-activity" rather than "multi-tasking" as the latter would indicate the role of cognitive load rather than the interactional accomplishment of multiple activities. In similar research analysing video recordings of car journeys, Haddington and Rauniomaa (2011) examined video recordings of the use of mobile phones inside cars with a particular focus on the pre-beginning of calls. The findings reveal the vocal and embodied practices used by people in coordinating the use of technologies alongside driving activities. They specifically discuss the support of co-passengers in retrieving phones and handling calls.

In contrast to experimental approaches that view mobile phone use and calls solely as a source of distraction, naturalistic studies go further to situate the phone call alongside the car's position on the road, the prevailing temporal constraints, availability of co-passengers and interactional history that determines the use. Furthermore, situating driving and technology to the context of family highlights the importance of passengers' identity and the impact of ongoing relationships in how technology use unfolds in the car. While the

driver-car is an important configuration, ethnographic work finds that the car-driver-passenger is an important triad to understand (Esbjörnsson et al., 2007, Laurier et al., 2008, Forlizzi et al., 2010).

Another aspect of technological relevance in the study of in cars relates to the use of navigational devices. I will my shift my focus to highlight some of the studies that explore the use of navigational devices in the car. In designing these collaborative systems for drivers and passengers, researchers have conducted ethnographic explorations of how these interactions unfold around GPS device use.

In exploring the use of navigational devices, Forlizzi et al. (2010) and Perterer et al. (2013) describe the social and collaborative mechanisms of assistance in collaboration between adult drivers and front seat passengers. Forlizzi et al. (2010) focused on collaboration in the use of GPS devices, finding that the presence of a knowledgeable person led to drawing of past knowledge as a resource to operate the device. On the other hand, Perterer et al. (2013) observed how pairs of travellers collaboratively navigate in the absence of GPS technologies. In the interest of providing implications for the design of novel driver-assistance systems, they specifically draw on observations of the organisation of knowledge and conversations with front passengers when way finding. They found that people often rely on shared knowledge and experience between speaker and listener, and that navigational judgments based on shared knowledge have an advantage over individually based information. They found that prior acquaintance and familiarity with routes, difficult weather (rain/poor visibility) were key determinants of assistance provided. Such similarities can be found with family units travelling together as they may draw on familiar resources. Similar to wayfinding without technology, collaborative navigation with devices entails that drivers and passengers draw on local and past resources in order to support the ongoing driving activity.. Studying the impact of family members particularly the role that children in supporting driver behaviour such as co-navigating or answering a phone call would add interesting insights to what is already known about driving together.

Whilst supporting the driving activity, using navigational systems can also be challenging and frustrating. Brown and Laurier (2012) discuss some of these concerns in their observation of routine journeys of drivers using SatNav devices. Their objective was to inform design through understanding users' way finding practices with navigation systems. The paper argues for a more pragmatic view of driving and way-finding in that designers

need to re-think the idea of a passive driver who follows GPS command blindly, to understanding how drivers, passengers and GPS systems work together. One of the key value that came out of naturalistic observation of drivers and passengers using GPS devices was the focus on how instructions are shaped as the course of actions unfold. Therefore, drivers and passengers who assist frequently adapt their actions and talk to the way in which the GPS instructions are read and understood. Such naturalistic observations of users interacting with technology in routine contexts reveal key concerns/problems of interactive systems that may be overlooked in controlled settings.

These in-depth ethnographic explorations provide a detailed picture of the socially rich nature of technology use in the car. Such approaches contrast with the deterministic view of technology suggesting that users are restricted to a particular range of interactions. Instead, ethnographic approaches focus on explaining how systems become entangled with the users' actions within naturally occurring instances of driving. It is within this context that the current research builds on.

2.4.3 Probe studies and in-situ evaluations

Studies have explored the use of technology for the car by combing user observation with the introduction of technology probes. Probes are aimed to draw inspiration from users by reflecting on their everyday activities through the introduction of probing tool-kit (Gaver and Pacenti, 1999) or introducing a new technology concept (Hutchinson et al., 2003).

A number of studies involving the evaluation of in-car technologies have addressed the need to provide entertainment for passengers. Educating child passengers is a motivating factor for the design of in car technology through playful explorations of surroundings or in the form of quizzing children on existing knowledge. Projects such as the 'Backseat Playground' (Brunnberg, 2002) focused on augmenting the experience of car travel for rear seat passengers while providing learning opportunities. The researchers combined playfulness within learning during car journeys by harnessing GPS information of the car's progress in order to provide game-based activities for the back seat. Another practical concern for families is addressing children's boredom during long journeys through entertainment media. Through a probing exploration into the technology needs of family cars, Wilfinger et al. (2011) found that the family car had very particular needs in terms of entertainment, space and support for the charging of devices. As active participants in the study, children indicated a strong desire for multiple technologies in the backseat and

particularly for access to parents' devices. Parents on the other hand, responded positively to the incorporation of games with educational potential and inclusion of the whole family. They concluded with the view that incorporating variety and engaging all family members were necessary considerations in the design of in-car technologies. Further, they emphasised on the need to integrate existing mobile devices of users rather than introducing new devices into the car.

Recognising the need to incorporate 'whole family approaches' into in-car entertainment, researchers have adopted *in situ* approaches in evaluating car games with families. For example, Broy et al. (2011) designed a tablet-based in-car collaborative gaming application. In evaluating it with families, they found that parents and children responded well to a variety of games focused on family togetherness. The dual device set-up of the game encouraged family interaction as it connected the parents in the front seat area with the children in the backseat area. The immersive nature of the tablet however, increased a shift of passengers' attention inwards to the game and away from the outside environment. An improvement on this was seen the development and evaluation of an application called Mileys (Zuckerman et al., 2015) which was designed to sustain interest and engagement with the outside environment. Based on an Android application, the game created a co-experience between the outside environment as well as the inside of the car. In the game, using a radar interface on the application, child passengers instruct the driver to navigate the car towards the nearest Miley (game character). While nearing a Miley, users are informed to leave the car and start a physical exploration using Augmented Reality.

The field trial involving parent-child participants indicated that the application's ability to retain engagement with the outside environment and family members was perceived positively. A key focus of this study and others it to find ways to incorporate existing mobile technologies in the car effectively. Recognising that children occupy a significant portion of their time in the car using iPads or other mobile devices, Sundström et al. (2014), directed efforts towards designing technology to encourage children to retain a good stance while playing. Addressing the dual purposes of safety and enjoyment, they designed and evaluated three backseat games to encourage children to sit still and avoid motion sickness. Their argument is involving body positions in game play, bring benefits for children travelling by car. The contribution of the study is to encourage the incorporation of full body interaction games as a way of channelling the bodily experiences of gaming. While this saturation of technology calls the need to study

technology practices in the car, but also how family relationships are enacted in the presence and use of devices.

This section started by discussing the experimental approaches to in-car studies while drawing attention to their limitations. Next, I discussed how a combination of in-depth ethnographic explorations of the car as well as probing studies of new technology designs enable researchers to build a detailed view on how users interact with technology systems in natural settings. These ethnographic explorations conducted in-situ examine how mobile technologies may change the ways in which drivers and passengers occupy roads and use technology in the progression of a car journey by pointing to the complex interactions and how that may inform the design of new technology.

2.5 Doing family life

Before we can fully understand the role of the car and car-related technology practices within families, there is a need to describe what it means to be a family and to do things as family. According to Morgan (1996) '*Family represents a quality rather than a thing'.* In drawing attention to this, Morgan explains that in order to study and describe family life, the focus is on 'practices' or the 'doings' of family. In proposing such a view, Morgan (2011a) describes that "family practices" are concerned with the set of everyday and ordinary activities that are part of family life. These are usually made apparent through repeated patterns of behaviour of family members that form routines and characterise the everyday activities of being a family. This section discusses first, the ways in which doing a family has been dealt first at the home, focusing particularly on the ways in which conversations take place in t the car.

2.5.1 Family life and routine activities

In approaching family life as an accomplishment of social order, the interest is on studies that describe and discuss how activities within family life are produced in a socially organised manner (Aronsson, 2006). These include the taken for granted aspects of conducting conversation over the dinner table or activities such as finishing homework assignments, carrying out daily routines, getting ready for bed, etc.

Family meal times are a characteristic setting to study the organisation of family talk (Blum-Kulka, 2012). They are routine events that are clearly bound in time and space where natural talk around family can arise. In this manner they draw close parallel to family time spent in cars as family members are expected to remain in a given space for a

particular period of time (Goodwin and Goodwin, 2010). Family meals are considered to be "we" events jointly shared between parents and children. They may carry important socialization functions-as children may learn good manners such as sharing (Busch, 2012), manners while eating food (Blum-Kulka, 1990) as well as discussions of family member roles (Butler and Fitzgerald, 2010). Family dinners are interesting to use as an example of family life because despite the absence of guests, children are expected to behave in certain accepted ways around the dinner table (Blum-Kulka, 1990) . Meal times are considered opportunities for children to share the events of the day in animated ways along with supportive questioning from parents (Ochs and Shohet, 2006). Further, meal times may also be a setting to explore the membership of 'being an adult' or 'being a child' as an interactive, moment by moment achievement (Butler and Fitzgerald, 2010). In family gatherings, the presence and conversation between adults help children understand their role as children (Butler and Wilkinson, 2013). As a part of children's development of socialisation, and as being part of a family, children are taught to learn to take turns at talk. Similar patterns can be seen in how such turn-taking may be transferred within the use of devices (Davidson, 2010). Parent-child talk may also be visible in knowledge exploration activities such as walks as a part of parents' role in scaffolding child's language development (Goodwin, 2007c).

Routine family conversations may take place in the home while parents are engaged in other domestic activities. In the example of homework enquiries between parents and children, Wingard (2006) discusses how parents usually initiate talk within this mundane family activity as a way of expressing responsibility over children's activities as well as to demonstrate regard to time management. For children, the conversation is related to whether or not they want to pursue discussing the activity whereas parents topicalize homework to display orientation to the next course of actions within family routines. Adding to this, Goodwin (2007b) in studying homework assistance between parents and children as an embodied activity elaborates how along with talk, the organisation of stance and affect between parents and children are key in gaining cooperation in the organisation of activities such as accomplishing homework assistance. Goodwin discusses how parents may engage in talk and negotiation with children in order to provide cues to direct their independent activity of completing homework assignments. At the same time, parents adapt their orientation to their children such that they do not replace the individual work that children should be doing, e.g. the homework assignment. In another example of a

parent-child activity, Rouncefield and Tolmie (2011) describe the enactment of social roles in a family are demonstrated through the family activity of reading together. Through video analysis of parents and children, the authors demonstrate how familiarity with knowing which book to pick up or knowing what questions to ask is all orchestrated within the activity's setting. In detailing activity's production as a family routine, they draw on the embodied nature of the book reading, while maintaining the intimacy of family relations marked by the positioning of family members, the familiarity of the household routine to each other and playfulness in the interaction. Next, we move on to another feature of parent-child talk, which involves the use of directives.

2.5.2 Directives, disputes and family

A particular feature of talk within parent-child interaction is the prevalence directive-response sequences. According to Goodwin and Cekaite (2014) parents regularly engage in issuing directives as a way to ensure that children move from one activity to the next. They found that such instances usually involve some kind of negotiation between parents and children where children may for example, delay going to bed in order to play for an extra fifteen minutes. In carrying out routine activities such as washing up and getting ready for bed, Aronsson and Cekaite (2011) explain that parents make references in what refer to as 'activity contracts' by which parents can be seen to offer children a choice to agree or not agree, thereby placing them as active agents in decision making. Such observed patterns of parent-child interaction has important implications for the current study of technology use as children are made to comply with parents requests to return devices or turn the volume down, not doing so may lead to negotiations, parents' upgrading requests or even curtailed rights to device use.

Directives may also be embodied through gestures such as "shepherding" along with verbal cues of coaxing children which may be employed to achieve actions such as getting children from the living room to their beds or in getting them to leave computers (Goodwin and Cekaite, 2013). Such efforts may result in upgraded requests from parents by adding emphasis or raising their voice in order to encourage children to comply with their requests. Touch along with talk, may enable parents display orientation to the child's activities. Further the role of touch is observed to be a way through which parents' solicit and monitor children's compliant action in family settings (Cekaite, 2015).

Failure to comply with requests or disagreements with family may lead to the outburst of disputes as a regular feature of family life. For example, (Goodwin, 2006a) found how arguments developed between parents and children and references to past occasions become relevant to the presiding concerns. The analysis also points to how parents may choose delay or avoid conflicts by not responding or making attempts to postpone discussions of arguments. As with directives, parents may jointly engage in preventing the escalation of disputes where a second parent upgrades an instruction providing by the other parent as seen in family mealtime disputes (Busch, 2012). Such mechanisms of directives and dispute resolution may have an important bearing on the configuration of family activities in the car. The eruption of disputes is a frequent occurrence in families travelling together (Laurier et al., 2008) and one that can be made more complex when disputes arise over devices, as they can be potentially disruptive to parents who are driving.

The above examples of studies show excellent examples of examining the family and the doing of family as an interactional accomplishment. They provide descriptions of how family is manifest through the series of activities that relate to family members' understandings of time spent together. They point to the ways in which talk and action discuss the orientation of members to each other as well as artefacts in the environment. Such an approach can similarly be transferred to the study of family work in the car.

2.5.3 Experiencing family life in the car

Despite its constraints around causing congestion the family car is considered as an 'enabler' particularly for mothers managing the home–work relationships, alongside after school activities, etc (Jain et al., 2011). Families can use time spent on long journeys in many different ways. Parents may use this time to conduct serious conversations while for children it may be a time that requires constant motivation and stimulation. The car is one such area that accommodates and supports the use of technology to support work and care practices (Bowlby, 2012). Cultures of parenting have a powerful role in influencing car use as part of the expectations regarding parenting responsibilities and care. For example, in New Zealand, local cultures of parenting produce powerful expectations that escorting children, and specifically escorting them by car, is a necessary feature of parenting. As more family activities become situated in the car, there has been a growing interest in supporting the needs of parents in this context. The car is seen both in terms of a functional and secure way to conduct family life for families to safely take their children to and from school and activities (Murray, 2009). It seems to be considered as "time well-spent" as it

reveals connotations of the positive aspects of bringing the family together-such as long journeys where parents and children can engage through games and eating together that fosters a content space for the doing of family life (Marvin, 1995).

The car seems to facilitate carrying out conversations usually associated with traditional spaces such as around the dining table at meal times (Laurier et al., 2008). Parents may use time in the car to conduct serious conversations, eat meals or catch up on daily activities such as school between activities. Marvin (1994) discusses how the car can be a site of child-directed talk, becoming a space where children can discuss and open up discussion about the day's activities. In her study of child-directed conversations across various sites including the school, home and car, the car stood out as a space for the most significant amount of talk carried out. In her study as well as others (Laurier et al., 2008, Barker, 2009) we see that the car provides a unique configuration for parents to prompt conversation and open up discussion in an uninterrupted manner. Therefore, the car becomes an exemplary site for the study of the family conversations.

Barker's work (2009) examining the travelling experiences of children in cars reveals the distribution of power relationships between parents and children and how this affects car travel. He found that children are presented with opportunities to be active passengers by adding to conversations as well assert their ownership of spaces in the car. The car also represents a lively space that supports the consumption of technologies such as consoles and card games. Other examples of doing family journeys draws attention to gendered views of parenting responsibilities and care work. Barker (2008) examined the differences in experiencing fathers and mothers' involvement in escorting of children by car and found that children's experience of travel contrasts quite differently with mothers and fathers. In several examples of families he interviewed, fathers carried out driving responsibilities more occasionally in turn children associated this travel with more novelty and exploration. Other authors also resound with the value of developing accounts of the overlooked area of fathers' role in providing care for children (Bonsall, 2015). Further, Schwanen (2008) argues that balancing care duties between mothers and fathers is reflective of the gender issues within work-life balances and socio economic status of families. While the issues of gender are not the focus of the current study, such studies highlight and contextualise balancing work and family responsibilities within the study of family care practices.

In using the family car as an example of a lived space, Noy (2012), describes the animated and inhabited space of the car. In his article, Noy discusses how family roles and actions collaboratively emerge as an interactional accomplishment in the shaping of a dispute regarding the move from house to car. Likewise, in studying family music-making practices, Koops (2014) found that for families, the car was observed to be a good place to engage in music related activities. In particular, it seemed to foster sibling interactions through joint singing activities. The car space was unique for music learning because it favoured particular advantages such as reduced distractions, proximity to siblings, and opportunity for parent and child reflection.

The organisation of the journey and its preparations are unique in while considering the family car as Tolmie and Crabtree (2013) describe the construction of a family car journey as from start to finish. They found that "doing a family journey" as an interactive accomplishment usually starts in the home, with discussions of what prompts a trip, followed by negotiations and discussions of where is the most suitable place to go. The authors point to how the activity of being a family and doing a journey unfolds in a sequential manner, right from when the idea of a trip is mentioned, to planning the route on the computer, preparation of items to take on the trip. They draw attention to how these various steps draw on the idea of the accountable character of family members' activities.

The examples of studies discussed in this section demonstrate how car spaces have come to be viewed as extensions of spaces within the home where families gather similar to the living room or at the dinner table (Goodwin and Goodwin, 2010). The car is seen as a space of intimacy that extends the family's spaces of residence where families gather, care for each other and do things together. This necessitates the study of technology use as a situated, local accomplishment in the family car as it is a neglected part of the studies around family life.

2.6 Doing family through technology

With the pervasiveness of technology, there is a noticeable increase in the adoption of technology into everyday domestic routines. In attempts to make the home smarter and more efficient, increasing emphasis is placed on seamlessly integrating technology into the fabric of the household routines (Harper, 2011).The supportive role of technology has seen to have significant impact on how families perceive technology use in everyday family interactions.

2.6.1 Technology and the coordination of family life

Mobile phones considerably support family activities by providing families a means through which to keep in touch and remain connected to the family has been one of the ways in which. For example, Palen and Hughes (2006) found that parents used mobile phones to communicate their sense of availability and stability of home base. This reveals that the mobile phone embodied a sense of security that even when the parent left the home and was in the car or at work, they still had a base or a common means to communicate to their children. Technology is particularly useful to coordinate the schedules of parents and carers who are involved in the doing of various family-related activities. In a study (Hjorthol, 2008) of coordination of car-based family activities, researchers found that the mobile phone was noticeably seen as a tool that connected family members with each other. It was often described as a means to change plans, and therefore allow parents to use their time flexibly.

A number of technology explorations have attempted to address the concerns of families and support of various practices surrounding family life. In an early attempt to extend technology to support domestic practices of family life, Eardley et al. (2004), conducted a study to ascertain the types of assistance or supportive technology specific to the car would be helpful to working parents. They found that parents consistently had difficulties dealing with the managing tasks and routines around daily schedules. These difficulties included: the stresses of arranging drop offs and pickups, stresses surrounding remembering objects and items for school and work, the difficulty of taking care of work activities (e.g., time management and communications) while in the car, the difficulty of communicating with family and managing and coordinating family life while driving the difficulty of entertaining children on longer journeys. Keeping in line these difficulties of parents, the researchers suggested design of in car supportive systems including task organisers for parents and interactive technologies in the backseat for children (Eardley et al, 2004) to engage them during journeys.

Together with the car, researchers have also extended to looking at the micro-coordination of a range of family activities. Carrying out a two part interview and field trial with families, Khan and Markopoulos (2009) found that parents expressed the need to coordinate in order to be at peace regarding the whereabouts of children as well as the ability to change plans and accommodate time together as a family. The researchers also tested a coordination system with the families. While at first families expressed some

scepticism about the idea of surveillance posed by the technology, in using the systems, parents found that they facilitated involvement between family members.

Driven by the need and desire of families to keep in contact with each other and know each other's whereabouts, an area that has generated significant interest in the development of technology is in the creation of awareness systems. While being driven by the need and desire to efficiently carry out various activities, these systems also had potential to bring families closer together. A field trial with the ASTRA Awareness System (Romero et al., 2006) indicated that while supporting distributed members of a household to stay in contact, the opportunity to send messages from different locations triggered family members to think about each other and remain connected. Such affective outcomes along with participants desire to share simple, passing events of the day with each other were unexpected outcomes to the initial intended design. Similarly, the findings of Brown et al. (2007) using the "Whereabouts Clock" awareness systems reveal key facets of family life. The design was intended to facilitate communication between family members to leave messages of their whereabouts. The field trial further revealed aspects of the social organisation of family life between family members in describing how being a family rests on its members' orderliness and awareness of each other's routines, roles and responsibilities. In other research, studying existing patterns of family calendaring systems (Neustaedter et al., 2009) researchers discuss the varied ways in which coordination of family activities occurred. Their observations indicate that routines of family life drew attention to the ways in which households manage domestic activities and resourcefully used means to organise their daily activities.

2.6.2 Family and leisure technologies

Within families, play and gaming is an aspect that is increasingly mediated through some technology-supported means. The home as a networked space where individual members are engaged in a range of leisure technologies creates the idea that activities such as gaming are restricted to be individual and solitary (Livingstone, 2007a). Recent studies argue however that there is a significant social element to gaming (Randall, 2011, Voida and Greenberg, 2012). Interactional studies on gaming and device use in the home reveal that parents actively moderate the use of technological devices by children through adoption of control strategies as well as aligning themselves with some knowledge of what children like to do and use in these devices (Aarsand and Aronsson, 2009a, Fatigante et al., 2010). Parents accomplished this through the physical placement of gaming consoles in

spaces where parental monitoring can take place or parents themselves, actively questioning children about game play and participating when possible.

On the one hand there seems to be parental concern regarding the regulating and monitoring use of these portable devices (Livingstone, 2007b), there is increasing support from parents for their educational value and building technological competence in children (Stephen et al., 2013). Marketing for game consoles seem to highlight that technology can promote time together as a family as opposed to earlier notions of children being isolating themselves with technology in their bedrooms (Chambers, 2012). According to Randall (2011), the conduction of play and gaming related activities is determined by spatial, social and material factors interacting with each other within the home. He stresses that age groups, routines and practices within the household unit all work into shaping the way in which playful activities may take place. The use of entertainment and gaming devices within families like most other technologies are supported by the physical and social contexts that they exist in. They are embedded within a unit's knowledge and expectations of its members and the conduction of activities within the bounds of the shared practices of the unit.

Studies of situated family gaming indicate that parents show active involvement in children's gaming by joining in and asking questions about the ongoing activity (Fatigante et al., 2010). Aarsand and Aronsson (2009b) discuss how playing video games may involve interactionally relevant talk in the form of 'response cries' in response to gaming manoeuvres while playing. This in turn draws the attention of parent-spectators who may be otherwise engaged in household work, yet may pause to comment on the game or join the child in playing. This observation indicates how gaming as a social activity may be supported with interactional resources of talk, gaze and action between players and spectators. Likewise, in her analysis of children playing a computer based game, (Davidson, 2010) used conversation analysis to provide a detailed moment by moment description of the playing of a game. She focuses on how taken for granted such as game-play between children reveals how children orient to the ongoing game by discussing and instructing each other of the upcoming actions. Parental presence was observed in the mediation of game play as well as in instructing children to take turns without arguing. Use of mobile devices such as the tablets also presents opportunities to facilitate parent-child interactions. Danby et al. (2013) while studying children's talk while using tablet computers (iPads) found that parents and children engage in question-answer exchanges

device content. The role of technology provides a facilitator for parents to question children, while presenting children an opportunity to share what they are doing, such as, showing children's progress of drawing a flower or winning a game.

In conclusion, this section dealt with discussing how technologies have transformed the ways in which families communicate with each other, conduct conversation and relate to each other. In particular, I discussed the focus on explorative designs of coordination systems that provide support for the needs of busy families. Further, I report on the interactional exploration of leisure and gaming technologies in the home, while situating these technologies in the car may lend valuable insight. This area will be addressed through the thesis.

2.7 Summary

In summary, the review of research presented here sets up the current research within the interdisciplinary knowledge of the fields around sociology, anthropology, geography and human-centred computing. The literature identifies a number of concerns regarding family life, technology practices and mobility. Early studies explore the ways in ICTs have changed the way individuals work or engage in leisure activities, necessitating the need to reflect on their use. Further, the use of interactional approaches highlights the need to situate technologies to settings of their use including families and the car. In the past, such approaches make use of in-depth observational studies involving fieldwork or video-based methods of observing interactional practices, arrangement of people and technology. In the same tradition of naturalistic approaches, this study aims to study the concerns of families in cars. One of the key aims of this thesis is therefore in applying this approach to understand technology interactions around the family car as stipulated in research questions 1 and 2. For example, observations in this manner may include the integration of mobile technologies into the car, as well as understanding the social norms surrounding family interaction in cars. In order to address these issues, it is necessary to have a description of *how* families and their technologies occupy car space and time.

The previous work discussed in this chapter demonstrates how family life has seen a dramatic transformation with the infiltration of new technologies into homes and cars. Earlier ethnographic work have emphasised on the highly contextual nature of family technology use (Hughes et al., 2000) thereby calling for the need to study technology use within sites of ro1utine family life. Further, the families spend a significant portion of time

in their cars and thus carry and use technology frequently (Line et al., 2011). This motivates the study of how the family unit is accommodating an adjusting to the influx of technologies in a dense social space. This is further addressed in the research questions 3 and 6 which set about to explore the role of technology in carrying out family activities.

In contrast to the family home for which a number of digital technologies exists, the car comes with specific restrictions. It has a unique set of spatial configurations (seats face forward) and physical constraints (seat belts restrict movement, backseat/front seat traverses are difficult when moving) and legal restrictions (such as holding mobile phones while driving) that affect the ways in which parents may manage device use alongside their driving. The demands of driving also add to the matter by making specific requests and offers of media unwieldy. The fact that some portable technologies have found a home in the car would attest to the value that their users hold for them, but we have little understanding of the ways that they are appropriated into travelling practices, the problems that they may cause, and how they influence family life in the car. This draws attention to observing how parents are coping with the demands of attention and children's' need to be entertained. The role of mobility and technology use while travelling as a family is addressed as one of the concerns of this thesis as set out through research questions 4 and 5 and emerges in the observations made in the empirical sections of this thesis.

Taking together with the literature review, the thesis thus far highlights the gaps that emerged from the literature. The research attempts to bring these above mentioned studies and motivations together. At the juncture of this research, there was an influx of new technologies entering the home and the car as well as a keen need to remain connected as a family. In order to design the future connected car, there is a need to study the pattern of technology practices, as they exist. The goal of this thesis is to add to the current body of literature on family and cars from a naturalistic, situated understanding of the concerns around technology use. A better understanding of the situated nature of technology use by families will sensitise designers to design family cars with these concerns in mind.

Chapter 3 Methods and Analytical Orientations

3.1 Introduction

The previous chapter provided an overview of the background to this interdisciplinary research. The study is situated between the three strands of work discussed before: the study of situated technology practices, ethnographic approaches to understanding technology use in the car, and finally a focus on an interactional perspective of family practices. The key goal of the research is in the study and understanding of social conduct in naturally occurring data of families travelling and using technology together. This called for the use of an ethnographic approach to data collection. The motivation for this is discussed in detail in this chapter. Building on the use of video and ethnographic methods within the field of technology studies, I justify why these methods were relevant to the current research. This method of data collection is adopted in the social sciences and technological studies where the interactional 'hot spots' of a setting (Jordan and Henderson, 1995) can be studied although the researcher is absent from a setting. The analytical orientation was particularly inspired by ethnomethodology; the analysis was further complemented by analysis of conversation (CA) and interaction analysis (IA) used in the study of video material. The first part of this chapter is concerned with describing the theoretical tenets on which the research is methodologically grounded. Next, the chapter turns to examine the practical application of the ethnomethodology within systems design, elaborating on how this perspective enabled the study to be accomplished. Discussion will include the practical and ethical implications of undertaking video-based research with families, and will show, by example, how data in this thesis is analysed and presented.

3.2 Ethnographic approach

Ethnographic approaches of 'participant observation' have the advantage of describing the social world of those researched through the researcher's presence in the setting. Fieldwork carried out as a part of ethnography aim to provide rich descriptions of the setting under study and the work of its members. By engaging in observational work, ethnographers have a close connection with the setting which they study (Hammersley and Atkinson, 2007). Therefore by embarking into the "field" the researcher is being part of the action 'as it happens'. As most ethnographic studies will attest, ethnography comprises both of method, which is the process of doing fieldwork, as well drawing up a written record of

observations made in the field-through the writing of ethnographic texts. Its method involves the presence of the researcher in the field, building rapport, asking questions, writing field notes and developing an understanding a setting. Writing ethnographic accounts is concerned with the product of reporting what happens after the fieldworker has left the setting. It is these 'thick descriptions' of a setting and its member's work (Geertz, 1973) that distinguishes ethnography as a research approach from quantitative, laboratory studies. These descriptions are built through consolidating information from observations as well as researcher's reflections on time spent in the setting. Traditionally, anthropological fieldwork entailed that researchers embed themselves in a research setting such that he/she is no longer an outsider but becomes a part of the world studied. Further, anthropologists popularly used ethnography to study groups of people in distant and isolated settings around the world over long periods. Inherently, the aim of ethnography therefore is to understand the culture of those studied (Van Maanen, 2011). While referring to 'culture' this may include language, traditions, rituals and routines that encompass the everyday life of the observed.

In contrast to the anthropological approach, sociology on the other hand, adopted ethnographic methods to study phenomena that were close at hand. The growth of the Chicago School of Sociology advanced the use ethnographic methods within sociology (Atkinson et al., 1994) and in studying the culture and interaction of people around urban areas. In studying these everyday practices, researchers did not spend a great deal of time in 'becoming native', and thereby limited time periods spent in the field became one of the distinctive feature of the sociological endeavours. This is evident in Park and Burgess's very early work (1925) on Chicago's urban slums. Branching off from this work, Erving Goffman, explored an interest in studying the social order of everyday life started looking at interactionally-relevant practices such as "pedestrian flows", "face to face encounters" in public spaces (Goffman, 1963). At the same time, an influential line of work emerged from Talcott Parsons' student, Harold Garfinkel on 'ethnomethodology' centred on the study of mundane everyday concerns (Garfinkel, 1974) which the current research aligns with.

3.3 Unpacking the 'doing' of family journeys

The ethnographic approach to car studies is well known from the geography and mobility literatures. The current research builds on a growing body of video-ethnographic studies inside cars (e.g. Katz, 1999, Laurier, 2004, Mondada, 2012b, Haddington et al., 2013). These studies direct attention to the complexity in studying the construction of social

activities within the mobile confines of the car. The focus in such studies is on the observable aspects of driving and 'passengering' as opposed to studying driving as a cognitive, mental process seen in experimental approaches to car studies (Alm and Nilsson, 1995, Iqbal et al., 2010). Naturalistic approaches to studying the car attest to the car's environment as being dense with social interaction (Laurier et al., 2008). This calls for the need to situate technology within real-life driving settings. Further, the research's motivation to study family life called for an approach that would provide an understanding of family routines and practices through an immersive approach that ethnography offers.

The research at hand therefore was concerned with the two-part enterprise of scrutinising family life, and the role of technology in the car. Keeping this in mind, I was inspired independently by work done to study home life (Crabtree and Rodden, 2004, Taylor and Swan, 2005, Randall, 2011) and the study of everyday technology use (Hughes et al., 2000, Crabtree et al., 2001, Kawsar and Brush, 2013). Past work on the situated practices around how families organise themselves both in the presence and absence of technology have informed the ways in which home systems can better be designed with particular settings, such as the home, (Hughes et al., 2000, Taylor et al., 2006). Outside of technology studies, the social science approach typically orients to studying the car in terms of arrangement of interactions. This is evident in research carried out with mobile phone conversations (Haddington and Rauniomaa, 2011), navigation and driving lessons (Mondada, 2011). Extending from this, I was keen to add to the understanding of situated conduct between family members in the car. This was done by drawing focus to instances in my data that revealed how and when technology was used in the car, how it was used, and who uses it.

Earlier CSCW work in the home has pointed to the findings of such ethnographic explorations as being useful to draw design implications (Crabtree and Rodden, 2004) and my aim was to extend this approach to a mobile domestic contexts such as the car. For example, the car afforded a much more dense space to experience social interaction as well as device use. The passengers are in close quarters to each other and are often engaged in discussions over device use. Conversations regarding planning the day's activities also take place as families move from one activity to the next. If specific preparations had to be made before setting off or while en-route, activities such as looking up an address on Google Maps had to be managed alongside the driving. Having a naturalistic account of

these activities offers a challenging yet fascinating picture of family life while in a moving environment.

3.4 Analytical orientation: EMCA approach

An ethnographer's orientation to the field and to the members influences the way in which he/she may describe and present the findings of the study. This is possibly the most distinguishing feature of ethnographic work as different theoretical perspectives can draw the analysis in different directions. The current research draws on the analytical tradition of the cognate fields of Ethnomethodology and Conversation Analysis (EMCA). The interest of ethnomethodological studies is focusing on providing thorough and detailed analyses of accountable phenomena through practical accomplishments. Ethnomethodologists are concerned with 'the work' of these practical accomplishments in order to obtain its relevance to an ongoing course of action (Sacks and Garfinkel, 1970). In early work (Garfinkel, 1964) used 'breaching experiments' to challenge the social organization of routine activity by asking people to behave as outsiders in familiar settings (for example acting as a lodger in your own home). This approach aimed at studying the production of social order through means that unpacked the routine production of activities. Since then, the choice of method to study practical action and reasoning has varied considerably across areas of application.

The application of the ethnomethodological perspective grew in two strands. The first strand of work involves the reporting on a series of workplace studies carried out by Garfinkel and his students (1986) in settings such as clinics and coroners' offices leading on to interest in the study of scientific phenomena (Lynch, 1994). Ethnomethodological studies of the workplace tended to involve extended periods of fieldwork and detailed accounts of observation. Analysts use observational methods such as ethnography, interviews and audio and video-recorded data to analyse the production of activities (for example Garfinkel's recordings of juries). This has led to the addition of richer resources for analysis such as transcripts of conversations and video material.

The second strand of EM work came out of the contribution of Harvey Sacks (1995) in studying naturally occurring talk in conversational data. The key point made by conversation analysts is that the production of social order is evidenced in the sequential arrangement of talk. This placed focus on the study of the sequential organization of ordinary language in a range of settings. This will be discussed in detail in the next section

that follows. However, it is important to recognize that both ethnomethodology and conversation analysis grew out of the same goals, but differ in the way in which they treat phenomena in analysis. In a broad sense ethnomethodologists adopting ethnographic methods tend to focus on a full range of activities in a setting, contributing to the production of social order while conversation analysts tend to focus on the micro-analysis of interactional phenomena (Clayman and Maynard, 1995).

The current study was informed through both of these perspectives. With the increasing application of ethnomethodology in different fields, there has been an increase in the form of 'applied CA' (Ten Have, 2007) which may include CA-type analyses along with ethnographically informed understandings. One such form is that of 'workplace studies' focused on technologically rich environments (Luff et al., 2000). This is the line of inquiry that the current research was builds on. The reliance on video as the source of my empirical data in this research enabled me to incorporate the multimodal aspects to interaction as well as talk as a feature of producing everyday family life. The data reported in this thesis was subject to the conversation analytic rigor as means to achieve the research goals of producing a detailed, sequential description of family activities. In gaining this understanding, the aim is then to apply this insight to inform designers to develop these descriptions into design potential. The analytical tradition of applying EMCA notions to the study of technology interactions has gained significant attention (Button, 2000). While discussing ethnographic studies within technology studies, there is a strong emphasis on studies that have been inspired by this tradition (Crabtree et al., 2000, Luff et al., 2000). The sections below will discuss the groundings for the current work in more detail.

3.4.1 Ethnomethodology

In the 1950's, Harold Garfinkel coined the term 'Ethnomethodology' when he became interested in how common sense knowledge of the world is applied to everyday activities and decision-making in a number of settings such as jurors' decisions in the courtroom (Garfinkel, 1967). Described as the study of "members' methods", ethnomethodology attempts to study practical action and reasoning behind everyday activities-as features of social order.

In discussing the term, Garfinkel (1972) describes his approach:

> *"I use the term ethnomethodology to refer to the various policies, methods, results, risks and lunacies with which to locate and accomplish the study of rational properties of practical action as contingent ongoing accomplishments of organized artful practices of everyday life."*

Through its emphasis on everyday action, ethnomethodology stresses that producing social order is an ordinary and mundane part of life, observable in all range of routine activities (Garfinkel, 1964). Ethnomethodology's concern, in contrast to traditional sociology, has been the interest with 'problems of social order' from the viewpoint of 'how social order is produced' (Livingston, 1987). To the ethnomethodologist, social order is built through a set of actions and ways of behaving that are largely observed to be situated, local accomplishments. For example, one may want to explore the social order of queuing outside the cinema. This may be evident through observing the way in which people organise themselves, the behaviour of those in front of one another or even the number of counters that remain open or closed.

Most everyday activities are achieved through the ways in which we conduct ourselves, by responding and reacting to situations and in using speech and actions. The focus on such analysis is to draw on these resources as analytical tools to build a record of lived activity. Thus while undertaking an ethnomethodologically grounded study, the researcher places emphasis on practical action and practical reasoning as key components of creating and maintaining social activities in a setting.

> *'Ethnomethodogical studies analyse everyday activities as members' methods for making those same activities visibly-rational-and-reportable-for-all-practical-purposes, i.e., "accountable" as organizations of commonplace everyday activities'*. (Garfinkel, 1967)

In effect, a routine and common place setting such as a home or an office is studied through the observation of production of activities between competent members of that unit. While ethnomethodological studies are not concerned with theory building, the focus instead is on producing a *'real and lived account'* of the activities that constitute a setting (Garfinkel, 1967). The present study looks to explore the organization and interaction around media use in family cars. Therefore by taking an ethnomethodologically informed stance, the research is concerned with the ways in which families ordinarily accomplish and produce family life in the car, thereby going about 'doing responsible parenting', 'doing family journeys' and 'doing media management'. This contrasts with traditional

anthropological studies where through the analytical focus of the researcher, grand themes like ‘gender’ and ‘power’ are adopted to interpret what is observable in the data.

From the understanding that social interaction is a product of visible conduct and natural language, ethnomethodology unpacks the routine production of everyday interactional practices. Ethnomethodology’s program can be explained through three concepts within the description of everyday activities: namely *accountability*, *reflexivity* and *indexicality* (Lynch, 1994, Ten Have, 2004).

Accountability: According to Garfinkel (1967), accountability refers to the properties of commonplace activities as being ‘*visibly-rational and reportable’*. This resides in the fact that accounting for a person’s routine activities is bound up in qualities of that behaviour to be *ordinary, rational and observable*. First, Garfinkel suggests that social activities are *orderly* and that this orderliness is evident in the character of these activities having recurrent, meaningful and sequential features. This is true of many aspects of family life as it is bound by weekly and daily routines-in turn these routines are repeated and form a regular pattern over time. Second, this orderliness is *observable*-this quality refers to ethnomethodology’s interest in the visible conduct as opposed to studying the mind of members (i.e. what goes on inside the head). Third, these activities are *ordinary* and therefore do not require any special skill or expertise to study them: i.e., they are available to anyone who participates in those activities. This means that the researcher draws on his or her common sense knowledge of the setting and its members to provide an account of activities. This leads to the understanding that while families differed in the way they accomplished or distributed family activities, essentially family concerns were universal: all parents were concerned with entertaining children in the car, keeping them free from arguments and discussing preparations for the day’s events. A fourth point is that, participants within these social activities *orient* to each other through talk or gaze, thus displaying their availability or unavailability to participate in an interaction. This is clearly evident in the data extracts of how parents initiate in-car conversations and make their attention visibly available to co-passengers.

Fifth, these observable and orderly behaviours are *rational* and so they are recognizable and made sensible to those who are competent members within that activity, and therefore making them analysable to the analyst. The sixth and final quality is that these activities are *describable*. This is both seen in the quality of the members of the observed unit to describe and talk about their activities as well the analysts’ ability to draw on these

descriptions and make them available. These last two features can be explained through the way in which analysts construct an account of everyday activities. Garfinkel (1964) points out that in the observation of routine affairs, the analyst cannot fully understand what transpires between two participants without some background knowledge of the purposes of the speaker. This is because in these routine tasks and conversations, people draw on their *common understanding* of the speaker or recipient and the setting. They tend to be vague or *'gloss over'* conversation aspects, which are *mutually understood*, and the participants can rationally recognise these without explicitly saying so. To summarise, accountability is produced over the course of ordinary, everyday activities (Sacks, 1984) made rationally available to members of a collective unit carry out routine activities.

Reflexivity : In referring to 'reflexivity' in ethnomethodological studies, Garfinkel refers to quality of talk and actions said and done by one person to have bearing on what was previously said or done (Garfinkel and Rawls, 2006). This contrasts with the social science assumption of reflexivity to be the ethnographer's inability to draw a completely objective account of observed phenomena. The latter has resulted in the practice of ethnographers to recount their experiences in the field through reflexive accounts. Ethnomethodology's concern focuses on describing actions based on members' view and perspective to activities within that setting. Being a part of the setting, accomplishing activities and to be a competent member, involves that members of the unit establish and recognise ways of producing actions (Garfinkel, 1964). By "competent", Garfinkel refers to the "*ability of a member to manage his everyday affairs without interference"*. For example, in their description of people 'walking together'; Ryave and Schenkein (1974) discuss how participants continually produce 'cues': such as greetings, head movement or gaze, in order to make the activity continually available and accountable to those participating in the interaction. Over the course of walking together, participants engage in talk or show their availability to engage in conversation. These actions are a feature of the activity and the same actions in turn inevitably maintain the activity. The witness-able features of conversation observed members in an interaction make their actions visible. This self-explicating property of ordinary actions is referred to as '*reflexivity'* (Ten Have, 2004). Therefore, through the close observation of social conduct, an analyst needs to describe how families *reflexively* produce their activities in a setting. A parent's ability to recognise their actions as relevant for the journey and the children and their ability to reflect on their actions provides me as an analyst the opportunity to construct an analytical account

through the social reality of the parent. An important feature in the organisation of members' activities is that they recognise and produce the necessary actions in that setting and an ethnographer must be attuned to make observations of this.

Indexicality: Indexicality is a reference to the analytical vocabulary that forms a part of the description of practical action within ethnomethodological enquiries (Lynch, 1994). In constructing an account of routine activities, Garfinkel observed that natural language was a resource for the analyst to draw on to explicate the routine features of the setting (Sacks and Garfinkel, 1970). While examining the ways in which a description or account is part of the setting in which it occurs, he observed that speakers' use of indexicals or indexical expressions could be used to study that relationship (Schegloff, 1996). Indexical expressions are those whose sense depends on the local circumstances in which they are uttered and or those to which they apply (Lynch, 1994). They are important for two reasons in an ethnomethodological analysis. First, they provide perspective for understanding how common scenes of everyday life are visibly accountable through natural language and second, they are important for the analyst to view how these expressions become analytically useful in constructing accounts of observed activities.

Their importance is explained further (Sacks and Garfinkel, 1970):

> *"Wherever and by whosoever practical sociological reasoning is done it seeks to remedy the indexical properties of practical discourse; it does so in the interests of demonstrating the rational accountability of everyday activities; and it does so in order that its assessments be warranted by methodic observation and report of situated, socially organized particulars of everyday activities, which of course include particulars of natural language."*

Deitic expressions such as 'here', 'now', personal pronouns and such as 'he', 'she' and 'It' are considered tokens by which indexical properties of actions are produced (Lynch, 1994). They particularly pertain to the local context in which it is used and can take on different meanings based on who is using them and who is being referred to (Lynch, 1994). A key demonstrable property of indexicality was highlighting that all circumstances, all expressions (and actions) are indexical. This is the understand that no utterance or activity happens without bearing on the fact that it is said in a particular place, at a particular time and by particular persons. The concerns of indexicality were extended further through Garfinkel's work with Harvey Sacks in the analytical properties of conversation, discussed below (Sacks and Garfinkel, 1970). In the current study, the use of indexical expressions

by participants engaged in naturally occurring talk helps me as an analyst orient to the here and now aspects of conversations in the family car. Further I also pay attention to how participants' gesture and embodied orientation in conjunction with talk may index their orientation to a given activity, device or person.

3.4.2 Conversation Analysis

One of the significant accomplishments of ethnomethodology was to inspire the growth of the related field of Conversation Analysis. Inspired by Garfinkel's methods and sharing ethnomethodology's roots, conversation analysis developed from the work of Harvey Sacks (Sacks, 1995) that looks at the social organization of 'conversation', or 'talk-in-interaction', by a detailed inspection of and transcriptions made from recordings (Ten Have, 2007). The basic precept of CA is the understanding that talk is organised in a sequential, orderly fashion. This observed talk unfolds in an utterance-response fashion, for example, a question requires a response. The goal of CA can be summarised as follows:

> *"The central goal of conversation analytic research is the description and explication of the competences that ordinary speakers use and rely on in participating in intelligible, socially organized interaction."* (Atkinson and Heritage, 1984)

In simple terms, CA as a methodology aims at describing the procedures by which conversationalists produce (*and account for*) their behaviour and make their behaviour understood to others. One of the ways in which this is achieved is through the concept of 'recipient design', described as the way in which any form of talk or utterance is designed to display orientation to the co-participant in a conversation (Schegloff, 1996). Conversation Analysis further extends specific aspects of ethnomethodological studies. In particular, Sacks and Garfinkel (1970) have documented how indexical expressions were further elaborated through the contributions of CA:

> *"Conversation analysts investigate the demonstrably rational properties of indexical expressions by describing recurrent sequential actions in conversation and specifying formal rules for generating their organizational features."(Lynch, 1994)*

For conversation analysts, the indexical properties of actions are evident through sequentially produced talk. As discussed in the earlier section, indexical expressions refer to those whose utterances pertain to the local context of activities. In CA, talk is considered

both ‘context-free’ and ‘context-sensitive’ wherein the understanding of context refers to the various places, times, and identities of parties to interaction (Sacks et al., 1974). In explaining this property (Sacks et al., 1974) states that, “*Conversation can accommodate a wide range of situations, interactions in which persons in varieties (or varieties of groups) of identities are operating*”. Given its wide applicability, talk can display sensitivity to the various combinations of speakers and changes in the situations. CA’s view is that talk and therefore the production of social action is not bound in a *single* context. One way in which conversation analysts explain the context-free quality of talk is that conversation, as a socially organised activity, is produced based on how participants in an interaction attend to, and take turns at talk. In turn, the utterances produced through these turns produce the ongoing context for the talk. Now I will discuss three of the highlighting features of the CA approach that I drew on significantly in my analysis of the data: turn-taking, sequential organization and membership categorization devices.

Turn-taking as an organized activity is a key concept within CA. It is supported by the understanding that within ‘conversation’, overwhelmingly, there is only one person speaking at a time (Sacks et al., 1974). Variants within the course of conversation, such as speaker change or minimal overlap in particular instances may also be observed. Turn-taking can be described as a feature of conversation that is locally managed based on how recipients may respond to what is being said by speakers. There is a component of ‘listening’ that takes place as the recipient must determine if he or she is being selected to speak or wants to use the opportunity to do so. It is also seen from the point of view of ‘action potential’: the ability to do something for participants, to respond with surprise, sadness or shock (Ten Have, 2007). Therefore the construction of the next speaker’s is bound up in what is being said by the first speaker. For example, a speaker may decide to tell a story, the length of which he decides for himself and the choice of narrating it. The listener on the other hand must wait for a pause or indication that the turn is finished in order to respond. Depending on who the speakers are, for example, in the case of parent-child interaction discussed in this thesis, gaps and pauses may be understood to indicate particular things.

Sequential Organisation: A second core idea of CA is that utterances within talk are sequentially organized. The concept of ‘sequence’ may point to the quality of speech to be arranged in a particular fashion- that ‘one thing can lead to another’ (Ten Have, 2007). Conversation is governed by particular patterns, similar to those seen of turn-taking.

Schegloff (1968) describes this in the distribution rule: when one speaker speaks first. For example, while analysing a telephone conversation, there may be a particular organisation to the way in which the interaction unfolds. It is usually the one who receives the call who speaks first, followed then by the caller, who may introduce him or herself. This may then lead to stating the reason for calling, depending on what follows in the sequence. Such a turn-based analysis provides explanations for why people may avoid an interaction, by not responding to a greeting or show interest in pursuing conversation by asking questions.

Membership Categorisation Analysis (MCA): Another aspect that drew Sacks' interest was in studying how participants' organized their knowledge of each other through interactions. He found that the use of categories was a popular way to refer to this phenomenon. For example, to study the category of "family member" such a parent or a sibling the analyst examines how such categories are invoked through the course of the interactions between family units. Sacks named this system of organization as a *Membership categorisation device* to refer to how activities are distributed amongst participants of a unit. Furthermore, according to Sacks' categories are not just named or implied, they also carry a number of different associated properties. To expand, a membership categorisation device refers to:

> *"any collection of membership categories, containing at least a category, which may be applied to some population containing at least a member, so as to provide, by the use of some rules of application, for the pairing of at least a population member and a categorisation device member. A device is then a collection plus rules of application." (Sacks, 1972)*

Sacks (1972a) also made an effort to explicate 'rules of application'. First, there is the 'economy rule': the rule that one category is sufficient for the person being referred to in the ongoing interaction. For example, a mother, as an individual may fit into more than one social role of wife or sister or daughter. However if the prevailing talk with her child pertains to her role as a mother, the analysis applies only one category (i.e. mother). Second, the 'consistency rule' of MCA states that within the course of interaction once a member is identified as fitting a particular category, for example, the mother is identified in the conversation by her children as a 'mother', this will be the role presumed for the analysis. In turn, the others in the interaction assume their roles are father, son or daughter. Furthermore, another way in which activities can be analysed was by understanding the assignment of activities to members. Referring to them as '*category-bound activities'*, Sacks discusses that particular activities are assigned and associated with categories of

members. This enables them to be recognized and described within the interaction, so for example, parents may show concern, do parenting such as reassuring a child or picking up a child or reprimanding a child.

In applying MCA to analysis of conversation, Ten Have (2007) suggests that it offers a useful start to *"analysing the social knowledge which people use, expect, and rely on in doing the accountable work of living together.* In applying this in my own analysis of the data, I was directed to look for the reference to membership as being accomplished through properties of conversation as local and sequential, i.e. based on the activities and references made within the conversation (Butler and Fitzgerald, 2010). This was a particularly useful analytical tool within my analysis of family interactions as there are frequent displays of parent-oriented and child-oriented talk and interaction that I was able to show using this analytical device.

3.4.3 Moving away from "talk" alone

CA as a method has evolved significantly in the way it has been applied to a range of settings. Although the focus on talk was seen as a dominant feature of the production of social order, in addition to talk, the positioning and placement of speakers, their orientation are important considerations in ethnomethodological enquiries. There have been an increasing number of studies where the focus on features of interaction apart from talk: bodily posture, gesture and artefacts in the environment are incorporated into the analysis.

Among these are studies that pertain to three particular areas of talk and interaction:

1. Institutional talk: analysis of talk and interaction within institutional settings
2. Studies of embodied interaction: including gaze and gesture as features of interaction
3. Workplace studies and the study of interactions within technology-rich environments.

The first of these studies is concerned with institutional talk. This is the feature of a number of studies to be focused on data collected in institutional contexts such as hospitals, courtrooms and police encounters. Talk within these settings is being particularly shaped by the institutional orders prevailing there (Heritage, 2004). The focus of such studies seems to be those that underscore conversation analytical procedures of turn taking and sequencing in addition to be governed by normalised patterns of interaction. As Heritage (2004) points out "*Institutional interaction normally involves the participants in*

specific goal orientations, which are tied to their institution relevant identities: doctor and patient, teacher and pupil, and so on." This is important as a development within CA as it was distinguished in contrast to ordinary talk produced in commonplace contexts. With this brief introduction, the discussion will shift to focus on the other two developments as they are more relevant to the current analysis than the study of institutional settings.

The increasing availability and access to video data enabled researchers to focus on broader aspects of interactions rather than to focus solely on talk. As a result of the rich multimodal data, the focus of analysis moved away from solely focus on talk to other aspects of the interaction, such as gaze, body movement and gesture. Goodwin (2000), in discussing a *'theory of action'*, explains the need to focus on features of interactions with the social, material and sequential nature of the environment in order to explain the accomplishment of an activity. He points out that the recognition that non-verbal features of conversation exist and require attention alone are not enough. To him what was more important is finding out how these can be incorporated into analysing the organisation and production of an interaction.

In observing play between children (Goodwin et al., 2002) and the organisation of parent child interaction in the home (Goodwin, 2007b), analysts were struck by the way in which participants engaging in an interaction displayed the need to monitor visibility of each other and coordinate their actions in a manner that enables the production of talk and activities. According to Goodwin (2000) the positioning of bodies and use of gestures reveal features of how participants mutually orient to each other in creating 'participation frameworks'. This physical orientation of participants then to focus jointly on a feature of the environment resembles the '*ecological huddle'* described by Goffman (1963). The role of interactions with the material environment, access to objects therefore has important bearing on the shaping of interactions (Streeck et al., 2011).

This embodied, 'participation framework' can be described to have a few characteristic features (Streeck et al., 2011). First, unlike gesture, these frameworks are not the essence of what people are talking about. Instead, participation frameworks are concerned with the participants' orientation and the world outside as their focus. Second, in contrast to talk, the temporal organisation of this framework is not defined. It can be sustained over time through talk and stopped whenever the participants wish to do so. Third, although they are not the essence of the talk, they contribute to the organisation of the talk. They therefore

provide a localised environment for participants to attend to and work together in achieving interaction in a setting.

Workplace studies are a rich setting to study materially, socially and technologically dense phenomena. In these environments, the busy nature of members' work and complexity of the setting make the study interactional phenomena quite multi-layered for an analyst to observe and analyse. Within interaction and technology-rich settings such as the control rooms (Heath and Luff, 2000), video production studios (Perry et al., 2009) or operating theatres (Hindmarsh et al., 2011, Mondada, 2014b), video data captures a detailed picture of what goes on between participants and the environment. Analysts can also narrow down focus on particular details of that setting that need to be studied closely, such as the focus on the ways in which people engage in focused interaction within a setting, for example how visitors may orient to each other and the exhibits through their conduct in museum visits (Vom Lehn et al., 2001).

Further, the richness of interaction in technology saturated settings may also involve the capture of multi-party and multi-device interactions that can make it difficult for the ethnographer to keep a manual record. In scrutinising video material, "interaction analysis" which incorporates the notion set by CA on the sequential feature of talk as well as including the wider interactions that surround the use of technology in the setting may be deployed (Jordan and Henderson, 1995, Heath and Hindmarsh, 2002). This application of the EMCA approach to studying technology has been particularly useful as a tool to study how talk, nonverbal interaction as well as placement of artefacts and technologies aid in understanding situated conduct in organisational settings.

There are also particular benefits associated with using video as a method of recording social interaction. Video recordings may control for the bias of the researcher and unlike relying solely on field notes, record social events in fine detail that may not be obtainable by re-constructing the scene. They fill gaps between what people say they do and what they actually do (Jordan and Henderson, 1995). They also provide a descriptive and detailed view of how members in a unit may interact with each other the environment and the unfolding of interactions within these spaces. To this end, video enables researchers to position where people access artefacts, how they articulate this and carry out activities (Jordan, 1996, Heath and Hindmarsh, 2002). Within CSCW studies, video has been able to provide a descriptive record of the ways in which people may use and collaborate around technology (Heath and Luff, 2000). Video provides a way of displaying

'articulation' work and 'centres of coordination', making visible how members apply and display their knowledge and skills within a unit.

In order to produce an account of how family members organise and produce their activities, I found that drawing on ethnographic material, to the extent to which was useful, but retaining analytic control over the interpretive statements was essential. Further as supporters of both methods (e.g. Clayman and Maynard, 1995) have emphasized that balancing focus on CA prevents risking losing data from early decisions about what interactional detail is critical to the study. The ethnomethodological perspective was adopted in the ethnographic observations that I made as a researcher while being a part of the field setting. These observations supported and supplemented my analysis of the conversations and interactions while analysing transcripts of the video extracts.

Discussions that move away from focusing solely on talk tend to be issues revolving around the idea of 'context'. According to conversation analysts, context is shaped by sequential organisation of activities (Pomerantz and Fehr, 1997). Ethnomethodological studies and those inspired by its program tend to think of context as being a product of sense-making activities including broader concerns such as the environment and interaction with members. Data focused on embodied interaction where gaze and mutual orientation of participants are considered for analysis, context is more easily defined through the visual availability of fields of interaction (e.g. participation frameworks are one example, discussed earlier). My approach and analysis therefore followed these multimodal aspects of the EMCA approach. I was particularly inspired by previous researchers' (Haddington and Rauniomaa, 2011, Mondada, 2011) work of embodied interaction in analysing in-car video material.

Studying interaction in a complex material environment like the car highlights the features of how talk and actions are shaped in an on-going fashion through the availability and access to particular resources. For example, even though drivers and co-passengers are co-present, ability to engage in face-to face interaction is limited. This in turn meant that conversation, gestures and moving of artefacts within the car had to consider these limitations. The 'work' in the car involves driving and the management of activities alongside this driving such as: managing device use, children's behaviour, navigation etc. Parents and child passengers had to therefore control and disengage from side activities occasionally to allow completion of primary actions. At the same time, parents are seen to

draw on their resources of past experience and biographies of family members while responding to requests and engaging in conversation.

3.4.4 Lending ethnomethodological insights to systems design

The ethnography carried out in this thesis was inspired by ethnomethodologically informed ethnography that is carried out with the view of informing design (Hughes et al., 2000, Crabtree et al., 2012b). Through scrutinising and understanding the role of practices, ethnography within systems design is able to point to a useful understanding of both the people and contexts where technology is to be implemented or improved. The usefulness of ethnography within studies of technology has been largely dealt with through the expectation that the analysis of the production of social conduct around technology use will provide the impetus for developing of design guidelines or support requirements for the design of technology systems. Therefore, the ethnographer's goal in ethnography for systems design is to unpack and make visible the work of a setting. This then facilitates designers to make informed choice about the development and level of complexity in systems that need to be placed with a setting (Hughes et al., 1992, Button, 2000, Crabtree et al., 2000, Randall et al., 2007).

Fieldwork for the purposes of design can be illuminative in informing the way in which systems design can adapt to the needs of users and settings. Hughes et al. (1994) provides some distinction in the sorts of ways in which ethnography can support the system design process, sometimes referred to as being *'quick and dirty'*: this type of ethnography involves spending a relatively short span of time in getting to know a setting and its members. However, the purpose they serve may be to give designers some informed perspective about what is required in a setting. Along with this, '*concurrent studies'* may be conducted which involve a more iterative fieldwork where ethnographers and designers work in a team together, constantly assessing and re-assessing the impact of particular prototype development. Where a domain has already been scrutinised, and the interest is to evaluate prototype technologies, ethnographers may be called upon to carry out '*evaluative ethnographies'* to study how the setting impacts the persons and setting within which it is placed. In keeping with such studies, the current research aimed to examine family life in the socially and technologically dense setting of the car. The aim is therefore to understand the setting and the technological and social landscape that surrounds the users before designing and introducing new technology.

Crabtree et al. (2012b) suggests some practical ways in which ethnographic findings can be meaningful in design. The *first* is that the purpose of using ethnographic descriptions in the design process is for the material to act as a resource to identify the key interactions between participants in a setting. In the current study's context, this is to find out how family members in the car go about managing device use and organising the use of technology over the course of the car journey. *Second*, ethnographic findings describe and point to the richness of social interaction that surrounds technology use in a variety of setting. In this regard, the ethnographer's role if to highlight the value of the socially organised nature of the activity and that this is not lost in the design of a new system. For example, if talk, gesture or gaze has an important place within the production of an activity, technology design must support the incorporation of these features into the requirements process. *Third*, rather than result in explicit design concepts, ethnographic research can be explorations that scope out the possibilities that are made visible through studying settings ethnographically. Yet, this does not mean that the ethnographer needs to stay away from the designer's arena. As addressed through the *fourth* and final concern, ethnographers need to systematically communicate the ethnographic findings to designers, and to try and make every effort to extend the gap between understanding of the social organisation of a setting as well as the design of systems to support this work.

While it was not this thesis' aim to provide explicit design concepts, the findings of the fieldwork was discussed with its scope in the design process in a separate extended project. This involved discussions and brainstorming sessions with design students and a longer period of close working with a designer that helped scope out the design ideas. Significant effort was taken to involve the collaborative participation of designers and users in this research. Details of this process can be found in Appendix 9 of this thesis.

3.5 Accomplishing the data collection

The data presented in this thesis draws on observational work (fieldwork) and video ethnography carried out over a period of eighteen months with twelve families in the UK during 2012-2014. Families were recruited through several means, including a university intranet, newspaper and supermarket advertisements, as well as an online parent community (Netmums). The majority of the families (10 out of 12) were from around the West London area, with one family based in Nottingham and another where the family was distributed across Devon and London. For further details on participants, refer to Appendix 5. Selection of families to participate was based on meeting the following criteria: (a) car

ownership or regular access to a car (b) family composing of one or more children and one or more parent/ primary carer and (c) willingness to commit for a period of 3-4 weeks of data collection. In return for their time and willingness to participate, families were provided with store vouchers of their choice to the value of a £100 on completion of data collection.

As with much of qualitative work, the criteria for participant selection also developed over the course of the data collection. I narrowed down my focus to families with primary aged children as I discovered while working through the data from the first set of families (F1 to F4) that such families made an adequate variety and frequency in car journeys. In addition, with regard to this, these families also used technology in interesting ways: many of the children shared parents' devices and owned devices of their own that they used. In addition, they also had the literacy skills to assist parents in supporting technology use such as answering phone calls, operating the stereo and assisting navigation. Diverse family dynamics also enriched the study: hence as far as possible, I made significant effort to include both single and two parent families and as well as families with one or more children to provide a good variety of car journeys and patterns of technology usage.

I met with interested families for a short interview to ascertain whether they fit the study description-i.e., car ownership or access, and length and types journeys made, technology practices, ages of children (refer Appendix 6). The first meetings usually involved the mother in all cases except in one case where the father contacted me. At this first meeting, I described the study, discussed the issue of consent in detail. Families were usually encouraged to spend a day or two in discussion their partners and children before confirming their participation. Once a participant confirmed their willingness, a schedule of the family's week was discussed with the parents. In order to arrange a mutually convenient schedule for the research, I assured families that I would fit into their routines and be as minimally disruptive as possible.

Once an agreed time was set with families, I commenced a week of ethnographic field visits to each family depending on the family's schedule. I chose to use the follow and film approach adopted by past car researchers in order to gain entry into the field site and understand the organisation of participants' activities before and during car journeys (Katz, 1999, Laurier et al., 2008). On my first visit to the family, I usually arrived 20 minutes early to clarify who I was, discuss the details of the project and answer any questions that the family had. I also used the opportunity to emphasise to family members that they act as

normal as possible throughout the study. My early arrival also enabled me to study the preparations for the car journey and how past activities wind down and new activities are commenced. I usually accompanied them on a few routine car journeys, except in cases where this was not feasible. In one of the families (F11) the car was too small so I could not travel with the family of 5 and in another family (F2), the family members worked across two cities during the week, making it challenging to travel with them.

One of the valuable aspects of travelling with the families was being sensitised to their routines and practices. I became aware of the places that families frequently visited and their patterns of life. Hammersley and Atkinson (2007) point out that ethnographers may need to pay attention to "*salient periods and junctures"* during ethnography. This was evident in the rhythms of family life. For example, term-time journeys tended to be quite different, from half-term periods or holidays where arrangements needed to be made to balance children's free time and this often impacted the ways in parents negotiated driving responsibilities. Families with elementary aged children often started the day very early, parents of these children had to do most of the planning and preparations for the journey, as the children were not as independent. In these homes, I usually arrived early so as not to make the family late for their routines. My presence was also more disruptive to children's moods so I had to be sensitive to this as an outsider to the family. While to the parent, I slipped into a familiar role as a friend, co-passenger or even resembling a sibling, parents usually adjusted to my presence.

In the past, researchers tend to draw in acquaintances or friends as informants for their participant pool. However, not having a family myself, I gained the additional experience of recruiting and reaching out to participants, because of which my experience of the field site began at gaining access. Once I had established the purpose of the study, families were essentially very willing and obliging participants as reported in earlier work (Hall, 2014). There were no expressed concerns about privacy issues in the home or the car. My association with the university and offer to set-up most preliminary meetings within the university premises gave me credibility as a researcher.

While doing observation work, I found that using a fieldwork checklist (see Appendix 7) to remind myself of what to pay attention to ahead of visits to families was useful (Crang and Cook, 2007). It helped prompt me to situate peoples' lives and routines, where they lived and went to work, school and shop as these were closely tied to how families used the car. Being there also prompts family members to talk and discuss about their lives in a way

that's different from a single self-reported perspective. I decided to compliment my handwritten fieldwork notes with photos taken on a fieldwork application on my iPad. I found this quite useful as the application also had GPS coordinates and helped me remember where the photos were taken. The fieldwork in the car enabled me to contextualise the data and support my analysis as will be discussed a little later in this section and those that follow.

Once I established that families were comfortable with me as a researcher, I provided the families with two video cameras who then recorded their family journeys over the next 3-4 weeks. Static cameras were set up for this filming in the front and back seat area (Refer Figures 1 & 2 below). One camera was mounted above the dashboard, and recorded a dual image of the front seat, and the road through windscreen; the other was to be mounted on the rear windscreen to record back seat passenger interactions. The front dual camera also recorded GPS coordinates of the journeys undertaken by families-provided contextual data pertaining to the journeys. The front camera could record continuously when connected to the power socket in the car-therefore recordings provided a good representation of overall journeys that families made over the course of one month. I met with families once in every 2-3 days to check the memory cards and replace them.

Over 20 hours of recordings per family were returned and clips that were to be used for analysis were reviewed and approved by participants for use. Because of both availability of equipment and fluctuating availability of participating families, I worked with no more than two families at one time (and this was rare). Usually I started data collection with a second family after cameras were set up with the first family. Working with a maximum of one or two families at one time also gave me time to reflect on the data collected from one family and organise it before continuing with further data collection. Also because of the volume of the data and the spread of journeys, I spent some time between fieldwork collating and scrutinising the data. Clips were reviewed by families and approved for use in the research.

Figure 1 Front Camera Set-Up

Figure 2 Rear-Seat Camera Set-Up

There are some challenges in gaining footage with a full view of the interactions within the car because of the limitations posed by recording angles and the fixed positioning of cameras (Luff and Heath, 2012). For example, some interactions with the car console such as the stereo were not visible because the camera captures only the front view of the front seat. Therefore the analysis focused on the interaction around the device itself. Monitoring early recordings became quite important as children's positioning and car seat height impacted the angle of the backseat camera. This was identified early in the data collection so that families could adjust the angle of the back cameras. Except with a few instances where the families were unable to continue recording because of battery life or limited day light, most journeys were uninterrupted. Allowing participants to keep the cameras for a longer period also ensured that it gave them an opportunity to get accustomed to the presence of the cameras. Families commented that setting up the cameras became just another routine in getting ready for a journey and after three weeks of setting up cameras, most families were content to keep them longer as they did not disrupt their journeys.

3.6 Ethical considerations with video data

While collecting the video data, the primary concern was to obtain fairly good quality instances of 'naturally-occurring' family activities, while minimising the researcher's presence. While there may be some concerns raised regarding the role and presence of the cameras to participant behaviour, in this regard, the video cameras are regarded in the same manner as the presence of an ethnographer in a setting (Heath et al., 2010). Despite this, the ethical implications of the video material in disclosing family identities cannot be overlooked. The same ethical protocols followed in the study of human participants in sociological and psychological research was followed in the current study. Ethical Approval was received as per the researcher's institutional regulations (See Appendix 4 for Ethics Approval). All participants were made aware of the details of the research involved

in research, and given the opportunity to clarify any questions they may have (refer Appendix 2 for Information Sheet). One of the key concerns of studies with human participant is the notion of informed consent. During their participation in the study, I reminded participants about their rights to leave the study at any point without providing a reason to do so (refer Appendix 3 for Consent Form). All data used for the researcher's analysis was approved by participants before use. None of the participant families expressed any concerns in using the data for research publications nor did any of them express concerns in the nature of the video material in disclosing their identity. Participants were also provided the contact details of the researcher for future contact in the event of any change of circumstances with regards to usage of the data.

3.7 Assembling and analysing the ethnographic material

In ethnographic work, data is almost everywhere where the researcher looks and it is up to the researcher to determine what to focus on and what will form the organised account of a given set of activities. In order to write up observations and make sense of empirical material, the analytical orientation of the ethnography enabled to point out to data extracts that would represent and address the questions set out at the start of the research. As with other types of ethnographies, analysis was interspersed throughout the period of data collection. To build this record of families' activities, I consulted both the sources of ethnographic data, but my primary source of analytical material was the video material.

The key source of situated conduct in the car is from the video material that I collected from families. This conduct was then transcribed and analysed from a conversation analytic perspective (Jefferson, 1978). While CA is largely concerned with the study of talk-in-interaction, ethnographic material may be incorporated into analysis if it is relevant to participants' orientation in a given sequence (Schegloff, 1991). For example while exploring a directive sequence where the recipient complies with the speaker, it may be that one reason for this is that the former is the parent and the latter, is the child. Researchers have often found value in using recordings with ethnography or sometimes supplementing it with interviewing and observations without prioritizing either one approach (Clayman and Maynard, 1995).

The current research draws on ethnographic data and makes use of this contextual knowledge to understand what families are oriented to, whilst ensuring that the principal focus remains on the study of the interactional data, and not anywhere else. My aim

through the analysis of ethnographic extracts was to describe and present the orderly work of members (within the family unit) by focusing on factual knowledge of what I observed in the fieldwork and in the video data. As video collection was spread out with intermittent gaps during collection and over winter periods where recording was poor, I could spend these gaps to review the data. During this review, extracts in the data relating to technology interactions within family journeys were edited and selected for further analysis. As in all qualitative research work, the aim of video excerpts is not to provide large amounts of data extracts with the purpose of comparisons or to generalise. Instead, a small selection of extracts is presented that is representative of the larger corpus of videos collected.

3.7.1 Organisation and selection of video clips

I initially reviewed the entire video corpus before focusing on extracts of talk and interactions that I was interested in for the focus of the research. Therefore I tried to look at the data with an open mind and then while working with a data extract, construct how its features described the accomplishment of members' activities. When choosing conversational extracts it is generally advised to engage in *unmotivated* looking at the data.

Schegloff (1996) defines unmotivated looking as:

> *"An examination not prompted by pre-specified analytic goals (not even that it be the characterization of an action), but by "noticings" of initially unremarkable features of the talk or of other conduct."*

I started my analysis on a set of small, chance fragments of data, through which I was able to create '*a provisional analytic scheme'* (Ten Have, 2007). Then I slowly started to develop my analysis by extending this to additional instances of similarly occurring data trying to be comprehensive in my working through the corpus. Once I had identified an instance of an action being done, I focused my attention on working with that extract in depth. For example, the action of passing a mobile phone to a child in the car, I continued to follow that interaction, both the talk and conduct that follow it-in its context: what is being asked of the child, how does the child respond to it? Does he/she receive the device? Is the action supported by any instruction: verbal or non-verbal? Next, I prepared detailed transcripts of the verbal aspects to reveal the nature of turns, pauses, overlaps and actions that reveal how the sequential progression of the interaction. This helped me analyse the sequential organisation of activities.

In discussing the ultimate aim of Conversation Analysis, Sacks (1984) writes:

> *"The gross aim of the work I am doing is to see how finely the details of actual, naturally occurring conversation can be subjected to analysis that will yield the technology of conversation. The idea is to take singular sequences of conversation and tear them apart in such a way as to find rules, techniques, procedures, methods, maxims (a collection of terms that more or less relate to each other and that I use somewhat interchangeably) that can be used to generate the orderly features we find in the conversations we examine."*

The description and analysis of the set of observed interactions becomes the analytical account of accomplishing the ordinary work of the setting. Hence the essential 'material' with which the analyst works with is the understanding of what the participants in a setting are doing in and through their talk-in-interaction (Ten Have, 2007). Furthermore, the next step was then to assemble a collection of fragments of talk-in-interaction in which recurrent words/phrases/actions i.e. "repeats" are employed, to deepen the set of patterns of the setting under investigation (Schegloff, 1996). For examples, I continued to scan through the data and find other extracts, to examine what other participants are doing with phones: how do they orient to it? Do they use them in the same or different ways?

Another valuable material of reference was my observations while visiting participant families. My field notes for each of the families provided insight into describing the people and contexts that set the background to the extracts. For example, from my observation work, I was familiar with what kinds of devices each family chose to carry in the car, what their limitations were and in the course of car journeys, references were made to these devices, I was able to draw on this background knowledge. While this supported my observations, my analysis was grounded in EM's notion of "visibility" of participants' actions which makes them visible and accountable through the fact that these actions 'reside' in the world (Garfinkel, 1986).

3.7.2 Analysing and presenting the data

In and through my analysis of video recordings, I was able to draw out and present data extracts that captured how family life was conducted in the car. The presentation of the examples in this thesis in not intended to display a variety of the technologies themselves, but to demonstrate the range of interactions that unfold within family device use. Once I selected and worked with a piece of video data, the analysis of it further demonstrated how family units negotiated and managed turns at talk and conduct around technology. Selected

clips demonstrated the feature of interactions that I wanted to explicate further (Heath et al., 2010). In doing analysis, I was essentially working with transcribed data of talk-in interaction and my focus of that was representing an "*empirically grounded account of action*" through three elements advised by Schegloff (1996) :

First, the account must describe *"a formulation of what action or actions are being accomplished".* This first aim is addressed by a focus on the observable features of visible conduct of family members: what they are doing, saying and how they go about doing it in a sequential and meaningful manner in various instances in the empirical data.

Second, there should be a "grounding of this formulation in the reality of the participants." This is in demonstrating that the participants in the data understand and respond to that talk as well as the conduct of those within a sequence of interaction. The analyst does this by unpacking and studying the sequence of talk, as well as how speakers and hearers orient and respond to each other. The focus of this is on the fact that the analysis represents the analytical frame of the participants rather than the analytical academic frame of the researcher.

Third, the account must be "an explication and analysis of what it is about the observed talk or other conduct or the practices embodied in it, which makes the enactment of that talk/ conduct possibly an instance of the proposed action, and makes it analysable by the co-participants as an instance of that action." In this final requirement, the emphasis is on the building of an analytical account of what transpires between participants. Analysts must not only present an understanding of the talk between speakers, but also 'provide analytically the grounds for the possibility of such an understanding'.

According to Schegloff (1996), adhering to such a strict procedure is challenging, particularly in cases of interaction where the understanding between speakers is not clear. However, this guidance should be regarded as minimum points of reference for the analyst. For example while choosing an analytical focus in the data, I identified several of these interactions were of how parenting practices and technology was placed alongside driving demands. This led me to select an instance for example, of doing a family conversation about a game, I then began to break this down in its sequential order into how the event was produced from start to end, how it was positioned over the course of a car journey and finally drawing analytical focal points in the extract. For example, this often started with the occasioning of the talk and orienting of participants to the speaker. This then helped me

follow and build my analysis around how parents are drawn into conversation by children and when (and how) this is pursued or discounted.

Although there were several points of interest in the data, I tried not to shift too much away from the questions that were posed at the start of the research. These were focused around what interactions families had with technology. While I adhered to this, I was conscious of what was driving my interest in the data: the dual interest in production of family life in the car and the role of media in the routine journeys. In approaching the analysis and presentation of data, I first made, detailed transcriptions of the verbal conduct of selected transcripts following the Jeffersonian style (Ten Have, 2007). The verbal conduct was later supplemented with detailed visual conduct including frame grabs (Goodwin, 1994) in order to draw attention to the conduct of participants in the video. As the researcher, I viewed the data independently as well as in organised data sessions with colleagues and presented at various group data sessions to discuss and identify analytical foci in the data.

3.7.3 Transcription style

For the purposes of analysis and presentation of data extracts in this thesis, I followed a simplified version of the Jeffersonian transcription (Jefferson, 1978, 2004a) . Details of the transcription notation can be found in Appendix 1). Hepburn and Bolden (2013) suggest that video stills supplementing transcriptions of verbal conduct *"have the advantages of being easily interpretable and more holistic in representation*". Given that the car environment itself is an eventful space where a range of activities are carried out simultaneously, I found that following the transcription scheme for non-verbal interaction (Goodwin, 1984, 1986) suggested by of detailed gaze and transitions from non-gaze to gaze made the transcription more challenging to read and interpret. Instead, I supplemented my detailed transcriptions of verbal conduct still snapshots from the videos, to support my transcripts. The style emulates work by other researchers (Goodwin, 2007b, Keisanen and Rauniomaa, 2012) have similarly adopted this style of transcription to display orientations to objects and people within a range of settings.

3.8 Summary

In this chapter, I have provided a detailed description of the analytical and methodological positioning of this thesis. I started by describing video ethnographic approach and what it offers in the light of the objectives set forth by the study. In discussing the ethnomethodology and conversation analytical perspectives, I describe its value to the

orientation of the data analysis. Through an analytical stance drawn from ethnomethodology and conversation analysis, the ethnographic fieldwork unpicks the socially organised nature of family technology use in the car. I justified my choice of an EMCA oriented data analysis and the ways in which my treatment of the data and analysis was in keeping with the main tenets of this approach. I then position the study against existing ethnographically informed tradition in technology studies. Further, I report on the data collection and analysis of empirical material.

The chapters that follow will report on the empirical findings carried out through detailed analysis of the data. The focus in these chapters is present extracts that provide an account of the organisation of social conduct around the use of technology in the family car.

Chapter 4 Organisation of device talk in the family car

4.1 Introduction

The data presented in this thesis is aimed at providing a description of how family life may be observed as an interactional accomplishment in the car, i.e. the *doing* of family life (Aronsson, 2006). Studying this interactional achievement has involved scrutinising the characteristic features of talk and activities between adults and children in settings where families gather and reside whether this is conversing together over dinner (Ochs and Shohet, 2006, Blum-Kulka, 2012) while narrating the day's events or discussions about homework (Wingard, 2006) or in the resolution of small disputes (Goodwin, 2007b). A more recent focus and one that the current research is interested in is the significance of technological devices in exploring parent-child interaction. Such explorations may include interaction around tablet computers (Danby et al., 2013), gaming devices (Aarsand and Aronsson, 2009a, Fatigante et al., 2010) or the computer (Davidson, 2010, Goodwin and Cekaite, 2014). The broad concern of the thesis rests on the premise that technology use in interwoven into the on-going production of family activities in the car. In presenting instances of parent-child interaction around device use, the thesis contributes to providing a descriptive account of such instances.

Although the role of technology in the socio-cultural development of children is increasingly viewed to be an important topic to study, parent-child discourse around technology is often a taken for granted aspect of family life (Danby et al., 2013). The findings in this thesis will extend the application of family practices to technology directed talk in the family car. Carrying out everyday family routines such as mealtimes and domestic tasks (e.g. bathing, brushing teeth, etc.) involve the enactment of cultural and social practices around family life. Studying such practices from an interactional interest may involve scrutinising talk between parents and children includes following the pursuit of question-answer sequences (Ochs et al., 1989), as well as organisation of directive-response patterns where parents request children to comply with activities (Kent, 2012b) as characteristic features of doing family. Other talk-related features such as embodied participation frameworks within activity through gaze, stance (Goodwin, 2007b) and shepherding (Cekaite, 2010) may also feature in family activities and will be covered in the next Chapter.

In cars, objects being used by passengers can present opportunities to become 'topics of discussion' (Goodwin and Goodwin, 2010). In keeping with this, the current chapter will focus on a very particular context of parent-child talk, which deals with device use in the car. In the car, conversations are placed in relation to the moving environment that shapes the ongoing progress of family conversation. This contrasts with other settings of family talk such as family meal times which are bound in time and space (Blum-Kulka, 2012). When considering device use in families, the primary use of devices by children is to play and entertain, whether this is in the living room or other places where the family may be organised together. The *use* of devices in the family car is similarly shaped by particular kinds of features, relevant to mobility, family and technology practices.

This Chapter will provide an account describing two different orientations of how talk between family members is managed and produced around technology use in the car.

First in Section 4.2, the data demonstrates how devices set off a distinct set of interactions between family members. In the first set of examples, the data demonstrates how device use may be seen as opportunities for family conversation to take place. The focus of this data is in describing the positioning of this parent-child talk over the course of the car journey. This talk is often dependent on who all are present, their knowledge of each other, and the local production of activities at that within space and time. Though it is important to emphasise that talk does not act and occur independently of action, but is often enmeshed within resources that are available through interaction-such as gaze, bodily orientation as well positioning of technological artefacts in question (Goodwin, 2000). Over the course of the journey and interactions in the car, it is observed that family members may refer to past knowledge or associations with the artefacts being used, as well as activities in the ongoing production of actions (Fatigante et al., 2010).

In the next set of examples in Section 4.3, I demonstrate how family talk features in the orchestration of device use over the course of the car journey. In this, I discuss how parents and children negotiate offers of media, orient to devices being use and how distribution of devices may be managed based on the appropriateness for the journey and the child. I also discuss how the management of devices is also very particular to rhythms of the car journey. Alongside this, I discuss how children may respond to parental rules on using devices and playing games as well as parents' references to prospective orientation in talk (e.g. warnings for refusals to return devices).

It is important to recognise that the examples of activities presented here are representative of the entire corpus of data. While such examples were seen across all families, particular perspicuous instances from a smaller sub-set of families are presented here to illustrate the range of interactions observed as well as rea.

4.2 Device use as a setting for family car talk

Children's use of devices often involves some form of commentary or discussion while a device is being used (Aarsand and Aronsson, 2009b). There is a distinction to what features in this talk as 'family talk' versus just talk about gaming. As I will show through the data, parent-child interactions are unique, because parents are invested in what their children are doing on the game consoles, but they may not be necessarily deeply interested in what it means for a gaming point of view. They may be keen to share their own knowledge of children's activities as well. In the instances discussed here, the child playing on the device is usually the one to initiate the conversation with the parent. This may or may not be further extended by the driving parent depending on what they know of the child's activity. As the nature of driving itself does not allow for active involvement in device use by the parent, they may engage with children by noticing, through acknowledging via gaze or pointing to support talk. In the examples described here, children who initiate in device-related talk are for most part, in the front seat and are in a good position to initiate discussion with the parent. Backseat passengers may also join in the conversation to present agreements or disagreements on the commentary.

First, beginning any kind of conversation in the car requires that the parties engaged in talk pay close attention to the talk's placement within the course of the ongoing journey. For the parent, driving is the focal activity requiring their main attention, much like the home where the parent may be involved in cooking or attending to other household chores (Fatigante et al., 2010) while they may still engage in commentary on the children's use of devices as a way to show interest and monitor what children are doing. In sequences of talk, participants may participate in 'talk in activity' (Szymanski, 1999, Danby et al., 2013) where the talk occurs alongside other non-conversation related activities such driving or travelling. Depending on how long the parents' attention can be drawn away from driving, there may be little opportunity or extended opportunities for commenting. It is important to observe that this sustained engagement in talk is positioned against the movement of the car as well as availability of passengers to sustain talk.

Second and closely linked to the first point, attention then turns to how parents may respond to the talk about devices by indicating when they can pay attention and respond accordingly. The focus here is on how the turns at talk are locally produced with regard to the journey and ongoing conversation sequence. In the set of examples presented here, I discuss how parents through their talk and actions orient to the children as well as the driving while noticing what is going on in the device. In turn, children orient to seek parents' attention by directing conversation through the devices.

Third, in the discussion of these devices, there is opportunity to engage in ongoing discussion or narration of device content, usually involving some game-related activity on the device. This refers to the distinct feature of game-talk as being produced in the 'here and now' while the game is going on. The data suggests that this unfolding of talk may take place through parents' questioning children about the device, the characters and their or even children volunteering and narrating information, families are actively engagement with the content in the device.

Fourth, during the sequential production of talk oriented to the device, participants are drawn into displaying ongoing, shared understanding about family members, the devices and their activities. This understanding is achieved through features of talk as being sequential or the idea that participants carry on taking turns in conversation (Mondada, 2011) based on what their understanding of what is said. In analysing instances of interaction, the idea is that to describe the social organisation of shared understandings between family members, attention is paid to the organizations of these turns (Macbeth, 2011). Therefore, in applying this to extracts between parents and children, the analysis demonstrates how parents and children display their understanding of prior talk, as the source of common understanding available between individuals in the social world.

Data extracts from two different families are presented in the first sub section of this chapter to discuss how talk unfolds around device use in the car. Both family data discussed here will observe the use of a portable game console (Nintendo DS) that is popular with primary-aged children as well as tablet computer (iPad) being used for gaming.

4.2.1 Occasioning device talk alongside driving

Parent-child talk usually presents opportunities for children to talk when facilitated by an adult who asks questions or prompts the child to narrate accounts of events. The role of a

device however is quite interesting as it provides the child with the impetus to initiate and sustain conversation (Danby et al., 2013) as well as regularly engage the attention of adults. Further, references to the present, ongoing activity is also another feature of how device-oriented talk differs from story based accounts where children are narrating accounts of past events such as during meal times (Ochs and Shohet, 2006). This first extract is an example from the F10[1] family travelling together. The conversation is prompted by the younger daughter's use of her Nintendo DS gaming console.

Description: The mother is driving while the daughters are playing in the front seat and backseat on separate device[2]. The younger child in the front seat (D2) attempts to start the first of several discussions around her Nintendo game of Mario with her mother.

Extract 1: What?


```
1   (Music is running in the background and sounds plays from game)
2                          (a) looking down at device                    (d) tilts screen towards mum
3
4   D2: Mummy ↑I- Mummy ↑that (sound's) cos I got (.)Umm..-cos now, I can go in that-
5
6
7   Mum:  (a) reaches and takes  (b) glances at  (c) places phone        (d)thinking/frowning face
8           phone from pocket          phone          on dashboard
9     (e)turns device back to herself
10
11  D2:    in that one
12      (f)Looks at D2
13
14  Mum:   What?
```


```
15  (g) tilts screen towards mum
16
17  D2 : In there=
18
19  Mum: (g) looks at screen
20  Mum: =Oh, in that.
```

[1] *F10:* This family comprises of a single mother and her two daughters (aged eight and six years). In this family the younger daughter (D2) used the iPad and her Nintendo DS frequently while in the car, while the older daughter used her iPod. The extracts presented here are from journeys that spanned approximately 25-30 mins where conversation centres around D2's use of both devices in the front seat.

[2] M-Mum D1- elder daughter D2-younger daughter

In this extract, the child brings to the mother's attention, a particular incident within the game. This is particularly striking, because this occurs while a lot is going on in the car. There is music running in the background and right then, the mother produces a sequence of actions in which she retrieves her phone from her pocket (Fig a) , glances at it (Fig b) and places it on the dashboard (Fig c.). As the mother's sequence of actions finish, the child's tilts the screen towards her mother to coincide with her description of *"go in that"*, which is probably a reference to a feature within the game. This is missed by the mother however as her focus is on the road ahead. Similarly, in other settings such as the living room, situations may arise where someone misses an action because of leaving a room or being temporarily distracted. However hearers usually come back and re-orient to what was being said before the distraction with a questioning response (Keisanen et al., 2014) as is seen in the current extract. What is interesting here as well, is the child's stance while she initiates the talk. The child's attention is fixed quite keenly on the device; she does not raise her head even while she calls her mother's attention (Fig c) whereas ordinarily, in face to face interaction the speaker gazes at the addressee while holding their attention (Goodwin, 1979). The child does not actually make eye contact until the mother responds in line 14. This reflects a particular feature of the stance of gaming wherein there is a focused attention on the screen placed in front of players and away from interactions between players or spectators. Hence talk is directed through the technological artefact itself (Mondada, 2012a).

The timing of the comment indicates that to the child, this probably seems to be an ideal moment to discuss the game. But the parent on the other hand, must concentrate on the main activity of driving. Further, the mother is also involved in another activity on the side, wherein she is just about to retrieve her phone and place it on the dashboard. After disengaging from this action, she is now able to turn her attention to the child's game (Szymanski, 1999). On completion of her action of placing the device on the dashboard (Fig b and c) and disengaging from that, the mother shifts her attention to the child (Fig f), who by then has returned her focus to the game. The mother's question of 'What' in line 14 prompts the child to explain what she had earlier called for her attention for. The 'What' here may be understood as saying "What did you say" or "What were you talking about while I was doing this"? However, because it is placed closely in turn with the child's comment, the mother picks it up as relevant to the device-talk. She responds by saying "in there", while turning the device screen in the direction of her mother (Fig g).

The mother's respond of "Oh" indicates her realisation and understanding of the earlier clarification request (Heritage, 1984) and the use of the pronoun "that" in line 19 specifically indexes the device as the focus of the conversation. At this point, the mother shifts her focus away from the child, to the device, which is tilted towards her in Fig g. Her response is also minimalizing further talk in this particular sequence as it is clear the mother is not pursuing any further questioning (Schegloff, 2007) .

In another example of the same mother-child pair, the child starts to discuss her game when the car is stationed in traffic. While this seems a good moment to get the attention of the parent (given the car stationary position), the conversation is not sustained for long as the mother has to soon turn her attention to the road.

Description: In this example of F10, D2 is playing a car game on a tablet in the front seat for some time. When the conversation opens, the child has just stopped playing for a few seconds, as she seems to have reached to a new level in the game.

Extract 2: Moving cars


```
((music running in background, the car has come to a stop))
                 (c) moves screen back and forth while looking at mum
                                          ↓
D2 : Mummy,  on (.)     Level 2, its moving cars.
Mum:    ↑        ↑                  ↑                Wow.
 (a)looking (b)turns to look   (c) fixes gaze on screen   ↓
    outside      at screen
                                                (d) Looks up at rear-view
```

In this extract, the child directs the parent's attention to the tablet, on which she is playing a game. Similar to the previous example, the child clearly indicates that she is addressing her talk to the mother as she explicitly draws the mother's focus from the road to the tablet by starting her sentence with "mummy" in line 5. She moves the screen back and forth (Fig c) to emphasise on her statement in line 5 about *"moving cars"* where she is directing the mother's attention. Here the child places emphasis on two aspects, first, the fact that she is

at a different game level and second, because of which she now has the special feature of "moving cars" on the screen. The mother's attention here, unlike the earlier example is not elsewhere occupied, the car is temporarily stationed allowing her to offer a quick glance to the device. The form of the device-a wide tablet screen in contrast to the smaller game console, makes it comparably easier to orient to the device. The parent can make out what is on the screen by glancing at it quite quickly. Secondly, the child here is not actively playing the game, but is instead moving to a new level on the game. Consequently, she is able to look at the parent while producing the talk.

In turn, the parent responds with "wow" (line 6), which seems an appropriate response to the observation due to the fact that the child has not asked a question, but instead drawn the mother's attention to a feature in the game. It may also be seen as an immediate reaction to the child's commentary. At the same time, this utterance is a minimal response to what the child is making her attend to, because the driving conditions do not allow the mother to pursue it further. We can see this as the mother's response of "Wow" is followed by the preparation for her next set of actions: glancing in the rear-view mirror to check for cars in the back before she sets the car in motion.

In both examples, we observe that the emerging participation of parents in discussion with children may depend on the conditions on the road in order to determine the right moment to engage in detailed conversation. In both examples, the child clearly denotes speaker selection when she first addresses the mother before produce any commentary on the game. The form of the device further provides easier access to what is being shown. For example, the mother viewing the tablet is able to look over at the screen on the child's lap with ease rather than the DS where she misses when the child orients the screen towards her. The examples draw attention to how talk around device use is prompted and managed while two participants are engaged in parallel activities. The mother's main task is the driving and the child who passes the journey time by entertaining herself by playing a game on a device. In both extracts, the child's attention is on game playing and being a child, she seeks to involve her mother in discussion about the game. This talk is produced within the simultaneous activities of driving and this means that the parent divides her attention between the road, the child and (as in the first example) the action of retrieving the phone. In contrast to narrative accounts of family conversation by children during meal times, the talk is produced while the child is playing, indicating that is an ongoing activity and the mother's attention is relevant *while* the activity is being carried out.

4.2.2 Indicating availability and unavailability for conversation

In pursuing talk, parent drivers can show different availability in offering their attention to participate in an on-going conversation. Children, as speakers with limited rights (see West and Zimmerman, 1977), often do not understand this difference and can interrupt at times that are not conducive for the parent to engage in conversation (Butler and Wilkinson, 2013). In the car, we observe that rather than parallel conversation, children may disrupt the parent's attention to the road conditions.

Description: The following extract follows on further into F10's journey while the child is still playing on her DS. At this point in the journey, the Mario game on the DS had become the topic of conversation for some time. In this extract, the child is trying to gain the mother's visual attention to the device's screen.

Extract 3: Telling rather than Showing

a  b  c  d 

```
                                        (a)leans forward and turns
                                            screen towards mum (c)looks towards mum

D2: Look, nobody's been in this library cos' of look [watch this
Mum:                                                 [So you going in?=

                                             (b)looks at screen (c) looks towards road
D2: =Mummy, cos look watch this. Look.
 (d) Looks towards road and tilts head towards child

Mum: >I can't really watch darling<. 'Cos I have to drive the car.=
D2 : =Mummy, if [I-
Mum:            [Tell me about it.
D2 : If I get a power, it goes to a different block and I have to try and get it.
Mum: Ah, ok.
```

The sequence opens with the child continuing from an on-going description of her Nintendo game's progress on the screen. Through her orientation and speech, it is evident that the child is seeking her mother's attention, as she explicitly positions herself and the screen by leaning forward towards her mother. In line 4, she appears to pursue her mother's attention as the mother turns her attention to the road. Her repetitions of the word "Look", followed later by "Watch" indicate that she is consistently seeking her attention. The mother glances briefly, while responding to the child's request to 'Look'. She accompanies her action with a question of her own 'so you going in?' in line 5 as a prompt to the child to discuss the actions that she is engaged in the game. While engaging in talk within action, questions posed midway between an activity bears close relation to the

ongoing activity (see also Szymanski, 1999). However, while the mother poses this question, she has to turn her attention to the road (Fig c). Seeing the mother's shift of focus, the child responds by further seeking her mother's attention in asking her to 'watch' what is going on in the screen (Line 8) while retaining her stance of leaning over, tilting the DS and seeking the attention of her mother. The mother instead, prompts the use of commentary rather than 'showing' the device to help her follow what is going on (line 11). Her stance is one that is seeking the attention of a recipient she leans forward in her seat and moves the screen towards her mother while talking (Goodwin, 2007). Through her bodily positioning and her talk, she is calling her mother's attention to the action of listening but more importantly, the child is requesting the mother to observe what is going on in the game.

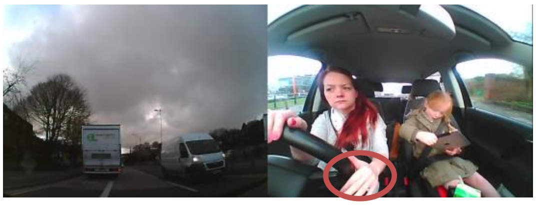
There are various reasons why the recipient may need to adapt their mode of engagement from the speaker. One reason could be because they are engaged in another course of action, in this case driving, the need to pay attention to what is happening of the road takes a higher priority over the conversation. This usually calls for interactional adapting actions such as pausing an action entirely until a particular event has passed (Keisanen et al., 2014) or in this case, changing the form of interaction, which is watching the ongoing game play towards listening to a description of what is going on. In this game, the child is persistent to 'show' the parent something in the game, which for the format of the game seems an appropriate game-related activity.

The mother's request for the child in Line 13 to "Tell me about it" serves an invitation to talk and at the same time works as a change of state token where the mother is communicating to the child, that while she cannot watch the activity, she can still *listen* to what the child has to say. The exchange here contrasts from a lone driver using a mobile phone as he or she can manage his actions and talk independently with a distant caller (Esbjörnsson et al., 2007). In the current data, the co-present passenger is a child and therefore requires further explanation to indicate that the parent cannot engage in conversation. Yet we see that the child is keen to pursue a conversation that involves the mother looking at the screen.

In other instances, parents may clearly indicate when they are unable to pursue conversation as in the case of the same parent in another example.

Description: The current extract follows on from the earlier exchange (Extract 2) between the child and the parent about the car game she is playing on the iPad.

Extract 4: Concentrate on Driving



a

b

```
     (a) Tilting screen towards self      (b) tilting screen towards mum
              ↓                                 ↓
D2 :  ↑Mummy (.)-I’m in this little car here
              ↑                                 ↑
Mum:  (a) focused on road ahead      (b) glances towards device
  with hand poised on left indicator

Mum: Ok I can’t really look darling, >cos I’m driving<

          (c)Indicates towards device      (d)Indicates towards driving wheel

Mum: You concentrate on your car and I’ll concentrate on mine.
```

c

d

Here the child follows up on her earlier announcement about her game level by extending her description of the game. At the point of this sequence, the mother is already aware over the last couple of minutes of what is going on in the game. In this extract, the focus of the child’s talk is moving away from an announcement to describe her position in the game (Line 3). The child produces her talk as her orientation is to the device, producing her speech through the screen as in Extract 1. She starts by calling her mother’s attention by saying “Mummy” with a marked rising intonation of her voice. During the initiation of this speech, the child is engaged in game play and the screen is held away from the mother, a position that is a result of the gaming activity.

At the child’s mention of the deictic term ‘here’, she tilts the screen to orient it to her mother inviting her to look at the car. While initiating this talk, the mother is very focused on the road ahead, seen by her leaning forward and with her left hand positioned over her indicator, demonstrating that she is preparing to change lanes (Fig a). At the child’s mention of ‘here’ the mother makes the effort to look, but quickly returns her gaze to the road. As is visible from the front view, we can see that the parent must turn her attention to the road ahead where there is a junction approaching. The parent is driving on a motorway, not far behind a truck and therefore her visual field is already limited.

The mother then quickly explains to the child in line 8 that she cannot give her attention to the game, as she has to concentrate on the driving. Unlike the earlier extract, the child is not using specific elicitors like 'watch' or 'look' and she does not seem to persist the mother's attention. However, it is important from the driving parent's perspective that the child develops an understanding of pacing talk and device use alongside the journey. Hence, the explanation given by the mother in line 8 indicates that she cannot look, because she is occupied with driving. She goes further to indicate what the implication of this means for the conversation. The mother indicates that she wants the child to focus on her driving game while she continues with her own driving.

Device use and its accompanying commentary as seen in these two examples here unfolds around layers of complexity around talk within the context of car travel, as it needs to fit into the demands of the driving conditions as well as the ability of the listener to understand and respond adequately to the speaker. In both examples, the mother has to attend to the road and the child is encouraged to provide an alternative way of communicating what she is doing, i.e. through 'telling' rather than showing as seen in extract 4 or to tell her that she needs to focus on driving (seen in extract 5). Across the examples, the form of the device and screen size also makes it difficult to see what is going on in the game. In the second example, the tablet is much easier to orient to and therefore allows easier access to the mother. In the car, the mother is not able to abandon or temporarily leave her main activity to attend to the child's talk as might be possible in the home (Goodwin, 2006b). In the next section, I discuss when extended discussions around device content can take place as parents express interest and question children on their ongoing device use.

4.2.3 Parents' engagement with game content

As we have already seen in the examples that precede this, device use presents opportunities for talk- this talk unfolds carefully over the course of the journey. Although this is a challenging content for conversation around device use, parents may take an opportunity to express parental interest and knowledge of what is being played. Parents as we already know may discuss and question what is being played or operated within the device (Livingstone, 2007). Sometimes these could be an attempt to break the monotony of the journey, while at other times, they could be to develop and facilitate the child's conversational skills as is done in the sequence of question-answer responses seen during knowledge exploration activities (Goodwin, 2007c, Fatigante et al., 2010). So rather use

the device passively, we observed that through detailed engagement with the game and content. Usually parents may orient to the playing of the game by either engaging in questioning or building a commentary around the game play.

Minimal Expansion to Parental Queries

Children may deflect responses to parents' questions by providing minimal responses either because they do not want to engage in conversation or because they are engrossed in game play. In the example from F2 [3], we see below, that the mother is trying to engage in conversation with the child, while he prefers to focus solely on his game play.

Extract 5: It must 'tell you'

Description: the mother and son are returning home from the shopping mall on a bleak, rainy day in London. The radio is running in the background and the child is playing on his DS with the game sounds running at full volume.

a  b  c 

```
1     ((loud game sounds running in the background))
2           (a)looking down at screen on lap
3          ┌──────────────────────────────┐
4     Son: Oh! Straight away I got killed.
5     Mum: What're you playing?
6             Looking down at screen
7     1.8    ┌──────┐
8     Son: (°Gotta listen°)
9     (b) tilts head towards son
10         ┌──┐
11    Mum: ↑Pardon
12    (1.0)
13    Son: (°Gotta listen°)
14               (c) Looking towards device
15             ┌──────────────────────────┐
16    Mum: No, ↑what are you playing I said?
17    Son: <don't know what it's cal::led>
18    2.0
19    Mum: Well it must tell you. You need to read it (.) Read the words on the screen…it'd °give
20    a bit of a clue°.
21    ((child continues playing on device))
```

In this interaction, as with most of the others seen before, the child is the first to initiate the talk. The game sounds also form a prominent feature in the interaction as the device is running at quite high volume in the background. The child's vocalisation of *"Ah"* is a

[3] F2: This family of three includes parents and their seven-year-old son. The mother was the sole driver of the family and hence several of the journeys involved the mother-child duo or all three members together. The extracts involve the use of the DS-a portable gaming console that is a favourite with the child and stored permanently in the car for journeys.

display of a reaction to the defeat in the game resembling a 'transition cry' (Goffman, 1978) which indicates a shift of state from play to that of non-play because of his defeat in the game. This is further evident in the child's announcement, with the emphasis on 'killed' in line 4. The mother notices the child's comment and responds with a question about the game (Line 5). From other observations in data, we know that she is familiar with the child's use of the DS in the car, and her question. At the same time, the child's response is not very forthcoming. One explanation could be that the child did not intend for his outcry to be pursued with more questioning about the details of the game, where gaming situations are concerned many instances of game cries need not require a response (Aarsand and Aronsson, 2009b). Unlike the earlier extracts where the child pursues the outcry with either a reference to the mother or looking in the mother's direction.

While responding to his mother's question about the game in line 4, the child does not seem to be sure of what he is playing, prompting him to respond softly. This response is missed by the mother, prompting her to ask a second time (line 16). Yet again, the child's second response appears to be something different from what the mother is asking for, as seen in line 10. This causes the mother to raise her questioning tone higher and emphasise what it is she is asking the child. In line 17, the child reluctantly admits, slowly that he does not know the name of the game. All the while, the child is continuing his game on the device, indicating that he is not willing to engage in extended conversation about the game.

The mother's instruction in line 19 and 20 is also encouraging the child to engage with the game in a manner that is typical to her as a parent. She insists to him that he should be able to read the 'name' of the game. Her stress on the particular words also implies that she could be trying to direct him to find out the information. Further, she is instructing the child as a parent who wants the child to engage with the game and the device in the appropriate way. She tells him that the information must be there and 'it', referring to the game, must tell him what it is he is playing. She is thus trying to provide some cues and guidelines for him to provide that information. Here the mum is taking on a different perspective as a parent, to actively make the individual activity of game play more engaging. The child on the other hand, seems to be more concerned with attending to the game rather than make conversation about the game. The mother's tone is also less sympathetic to the child. She wants the child to talk about the game play, as well as engage with the device content in a manner that the child is unwilling to do so.

Extended expansion to parental queries

In several instances where children are keen to respond or pursue in conversation, parents may be drawn to actively question and verbally probe what children are doing within their gaming. In the example below, the device provides an opportunity to engage actively with the content of the device and for the mother to display her own knowledge and understanding of the child's activity.

Extract 6.1 Mario Game

Description: In the next extract, we return to F10's family to carry on from another discussion about the Mario game. Again prompted by the younger daughter, the exchange involves a discussion of the conditions present in the game environment within the device.

a  b  c 

```
  (a)tilts screen towards mum        (b) points towards device
     ┌──────────┴──────────┐          ┌──────────┴──────────┐
D2 : ↑Ooh..I fell over! Mummy, I fell off the mushroom.
                                      └──────────┬──────────┘
Mum:                                 (b) looks towards screen     (Good work)
(2.0) (Child giggles and looks down at screen)
    (c)Moves left hand
       to indicator
             ↓
Mum:      (  )   Do you die when you fall off the mushroom?
D2 : Ye::s
Mum: Mhmm.
```

At the start of the extract, the child's outcry "Ooh", followed by "I fell over" is a spontaneous response to an event in the game. This is noticeable because of two things: first, the child has been playing on the device for an extended period, and second, while the exclamation is produced, the child turns her gaming console towards her mother (Fig a). The child's exclamation is immediately followed by a descriptive statement addressed specifically to her mother (line 3). Her action of orienting the device towards her mother and pointing towards the screen (see Fig b) is a visible means to indicate and draw attention to the topic of conversation. The gesture of pointing to the device acts as a supportive function to direct the mother's attention to what the child is essentially talking about (Hindmarsh and Heath, 2000). The child's added explanation that she "fell off the mushroom", brings the description of the gaming situation into focus. In line 5, we observe that the child's exclamation receives a minimal acknowledgement of "Good Work" from her mother.

Although the mother appears to have some knowledge of the game based on her involvement in previous sequences, we could probably assume that her first reaction was more a spontaneous response to the child's sudden outcry. On reaching the red stop signal, the mother is able to follow up further with a question, which shows that she has interest in the child's activity. The short pause (2 secs) between the mother's response and her follow-up question in line 10 also provides an opportunity to understand the implication of what the child has said and that it is could in fact be negative. The mother's follow-up question to the child in line 10 is produced once the car is stationary and the mother has turned on the indicator. Her question highlights both the fact that the young child is evidently more knowledgeable about the relevance of the gaming activity, as well as displaying the mother's interest in the activity and its relevance to the child. Therefore, the mother is also inviting a discussion by asking the child whether the action of falling off means that the child dies in the game i.e. does the child lose a life while playing.

Extract 6.2 Mario Game Continued

a  b  c 

```
1                    (a)demonstrating with right hand          (b) pointing downwards
2
3   D2 : There was a big one. About that big- and then there's water underneath.
4
5   Mum:                    (a)looks towards child                (b)looks towards road
6                (c) looks at child
7
8   Mum: There was what underneath?
9   D1 : [Water
10  D2 : [Water.
11  Mum: Ah.. ↑Water.
```

d  e 

```
12     (d) leans forward while looking towards mum
13
14  D2 : And you'll drowning-drowned and[then-
15                                      [Look up!
16  Mum:  (d) looks at child          (e) reaches out to push child's hair back
17            in dismay
18  Mum: Oh..poor Mario.
```

What follows is a story-like rendition of the description of the gaming event. The child animatedly describes the scenario, supporting her verbal descriptions with emphasis from non- verbal gestures (Figs: d, e and f.). This is done while the car is stationary at a red light

and so this allows the mother as well to look at the child while she provides the description. At the same time, the mother is switching her attention between the child and the traffic signal to check if the light changes (Fig e). During this description, in line 8, the mother seeks a clarification of the child's description as she briefly turned her focus to the road. However, by seeking this confirmation, the mother indicates that she is still engaged and interested in the topic of the child's talk. The mother's question receives a joint response from both the younger child as well as the older daughter who is sitting in the back and who is evidently aware of what is going on. As the story unfolds, both parties in the interaction, the child as speaker and the mother as hearer pay attention and respond to each other in order to understand the unfolding conversation. The mother's position is that of one who is listening as well as interpreting what is going on. Her receipt of the information is noticed through the way in which she keenly watches the child as well as the change in her facial expression as she hears the description (Goodwin and Goodwin, 1986).

Following the clarification of the word in line 8, the daughter starts to describe the consequence of the action in the game play: which is the drowning of the character (Mario). The mother is attuned to this as we see her expression in Fig d, immediately turns to that of dismay as she identifies with the event and responds to the child's statement that in a knowledgeable way stating "Poor Mario" in line 19. During this response, she glances at the child and uses the opportunity to reach out to stroke the child's hair back while telling her to sit up, this is a direct reference to the child's gaming stance, which is causing her to keep her head and body slouched over in the front seat (Cekaite, 2015). The mother's action and talk here is one of concern at the same time, re-configuring better the interaction that is going on currently where they are both parties to (Goodwin and Cekaite, 2013). The car is not always a place where there are extended opportunities for a driving parent to show care and express touch, but when there presents an opportunity for this, we see that the parent immediately steps in. The car's position at the red light seems to provide both an opportunity for the parent to interactionally manage her activity of driving with listening to the child's talk as red lights allow drivers to manage their interactions such that they can receive a mobile phone call or locate something in the car (Esbjörnsson et al., 2007).

The extract then continues with a discussion of what is in the library, another feature of the game environment.

Extract 6.3 Mario Game Continued

a  b  c  d 

```
1          (a) holds screen towards mum          (b) looks towards mum
2
3   D2 : Mummy this is (.) the library and nobody's been in it=
4
5   Mum: (a) places left hand to indicator =The ↑library?
6
7                                    (b)moves hand to gear shift
8
9   D2 : Yes and nobody's been in this library. Because it's-cos it is <full of>
10  (c) Leaning in front to adjust something
11
12  Mum: Books.
13  D2 : No it's full of umm, monsters. They can punch you and then you die.
14
15          (d) directs gaze sideways with an expression of surprise
```

While the exchange continues, the discussion is about the level in the Mario game. The child continues to describe a library where no player has entered. This is done while the traffic light turns green and the mother reaches to indicate to make a right turn (Fig a). However, the mother seems to be keenly listening to what is going on, noted by her questioning of the child in line 6 to confirm if the child is describing a library. Another explanation for this could also arise because the child has just been describing a mushroom in the game level and to the parent this may seem like quite a jump in topic. At this point, the mother has completed her action of turning the right indicator and is preparing to make the turn, as she engages in the preparatory motions of shift the gears to prepare to move forward. The child is also positioned in a way that she is looking to see her mother's reaction to what she is saying (Fig b), showing that both are equally involved and engaged in the interaction. During the child's commentary, we observe that the parent driver, must attend to driving and the road conditions and this cannot easily be stopped, but must be attended to alongside other activities-such as a conversation

While the child starts describe what is in this library, the mother steps in and uses the child's slowly produced word search in line 9 to complete the description with a logical answer of 'books' in line 12. Word search often involves the involvement of participants to produce talk together (Goodwin and Goodwin, 1986). The mother's prompt is disputed by the child who says it is full of monsters that can punch. This response surprises the mother seen in her expression of confusion in Fig d.

Extract 6.4 Mario Game Continued

a  b  c  d 

```
1                ***(a)makes boxing action***
2
3   D2: Yeah, monsters with boxing gloves.
4   D1: Yeah.
5           ***(b)Scrunches up face to express confusion***
6
7   Mum: What, >in the ↑library<?
8   D1:[Yeah
9   D2:[Yeah
10  ***(c) mum makes expression of irony***
11          ***(d) leans forward to show screen***
12
13  D2 : Mummy [look..
14  Mum:       [Nothing sacred anymore?
15
16          ***(d) glances towards window***
```

At this point, the elder daughter who is playing on her own device in the backseat steps in to contribute to the discussion. She has been listening to the exchange between the mother and younger sister (as seen in her earlier comment in Extract 6.2 about the 'Water'). Through her comment, here in line 1, she is adding to her sister's description as well as displaying her knowledge of the game from the backseat. Her statement is one that supports and justifies the younger child's description of monsters. In describing that the monsters had *"boxing gloves"*, D2 is providing the reasoning for *why* they would punch. This added explanation highlights that within the shared car interiors, passengers travelling together may simultaneously listening to the parallel talk in progress and comment on it even while engrossed in their own activity (Goodwin and Goodwin, 2010).

In response to this, the mother questions the descriptions in line 7. The mother's tone and facial expressions here requires some attention as it changes from a sense of disbelief and confusion (Fig b) to irony at what the child is saying (Fig c). The rising intonation on the word "library" (Line 7) indicates her surprise as her guess that the library would contain books is a logical explanation from an adult's perspective. The mother's question of "Nothing sacred anymore?" in line 14 may be described as a musing or a 'think aloud' which is a response to the child's description about the library (Goffman, 1978). Her question does not really require a response and is not directed at anyone in particular. It is could also be explained as an idiomatic expression, which is usually immediately understood by adults (Drew and Holt, 1998). This explains why neither child responds to

her comment and instead, D2 continues to pursue her mother's attention by inviting the mother to 'look' at what is happening on the screen (Line 13).

The examples from the two families also show the contrast in what the children's perspective of device use versus a driving parent's. In the first example from F2, the child did not show much willingness to participate in lengthened descriptions of the game-play. Whereas, in the other example from F10, the child was much more animated in describing the game and seeking the mother's attention. Previous studies seem to indicate that parents are hopeful that game play will encourage some kind of learning experience for the children and this is evident in the example of F2, where the mother seems to expect the child to be able to read the titles and descriptions on the screens. Unlike joint gaming situations where both players are focused on the same activity (Mondada, 2012a) the coordination of talk and action is orientated based on what both players can see on the screen. In the car, the mother who is driving only has limited access to what is on the screen, relying largely on the child's descriptions. It is also important to notice here that what the children are doing in these extracts are commenting on the content of the game and this is not consistently available to the parent who is driving. This also points to the form factor of the device itself. This was also observed in previous work on DS use within co-located gaming contexts, in which screen size restricted "the ability to observe gameplay" thus making people lose interest (Szentgyorgyi et al., 2008).

4.2.4 Mobilising shared understanding

Over the course of conversation between parents and children, it is normal that family members often draw on their familiar notions of each other's activities. Similarly, during device use, parents and children orient to the device and what is said about it by drawing on particular knowledge of activities associated with the device and its user. Within the sequence of talk, references may be made to previous accounts of play, familiarity with rules or characters and the relevance to the current focus of conversation (Aarsand and Aronsson, 2009a). Similar to family conversations in the home, the construction of children's accounts of events are often related to parents' and other family members' knowledge of the topic's background and speakers (Butler and Fitzgerald, 2010). This joint orientation to an activity or content within a device is displayed through the sequential production of talk. In the extract that follows, I shift to another example from F2's family where the parents are driving with their son (S) in the backseat.

Description: The family of three are returning on a long journey back from Wales to their home in London. The child in the backseat is playing with his portable gaming device (Nintendo DS). The sequence opens with the child's comment about a notable accomplishment in the game.

Extract 7.1: Level 3

a  b 

```
                              (b) holds up DS facing towards the front

S  : Defeated him! Mum, I defeated him=

Mum: (a)Glances up at mirror
Mum:=Well done you!
S : I need, I need. I can't lose this.. ↑I'm on Level 3
(2.0)
Mum: ↑Is it the big fella that flies?
S  : No
Mum: ↓No
S  : Level 3.
Mum: ↓I dunno what Level 3 is.
S  : The ↑Ninja gu:[y.
Mum:                [Is he-he the one with the nunchucks?
(2.0)
```

In this extract, the use of the device facilitates the opening up of a sequence where both parents are drawn into conversation with the child and themselves about the game that he is playing. The extract opens with an announcement to break a long silence during the journey. In the first line, the child starts the sentence with "I defeated him". We can see that this statement is registered by the mother as she glances in the rear –view mirror (Fig a). Then this is re-emphasised by addressing the statement again to "Mum" (Line 3) while holding the device up (Fig b). This statement along with his action indicates that the child is seeking a response concerning a significant accomplishment in the game and its progress, which so far has carried out silently on the backseat. The mum's immediate issuing of a compliment in line 6 expresses an understanding that the child has accomplished something noticeable in the game and worthy of acknowledging.

Picking up on mum's interest now, he goes on to discuss the importance of his call to attention in line 3 explaining that he can't lose 'this', which refers to the game level that he is at. The rising intonation of his speech (Line 7) seems to indicate that reaching Level 3 is the significant feature of what has just taken place in the game. After a brief two second pause (Line 8), the mother attempts to make conversation by clarifying if it is a particular

character and in doing so, displays her knowledge of what the child is doing. Goodwin (2007c) discusses how parents may engage in knowledge exploration by asking questions to children during activities such as walking. We see this similarly occur in this instance of 'doing family talk' in the car. To this the child responds "no" (line 10), without providing any further explanation. The mother's lowered "No" at this point also may be an indicator that she is seeking out an explanation for what the level is. In lines 7 and 12, the child's response resembles a speaker who presumes that the recipient (mother) has some knowledge of what Level 3 is by not providing further information (Pomerantz, 1984b). In line 12, instead of clarifying the previous question, he reiterates to the fact that it is Level 3. The situation is such that the mother being called into the conversation through the child's announcement is attempting to find out more about the game and while the child is keenly absorbed in his device, assuming the mother's knowledge of what is going on.

Yet here, the device is away from the mother's visual focus and also requires some special knowledge of the game and characters. Finally, the mother acknowledges that she does not know what Level he is talking about (Line 11). At this point the child names the character, while the mum immediately picks up on this with her expressed understanding of 'who the ninja guy is'-i.e. that he is the one with the nun-chucks. Through her descriptive answer to the child's prompting, she displays her knowledge of not just the character, but what he *does* in the game. The pursuit of a suitable response from the recipient (the mother) involves accurately guessing what level it is, based on her knowledge of the game. This is hampered slightly by the speaker's presumption that the mother should know what 'Level 3' is. However, the mother's expressed lack of understanding in line 13 prompts the pursuit of information from the speaker, who enables the conversation to proceed.

Extract 7.2: Level 3 Continued

a  b 

```
 1                                        (a) makes slicing gesture with hands.
 2
 3   Dad: This is where he jumps and [you do that-chchchch
 4   Mum:                            [yeah.
 5
 6                                  (a) looks towards dad's gesture
 7   S  :  Yeah. [I know what he does.
 8                                                (b) makes gesture with hand
 9   Mum:        [Step in the (court) and goes bang [bang bang.
10   Dad:                                           [Yeah
11   Mum: Yeah
```

After a short two second pause during which there is no response from the child (an indication that he is probably engrossed in the game play) to the mother's guess, the parents shift to engage in dialogue about the game. The father who has been silent all the while, steps in to display his knowledge of what the character does, building on whom the mother has identified to be 'the ninja guy'. The father's description is accompanied by an animated gesture of describing the action of slicing the air (Fig a). This gesture catches the attention of the mother who glances his way. The gesture along with his commentary, draws the mother in agreement. By gesturing, he is adding to the description that the mother has already started. There is a joint agreement of all members that this is the right guess. Similarly, she mirrors the father's gesture to indicate show her recognition of the activity (Fig b).

For a brief moment, the discussion moves away from the child and centres on the parents' display of knowledge (lines 3-10). This is further observed in the child's statement in line 7 that he knows what the character does. Here the talk is a means through which both parents are able to orient to the device and its content. In encounters like the one we have observed, understanding is jointly produced through both awareness of what the child has accomplished as well as descriptive information of the activity that is jointly produced here by both the mother and father. In this example, we notice that children's reactions to a game can prompt and encourage some form of conversation around the ongoing activity. This can similarly extend seen in the absence of technology such as recognising a favourite book or jointly observing a dog outside the window can trigger situations of shared knowledge exploration between parents and children.

Additionally, a limited form of vocalisation during game-play as seen in the next example, may also become a way of recognising familiar game-based activity. As a part of gaming, children's response to a gaming event expressed in the form of a 'response cry' immediately comes to the attention of the parent. A response cry is noticeably seen as an immediate, spontaneous vocalisation to an event (Goffman, 1978). An example of this is seen in the next exchange between mother and daughter.

Description: In this extract, the mother and two daughters are travelling on the same journey described earlier. Here the exchange follows the younger child's (D2) use of a 'response cry' with regard to an event in her game.

Extract 8.1: Game and Lives

a  b  c 

```
1     (a)lowers device and looks at mum
2
3     D2 : Ohh::hh
4                                  b) mum glances towards child
5
6     Mum: glances towards device      Did you ↑die?
7     D2: (c)Child nods and the two smile
8
9     (7.4)(mum returns attention to road and the child returns her attention to the game)
```

d  e 

```
10                (d)glances at mum
11
12    D2: I have to do this ag-gain
13    (3.4)
14            (e)looks at mum, seeking her attention
15
16    D2 : I got seven more lives
17    Mum: (1.9) (singing along to radio)
18    Mum: You got-What ↑seven more lives?
19    D2 : Yeah.
20
```

In the exchange above, the sequence starts with the child's vocalisation of "Ohhh" in line 3, accompanied by her lowering the device and turning towards her mother. This is promptly picked up by her mother as being game-relevant, as she first glances in the direction of the device and then shifts her focus to look at her daughter. This action is accompanied by the mother's question "Did you die?" which a question about what happened in the game (line 6), but is delivered in a knowledgeable way. The knowledge here is that child's disappointed reaction prompts the mother to recognise the child's outcry as a defeat in the game.

This talk occurs shortly after the earlier announcement about the game, so the mother is already attuned to what is happening. The hint of amusement seen on both participants' faces (Fig c) is also an expression expressing understanding of what has just taken place. This understanding is a result of the meaningful sequences of action and talk: the child's disappointment, her action of lowering her device and seeking of the mother's attention clearly indicates a set of actions that support defeat. After this initial exchange, both

resume the activities they are engaged in because they have different foci of attention: the mother attends to the road and driving while the child turns attention to the game at hand.

After a few seconds pass, the child further brings up the game and attempts to re-gain the mother's attention with a discussion of the consequences of the game play. She refers to the fact that she has to 'do this again' (line 12), referring here to the action of repeating of a game level that she just lost. After not receiving any form of response to this, she attempts to regain it by bringing up the topic of lives. The child is appeared to seek the mother's attention and reaction to what she has said as observed by two things: her statement in line 12 and her attempt to catch the gaze of her mother in Fig c. At this point, the mother is engaged not just with driving, but is also singing along to a song in the radio. This could indicate that the mother does not see any further conversational opportunity.

As the child says she has to do this again, one consequence is that the child must now act on this and so this can be heard as not necessarily requiring a response. Not responding may mean the child will return to the game leaving mum to get on with driving. The child then makes a second attempt to engage in conversation with her mother in 16, which is an informative statement that she has *"seven more lives".* After a brief pause of nearly two seconds, the mother, realising her daughter has said something, stops singing and replies with an expressed of surprise denoted by her rising intonation at 'seven more' (Line 18). At this point, it seems as though there may be more sustained dialogue about the state of game play. However, it is conveyed as an acknowledgement to what the child has just said and does not really open up any further discussion. She does not pursue this further as the child resumes playing with her game.

Overall, we see that the exchange here is prompted by the child's response cry of "Ohh::hh" in line 1 featuring in game playing which can often draw the attention of people around. Again, this resemble the earlier 'spill cry' (Goffman, 1978) observed in Extract 5 in the mother and son exchange. Within the family context, game play may involve at least more than one player or spectator, who inevitably become drawn into the player's actions and talk (Aarsand and Aronsson, 2009b). It is important to note here that the mother has immediately picked up the cry as being 'game relevant'. This may or may not lead to further discussion depending on the relevance of the gaming milieu and the availability of the participants to comment on the activity (Fatigante et al., 2010). Here the mother responds to the child's disappointment, but does not respond to the child's statement in line

7. This could also be that the child's defeat as well as the fact that she had seven more lives (line 9) was more noteworthy to provide a response.

In both examples, children mobilise parents' involvement in their game play by referring to events in the game. In both examples, the children seek the response of parents by way of either joining in their victory (seen in extract 7.1) or seeking their sympathy (seen in extract 8.1). Parents in turn reflexively produce their understandings of the game based on shared knowledge of the characters and jointly producing the talk as a way of locating what information is required in order to understand and make sense of what the children are saying in these exchanges (Pomerantz and Mandelbaum, 2005). Thus meaning within conversation is produced through the knowledge of family member's histories as well as the local relevance of the talk.

4.2.5 Discussion

The data presented in this section discusses the ongoing production of talk around device use between parents and children over the course of the journey. The analysis contrasts this talk from other work on previous family conversation around the dinner table for example as those instances usually involve recounting events that have happened in the past (Ochs et al., 1989). In contrast, the focus here is on the current production of talk during ongoing device use and game play as a feature of parent-child conversations in the car. In resemblance with family meal-time talk, parents may actively encourage children's discourse by asking questions and participate in their discussions. The focus of the current section has been to describe how parents occasion and carry out discussion around device use in the context of the car. In analysing the data, it is found as with previous work on device-oriented talk (Danby et al., 2013), that devices feature as facilitators of talk between parents and children. The analysis therefore follows the progressive way in which talk is managed between parents and children over the course of a journey.

First, the focus of analysis was on how the *talk is occasioned* and *situated*, alongside the activity of driving. The timing and placement of the talk in accordance with the driving has important implications. For example we see that the when co-participants are engaged with an other activity such as the parent retrieving the mobile phone as in Extract 1, she has to re-orient to what was missed in the speaker's talk. This is a key aspect of the co-present nature of driving and passengering that both drivers and passengers are oriented to the activities of each other. Other studies of in car technology use indicate that the presence of

technology immediately gets the attention of the driver even if it does not involve them (Nevile and Haddington, 2010, Haddington et al., 2014). The form factor of the technology also has an important role to play in engaging in social interaction. Where devices are concerned, the DS for example, has not been associated with positive social interaction from spectators (Szentgyorgyi et al., 2008). However, through game-based commentary, in the examples seen here, the device is seen to be associated with positive social interaction through the way in which parents and children orient to each other through the device. The focus in the examples is in describing what the children are doing in the "here and now". Talk and discussion may be interspersed along the way depending on the prevailing conditions of driving over the course of journeys. Further devices are used to orient and sustain the attention of the parent to what is going on in the screen.

Second, once the attention of the driver is acquired, the child is seen to pursue and request for sustained conversation regarding the device at hand. The driver's orientation and response to the commentary about the device then becomes the focus of the interaction. Here, balancing driving along with conversation may involve that the co-passenger is sensitive to the driving conditions. This seems to be a challenging one to address by the parent as they are in a dilemma between driving and attending to talk. Parents are seen to make their unavailability visible by providing minimal responses or telling the child explicitly that they cannot continue conversation now. Another way of dealing with the child's request for participation in their game play is to pursue a verbal description of the ongoing game as seen in Extract (3) where the parent encourages the child to talk to her about what is going on in the game.

Third, when possible to engage in conversation, parents seek out information and engage in children's game-related activities. This is done by adopting a question-response format in their conversation with children. In some examples, children animatedly describe the progress of the game as seen in Extracts 6.1 & 6.2. The unfolding of these descriptions are made possible through the parent skilfully dividing their attention between the road and the child's ongoing description. This interactional adaption is similar to other research seen around the use of mobile phones with co-passengers (Esbjörnsson et al., 2007, Haddington and Rauniomaa, 2011). For example, a red signal or a relatively free motorway allowed parent-drivers to enquire about children's activities in detail. However, the extent to which this was pursued was dependent on how forthcoming both parents and children were in discussing the game, knowledge of characters as well as the potential for the discussion.

Finally, it is seen that ongoing device use provides an opportunity to refer to information that is shared by the family. In the examples that we described above we see that talk in reference to a device involves both tropicalizing the game for conversation as well as making reference to the family knowledge of past activities, who is knowledgeable in the gaming activities as well (Butler and Fitzgerald, 2010). Usually this is prompted by way of an exclamation from the child while playing the game, or some elicitation device such as a comment that is meant to seek out the attention of the parent (Aarsand and Aronsson, 2009b). Depending on the nature of the commentary, the talk may be accompanied by gaze and mutual attention to the focus of the talk. However, this depends on the position within the game. For example, if commentary is produced while the child is playing, the parent may engage in talk whilst keeping their focus on the road. Occasionally the child playing on the device may wish for the parent to look or watch what is going on in the screen. However, we find that game commentary in the car seems to be preferred by parents particularly because sustained eye contact becomes challenging while concentrating on driving. This talk during device use appears rather banal, but because time in the car is such a particularly focused activity, we observe that parents can really engage in what the children are doing.

In addition, another factor that underscores the observations is the moving context within which talk in the car takes place. The family car is a lived space where a number of activities occur simultaneously. In majority of these extracts, there was music running in the background, parallel activities being carried out such as the action of the mother placing her phone on the dashboard as the child comments on her game. Thus, family talk also involves navigating all these ongoing activities and using the available resources to pursue talk over other activities. While it is established that devices are frequently incorporated into the car and into conversations, the next sub-section discusses how device use in managed within the wider context of the journeys and the interactions that take place inside the car.

4.3 Orchestrating device use as a feature of family car talk

One of the striking aspects of families travelling together is the fact that conversations often involve telling children about what is appropriate behaviour around devices. This section discusses the discourse around devices with a particular focus on how parents orchestrate children's device use within the car. This is done when devices are offered for use or when their use is negotiated between parents and children. Essentially, because device use is for a large part controlled by parents, parents are regularly involved in stepping in to encourage children to take a break from device use or question ongoing device use. A number of everyday interactions involve offerings and refusals between parents and children (Wootton, 1981a). The application of interactional approaches to studying device management has received very little attention although a significant part of family life now involves the use and appropriation of devices. Further, there are very particular constraints in the car that affect how devices are managed. These are closely tied to the fact that the car presents a limited set of resources to draw on at a given moment.

The aim of this sub-section is provide a description of how parents organise children's device use based on the needs of car journeys. There are several aspects to the way in which device use is managed between parents and children in the car.

The first of these concerns involves negotiating around granting and refusals of requests to access particular devices while in the car. In the video corpus, it was observed that in majority of cases, requests for media come from children. In particular, if children are young, they rely on the parent to operate devices. In presenting requests, requests may be assessed by the parent before offering a device or game to the child. The assessment may be dependent on the game or device requested as well as who is available to provide the device. Parents carefully control what is offered in devices as a way of limiting the options that are available. This sometimes means that children are not always offered the choices that they are pleased with. When requests are refused when children are unhappy with the selection offered, disputes and arguments can develop and an argument develops.

Second, parents may be prompted to draw attention to disturbances caused by devices as a side-effect of their use (Rauniomaa and Heinemann, 2014). Often this auditory influence from devices may be considered disruptive or intrusive to conversations in the car. Thus, children may be asked to control or reduce volume on devices or reprimanded when not following instructions. There can also be friction between parents and children across backseat and front-seat spaces over conflicting media use. For example, one conflict that

arises could be between the music from the radio and a child watching a movie in the backseat.

Third, during car journeys, a very practical concern for families is recognising the finite resources available in terms of media options and limited battery life. Parents may instruct children on how to pace their use of devices such that they can be used for later portions of the journey. This may involve issuing suggestions or even the action of physically taking away devices along with directives to encourage children to do other things. In the car this is particular relevant as this may relate to the journey length, turn taking if there is more than one child in the back or an opportunity to engage with the outside environment or the family conversation.

Fourth, car journeys encompass very particular rhythms. In keeping with these rhythms, apart from offering and using of devices, parents need be attuned to the return of devices as well. This has important bearing how the drive unfolds as reaching the end of a journey prompts families to prepare for winding up ongoing activities and prepare to arrive at the destinations. In the data presented, I show how talk may be used elicit cooperation from children for the return of devices. This does not always go according to parental plans, as children may want to delay returning them leading to some friction between parents and children as will be seen in the data discussed in the chapter. Resisting to comply may also lead to an unfavourable set of consequences such as warnings from parents (Kent, 2012b).

In order to demonstrate the issues listed above, I use examples from three different families from the corpus. In the examples presented here in two of three families (F4 and F7), parents' devices are offered as entertainment devices to be used by children whereas with F2, the child is using his own device.

4.3.1 Requests and offers of media

Providing children with media options to occupy their time on car journeys goes beyond just handing over devices. There is a significant part that deals with the contingency of actions and the viability for requests while children's' display of entitlement to devices (Craven and Potter, 2010) in the car that must be dealt with over the course of interaction. Requests are assessed by parents based on when they are made, what is available and appropriate for the child to use at that moment. The data presented in this sub-section involved quite young children and they rely on their parents to share their devices with them.

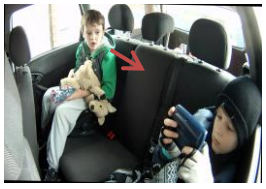
Constructing requests and offers

The focus of these extracts will be to describe how children's' requests are shaped through the presentation for particular objects and content. In observations, it is evident in presenting requests children display clear preferences for particular games and devices because of experiences they associate with them or the fact that they are able to assess why other options do not meet their desired needs.

The first extract is from F4[4] where the family is preparing to leave the parking lot of a supermarket. The two children are in the rear passenger seats.

Description: S1 is occupied with a crossword puzzle game, while the younger son S2 is bored and requests to play on dad's phone. The request is made when the other child passenger is occupied with another game, leaving the S2 without something to play.

Extract 9.1: Can I play?

a  b  c 

```
1   ((Dad is getting ready to pull out of the parking lot, the radio is at full volume in the car))
2            (a)looking towards S1
3          ┌──────────────────────┐
4   S2 : How come S1 gets the computer to go on?
5   Mum: He doesn't. its just the little word search thing.
6   (1.4)
7   S2: Can I play on somebody's ph::one?
8   (1.2)
9                    (b)looking towards dad
10                   ┌──────────────────┐
11  S2 : ↑Can I play on your dead phone dad?
12                   └──────────────────┘
13  Dad:               (b)reaches for seat belt
14  (1.0)
15           (c)looks towards S2 while reaching for seat belt
16         ┌──────────────────────┐
17  Dad: No, it's too far in my pocket °anyway°.
18         └──────┘
19  Mum:      (c) looks at dad
```

The above sequence opens with the younger brother (S2) raising the issue of S1 having "a computer" to use. The child frames the statement as a comparison because the action of pointing out that his brother is engaged in an activity, simultaneously highlights that he (S2) is left without anything to play on. Furthermore, this is said just before his request for

[4] This family of four comprised of parents and two sons aged 6 (S2) and 9 years (S1). The family usually carried a few specific devices in the car for the purposes of entertaining the children as well as the family together. S1's crossword puzzle game, S1's nintendo DS and parents' mobile phones which were offered to the children for entertainment. The 'dead phone' referred to dad's old phone that was used for games.
S1-older brother S2-younger brother

a phone to play on, providing an indication that he is unhappy about being left out. Children are often seen to use comparison for complaining about not being given access to something and complaints involve siblings and directed these towards mothers (Laforest, 2009). Further the child's question here is also seen to be as seeking an account from the mother for *why* the brother has a game while he is left without one (Sterponi, 2009). The mother quickly explains that it is not a computer, but *"the little word search thing"*. By downplaying the child's comment, she is seen to be avoiding further development of disputes, but also reassures the younger child that the puzzle is a familiar object and not anything more special, such as the computer, as S2 has said (Line 5).

What follows shortly after the mother's response is S2's framing of a request for play on "somebody's phone" (line 7). His request indicates that he is not referring to anyone in particular. This request comes while the radio is at full volume, a possible reason that explains the child's repetition of his louder request in line 11 for a second time after a brief pause. His second, more specific request in line 11 is directed to his dad, for his dad's 'dead phone'. In both instances the child starts his request as "Can I" indicating a *permission directive*, which involves that the hearer both recognises the child's request as well as acts on it by permitting him to use the requested device (Ervin-Tripp, 1976).

The father's response is delayed by a one second pause, both because he is reaching for the seatbelt but also as he provides an explanation for refusing the child's request (Wootton, 1981b). It is important to note that during this time, the car is stationary and the family has not yet left the parking lot of the supermarket. The preparation is marked by the ignition of the car engine being switched on and the driver and front passengers' movements to put on their seatbelts. The child's second request comes midway through the driver's action of reaching for his seatbelt (Fig b). Having started the action, the father decides to decline the request. as to do so would mean he has to stop and reach 'somewhere inside his pocket to retrieve the phone' (Line 17). During this exchange the mother who is handling her phone, glances in the father's direction while he responds to the child's request.

Extract 9.2: Can I play? Continued

a  b 

(a) operating phone

Mum: You can [have bounce tales, if you want.
S2 : [No-
S2 : Ma-umm..Mono- Monopoly
Mum: No-no, >I doubt-I don’t understand that darling< It’s like a card game.=

(b) leans towards S2 and points to phone

Mum:=Or do you want the block’d game?

S2 : *(b) Gaze fixed on pencil case))*
S2 : Monopoly.
Mum: No I told you. It’s bounce Tales or block’d.

Following the father’s refusal to give the phone, the mother in the front passenger seat offers a game from her phone. We note here that the offer is that of a specific game ‘Bounce Tales’ (Line 2) and not the phone in itself, which is what the child asked for. Parents frame offers in a manner that they are clearly stating what is offered. This offer overlaps the child’s talk whilst he is still responding in dismay about his dad’s refusal for his phone (denoted by the child’s response of “no” in line 3). The exchange between the child passenger and mother is crucial as it determines whether or not the offer presented by the parent is accepted and thereby decides whether the media is used.

Instead of accepting or declining his mother’s offer, the child responds with a request for another game, which is Monopoly (Line 4). The mother’s response to this and her repair of the response in line 5 is quite interesting. It seems that she starts to say that she has some doubts about the game and states her reason as not being able to understand it. This could be understood as the mother not wanting to offer the game as she is doubtful about whether it is an appropriate game for the child to play. Here she is making a judgement on the game that because it is a card game, it may not be one that is appropriate for the car or for the phone or indeed appropriate for the child to use. She appears to be keen not to pursue this as an option, as she almost immediately counters the child request with another game Block’d (Line 9). While making the offer, she accompanies her verbal offer with the visual cue by holding her phone towards the child in the back and indicating to the screen (Fig b). At this point, the child is looking down at his pencil pouch, thus the orientation of his gaze and body away from the mother’s action (Fig b) and his repeated request for *“Monopoly”* in line 12 indicates that he is determined to ask for his choice of game rather than consider what the mother offers.

As the extract continues, the mother promptly responds to the child’s second request for Monopoly clearly indicating a non-compromising imperative by telling the child clearly what his options are. A dispreferred response as seen here, is usually followed by delays or hesitations (Pomerantz, 1984a), but here, the parent’s response is immediate and firm.

Along with the firm insistence, there is a reminder of what was offered as an indicator that this does not match what the child is asking for. This initial refusal of accepting the offer begins to indicate the development of a dispute between parents and during which children are expected to comply with what parents are saying (Kent, 2012a).

Next, we move to another example from F7's data[5] of a slightly different example as here the offer of a device is presented by the parent. In this extract of data, it is observed how parents may offer devices to divert children's attention when they become restless or keep parents from carrying on other activities such as conducting adult conversations.

Description: In this extract, the family of three are travelling on the motorway on a long, one-hour drive to visit grandparents. It is the start of the Christmas season in school and their daughter (D) wants to practice the Christmas songs during the journey. After being convinced by the child to sing with her for the last 15 minutes, the mother wants to disengage from the activity and start a conversation with her partner at which point she offers the child a game.

Extract 10.1: I want to Draw

a  b 

```
1    ((child is restlessly fiddling with toys in backseat))
2    Mum: No quiero cantar mi amor
3         I don't want to sing my love
4    Mum: D, quieres jugar un juego?=
5          D, do you want to play a game?=
6    D  : =Si
7         =Yes
8    (8.0)
9        (a) mum operates phone
10           ┌──┴──┐
11   Mum:    Que-es
12           Which one?
13   D  : Mummy what are you doing?
14             (b)looking down swiping through phone
15          ┌──────────────────┴──────────────────────┐
16   Mum: Go::t Farmyard o::r the other one(.) Wild Animals
17   D  :I want to dr::aw
18   Mum: Draw
19   ( 16.0)waits for application to load and passes on to child
```

The extract begins with the mother's response to her daughter's persistent pursuit in trying to convince her mother to sing with her. In turn, the mother offers the child a distraction

[5] F7 comprises of parents and a young daughter (D-4 years). In this family both mother and daughter were bilingual (English and Spanish). The father could understand some Spanish. All members travelled together only on weekends to visit grandparents and friends. The daughter was frequently offered the parents' phone and tablet on journeys to play games or watch movies. During the recording of the journeys the family was expecting their second child.

from this request by asking the child if she would like to play a game on the phone. When the child willingly accepts the offer, she turns her attention to the phone while the child waits for her game. The silence between the child's positive response to play a game to the mother's question indicates that the parent is silently setting up the activity by opening her phone and searching for the options (Fig a). Next, the mother asks the child in Spanish "Which one?" line 11. The child has not heard this as we notice she poses a question of her own in line 13 asking her mother what she is doing. Instead of repeating her question, the mother responds with an offer of two games for the child to choose. She lists two options that are offered to the child. The framing of the offer is carried out with familiarity. The description of the "other one" in line 16 before the mention of "Wild Animals" indicates that the game may be associated with prior use of the device. The mother is displaying a sense of familiarity with the games and the child's preferences.

In response, the child replies with a preference for another game in line 17. The child expresses her desire for a game that is outside of the options saying, "I want to draw". However, in this case unlike the other parent-child exchange (extract 9.1), the game is considered an appropriate option for the child to ask for. There is no refusal from the parent to offer this to the child. The mother responds by repeating the request, perhaps as a way to clarify what the child asked for. The mother's orientation then continues towards the device, as she must set it up for the activity (Fig b). The time that the mother takes to respond may pertain to the fact that she needs to re-navigate to a page with the Drawing application. Once set up the device is then passed on to the child in the back.

So far, the examples presented here discuss the shaping of requests and how these are then received by parents and translated into offers made to the children. The first example indicated how children may express particular desires for games or devices and the evident mismatch between what the mother offers and what the child wants. In the second example, the offer of the game is made as a distraction for the parents to conduct conversation. Both examples draw on the parenting resources at hand, they also seem to know enough about the games and the children to offer what they think is both appropriate for the child as well as the journey. In the next examples, we look a bit further into the progress of the same extracts to see how offers may be challenged.

Challenging offers

Often when children are told something to do, or in the case of the extracts seen so far, offered objects to use, they can sometimes resist what the parent is saying (Kent, 2012a).

In response, parents are left to deal with the consequences of children's refusals and unwillingness to accept what is offered to them. We continue from the earlier example of F4. It is seen here that the mother's refusal for the child's choice leads the child to challenge the mother's offer of the other two games.

Extract 9.3 Can I Play? Continued

a  b  c 

```
1   S2 : Then can I play on dad's phone?
2           (a) looking down at her phone
3
4   Mum: no darling, that wasn't the option.
5   (b) child rolls head back and makes crying sounds
6
7   S2 : Ooh..Uhhuhuh
8              (c) lowers phone to lap
9
10  Mum: Ok, suit [yourself.
11  S2 :          [but your ga-..=
12  S2 : =Your phone only has three [games on it.
13  Mum:                           [I know. It's an old phone.
```

Although the offer of the game of Monopoly is refused by the parent, the child tries to persist with his first preference, which is a request for the dad's phone. The mother refuses, with a firm insistence that this is not the option that was offered (line 4). The mother response indicates that she is pointing out something that was already obvious but one that the child was unwilling to accept. Parents are often found to repeat instructions and directives because children defy or challenge what is told to them (Kent, 2012a). In earlier observations of parent-child requests, it is evident that refusals tend to be more contested and long drawn as compared to granting a request (Wootton, 1981a). In this example, in response to the mother's refusal, the child responds by taking a stance of protest; he rolls his head back and starts to cry (Fig b). The parent addresses the reaction as a tantrum and refuses to give in in line 10 by saying *"Suit yourself"* referring to the child's lack of willingness to compromise. She accompanies this statement by lowering the phone and no longer holding it a preparation for a hand over, indicating that it is no longer on offer.

The child recovers quickly from the crying tantrum and goes on to legitimise his refusal for the mother's offer by pointing out the fact that she has only three games on her phone (Line 12). The child's speech is produced in a whining manner as a complaint for being refused something (Wootton, 1981b). This is a common reaction to a dis-preferred

response as the child has a reason for wanting the father's phone presumably, because it offers more games than the mother's phone, which has only three games. Therefore, the shift here moves from a dispute the particular game and instead to one that pertains to the device itself. To this, the mother adds that it is a limitation of this being an old phone (Line 3). The child here seems to be ahead in his knowledge of the parent's devices and he seems very clear why he wants a particular device. Both because of familiarity with the devices and because of prior offerings, the child appears to try to negotiate the offer of media.

The parent in this case, prefers to retain the upper hand of choosing what is offered. Both parents and children seem to know exactly what children want in games. There is mismatch between what parents consider appropriate to what children may want to play. The parent is reflexively producing her talk and actions as ways that are pertinent both to the relevance of the journey and to what she feels is appropriate to offer to the child. Further, the mother accounts for her offer in line 4 to the child's request for the dad's phone by saying clearly that was not on offer. On the other hand, children are knowledgeable about the variety of games available in parents' devices. Here a notable point is that the father had a smartphone, which offered more games than the mother's older model of mobile phone.

We return to the other example in F7 where the child has just been offered the mother's phone to play a game, but soon the child returns with a request for another game, which is not available on the phone.

Extract 10.2: Playing on phone Continued

a  b  

1 (a) ***looks up fom device*** ***(b) leans forward***
2
3 D : Mummy can I colour in a picture instead?
4
5 Mum: ***(b) Turns towards child*** No I haven't got that one any more.
6 D : Mummy-you don't have it anymore. ***((Pouting voice))***
7 Mum: Listen to what I say=
8 Dad: =You can do it at Robert and Micky's.

In the extract above, it is seen that shortly after receiving the phone with the request to 'draw', the child realises in line 4 that she wants to do something different. She asks her mother if she can *"colour in a picture"* in line 3. In this case, the option that the child asks for is one that the parent does not have on her phone. The mother's response *"I haven't got*

that one any more" in line 5 is indicative that the application has been on the phone in the past and maybe perhaps that the child has even used this earlier and associates it with the phone. However, the mother's response now seems to indicate that the child can no longer play it and must now play what was offered. The child indicates displeasure at the mother's response and the fact that she is unable to play the game she wants to by taking a pouty tone to her voice, while recycling part of what the mother says (See Line 6). In response to this, the mother exercises her authority and says that the child must listen to what she says. This is a stern directive is a response to the child's churlish statement indicating that the parent is not happy about the child's comment.

The exchange is closely followed by the father coming in quickly and suggesting to the child in line 8 softening the impact of the mother's imperative by reassuring the child that she can play the game when they reach the friends' house where they are currently to which they are travelling. Hence there is postponement of the activity, which is not the desired response for the child at present, but offers some compromise to dissipate the potential of a lengthy disagreement (Wootton, 1981a). Here there is a brief moment of parents working with each other as the father recognises this and feels that it is an appropriate time for him to come in and add peace in the situation.

In summary, there are some distinct similarities across both examples. In both families, the parents offered content on devices that are considered appropriate for the journey as well as the suiting the children's needs. Offers are sometimes contested when children want something different from what parents are willing to offer or what is available on the device. When not getting their way, children are difficult or respond by producing negative affective responses to parental regulation by crying, pouting, showing disappointment or rationalising why they want something other than what they are offered. In turn parents draw on their resources of parenting to assert their reasoning or trying to compromise with children. In all, the car provides a limited set of resources at hand while the need to manage peace in the car is an all-important issue for parents.

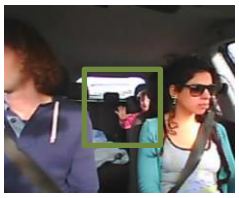
4.3.2 Managing auditory conflicts in on-going device use

The family car is a complex space of competing devices and users. Passengers and drivers share the same auditory and physical space. Often contesting technology use becomes a cause of auditory friction in the car as children and parents may have their own preference over how devices should be used in the car (Rauniomaa and Heinemann, 2014). In the

shared space of the family car, children may own noisy game consoles whereas the parent may want to conduct conversation or listen to the stereo, which is an activity enjoyed alongside driving (Waitt et al., 2015). This clash of activities often leads to situations of complaining where parents often explicitly indicate to children that their devices are disruptive. Situations can also arise within technology use in the car where the devices are perceived as being disruptive and annoying to co-passengers and drivers. Usually, if the child is using the device, the parent may step in to complain about the situation and request for an alternative. The first example demonstrates how the concern for conflicting device use may be raised by a child passenger while the next extract discusses how parents may raise reprimand children when they use gaming devices at loud volumes.

Description: In this example, we return to data from the F7 family, where their daughter is travelling in the backseat with her headphones while watching a movie on the tablet. Shortly a dispute forms between the parents and the child over the volume of the music.

Extract 11: Whose background audio?[6]

a  b  c  d 

(a) shakes hand and protests

D : Uhhh…Plea::se..(turn it off)

(4.0)

(***b)reaches out to lower volume while making an expression of annoyance***

Mum: D.…ple::ase..
Dad: [Whats wrong?
Mum: [***(c)starts to turns towards D***

(d)holds hand up in protest

D :That's unfair mummy`
Mum: No it's not unfair. We want to listen to music too.

The child is engaged with the activity of watching a movie while listening with the earphones on. At this point in the sequence, the parent has just started playing music on the stereo, which seems to cause some agitation from the child in the back (Fig a). Her actions of producing disagreeable sounds of crying as well as waving her palm, is a way to gain the parents' attention (Fig a & b). This is heard by the mother who responds with an

[6] This extract does not have footage from the backseat camera as it was accidently turned off by the parent. However, prior to starting the journey, the parents prepare the tablet before offering it to the chid. Over the course of the journey, the child's activity is still partially visible from the front camera.

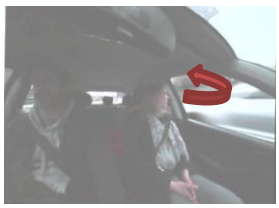
annoyed lengthened imperative of "Plea::se" (Line 8). Such imperatives are used by parents while soliciting the attention of children or to show annoyance as the parent expresses here (Ervin-Tripp, 1976). The dad who has not realised what is happening also picks up on the exchange follow the mother's request with a query about the situation (Line 9). However, his question is left unanswered as the mother turns to the child in the back to tackle the issue (Fig c).

At this point, the child continues to hold her hand up in protest in conjunction with her statement protesting 'that's unfair' (Fig c, d). The 'that' is immediately indexed by the mother as referring to the stereo, as we see her earlier move towards the radio to turn the volume down when she hears the child protest (Fig b). The child's indication that "that's unfair" is also quite interesting because she assumes that because she has been engaged with watching a movie in the backseat, she is entitled to the auditory space. However, the parent challenges the child's statement making it apparent that they "too" want to listen to music and have common ownership of the audio space. In the home as well rights and entitlements are something that are always of concern between parents and children (Craven and Potter, 2010), but here the mother intervenes to say that this is not unfair as the parents too want to be entertained on the journey.

On the other hand, conflicting device use may also result in parents issuing reprimands to children about their behaviour. In the next example from F4, the parents are prompted to admonish their son for the increasing volume of his game. As the next example indicates:

Description: This family of four is returning home from a family gathering on a late evening. The younger son (D2) is given a car game on the father's phone to play while the older son uses his DS. The game has loud sounds producing from it. The father uses the car's stationary state at a red light to reach across to the back and adjust the volume on the device. A few minutes later the volume is seen to return to its loud level.

Extract 12: Turning Volume Up

a  b  c 

1 ***(a)turns towards child in backseat***
2
3 Dad: S2, I've just turned that down and you've turned it up again., haven't you?
4
5 ***(b)turns towards child in backseat***
6
7 Mum: That's what you were doing at grandpa's study S2. And I was well (.) not too
8 impressed with your behaviour
9 ***(15.0 secs pass, while children continue playing on the game(c))***
10 Dad: When you do silly things like that S2, it means I might take my-the game off you.

The extract above opens with the father comment on the loud music stemming from the child's game. While doing so, the father draws attention to the fact that he has already made an effort to reduce the sound level on the device. His emphasis on the relational term 'just' in line 3 highlights the importance of the timing and makes a reference to the father's action. This indicates that a short while after the father's action, the volume has increased back to a loud level, which is immediately noticed by the parent.

Here we see the dad commenting on the loud volume and the mother then joining him to add that she noticed the same behaviour before, in the grandfather's study. Here the mother is making a retrospective orientation of the child's behaviour in another setting, adding that she was not happy about the behaviour in either place. From the tone of both parents, as well as the accompanying implications it is evident that the behaviour is not well-received. What follows then is a long pause of 15 seconds (Line 9), which could have been an opportunity for the child to respond. However, when this is filled with silence, the father follows this up with a further warning, that he may take the game away from the child. Whilst this is a brief example of a dispute in the car, the father is seen to be asserting his authority as both a driver as well as a parental authority. His emphasis on 'the game' in line 10 of his warning may be a reference to something the child finds enjoyable, that may be lost as a result of the bad behaviour.

In summary, a key aspect of allowing children to use devices in the car is that parents tend to indicate what they consider appropriate behaviour around devices. Here the auditory clashes disrupt the talk and environment for the other passengers who are also travelling. There is a sense of entitlement for child passengers to assume that they have sole ownership of the audio space. The shared space of the car requires that passengers in the front and backseat are sensitised to the limitations of the car. Parents make this apparent through expressing displeasure or annoyance when devices are used inappropriately.

4.3.3 Pacing device use

Pacing of device use is similar to that of economising and negotiating time on the TV or computer in the home (Shepherd et al., 2006). However, in the car, the need to pace device

use is closely linked to keeping with the rhythms of the journey. This involves parents explicitly making this apparent to the child by requesting devices back during travel. Such mediation of device use is frequently observed in the home (Plowman et al., 2010), but some important differences are observed that bears particular relevance to the car and its impact on passengering will be discussed in the examples that follow.

This example extract is taken a journey by the F2 family who are returning from a long trip, when the father steps in his role as a parent regulating media use by offering another device to the child to pace his use of technology in the car.

Description: The family of 3 are just returning home to London from a Christmas trip to Wales and mum is driving. They have just started their long journey back to London. In preparation for the journey ahead, Dad asks his 7-year old son in the backseat to save his tablet for later on in the journey.

Extract 13: Save it for the Motorway

a  b  c 

```
       (a)Dad turns and glances towards child in rear seat

Dad: S, I'd save that for your journey on the motorway.
(c) looks down at screen

S  : Wh::y?
   (c) reaches out to back

Dad: Because it-yeah and [I'll give you your DS.   ]
Mum:                     [Yeah you don't want it to] uh (.)run [out.
Dad:                                                           [Yeah, yeah.
```

The extract opens with the father suggesting to his son that his tablet could be saved for travel on the motorway. The father makes this suggestion by referring to the device as 'that' but this is done while looking over to the backseat and watching the child, indicating quite clearly what he is referring to. The suggestion is also descriptive as the father specifically tells the son would need to save it for the 'motorway'. This could be for several reasons: the monotonous stretch of the motorway, lack of scenery or the fact that they would be likely to encounter traffic may play into the reasoning behind why the parent may want to restrict the use of the device.

In response to this, the child asks for an explanation but while doing so, continues to look down at the tablet (Fig b). Following the child's request, the father starts to frame an

explanation as observed in his use of because at the start of line 8. However, he abruptly cuts off his talk and instead indicates that an alternate device (the DS) will be offered (Line 9). The offer is more of an imperative because the father says this while extending towards the rear seat, indicating through his actions that he is going to take the device away. It is also interesting that the father immediately moves onto his next action of taking the device away almost immediately after he issues his suggestion instead of first elaborating the explanation. One possible explanation is that he wants to resolve this early, before the journey progresses when it is likely to become irksome to manipulate storage compartments in the car.

The mother inserts an explanation in line 10, supporting the father's statement for why the device should be swapped. The reason she provides is the warning that the tablet could otherwise *"run out"* (of battery). The father adds his agreement to the mother's explanation indicating that both parents agree over the reason behind taking the device away. This exchange seems to point to the way in which parents manage the work of device use collaboratively as a "family team". This joint agreement and producing of explanation is a good example of how parents work together in managing device use by children. The management of devices in the car has to fit the demands of the journey and passengers. This conversational exchange reveals how the parents' awareness of the child's device and how it impacts on journey time. Again we see that the context of the car and the family members' enable them to make these choices of taking one device away and replacing it with another device. Further, a reference is made to the particular context where the participants are a part of, the fact that being in the car, gives little opportunity to recharge the devices' and hence the child must be made aware if this.

Another aspect that arises out of the extract is the idea that different devices index different things for a family. The Nintendo DS is considered as an option for keeping children occupied through games that can usually lead to boredom after some time. Watching a film on the other hand, and occupy the child for at least one and a half to two hours without children losing interest and seems to be an appropriate choice for motorway travel. In the example presented here, gadgets become problematic on journeys because of limited battery life. Pacing device use for battery life appears to be a relevant concern for why parents may prompt children to postpone its use. This is a distinct feature of device use in the car that is not experienced in the home, where there is availability to charge devices as well as leaving one device and picking up another.

4.3.4 Disengaging from Devices

So far the data discussed examples of the participation and engagement with devices, it seems relevant to end with how 'disengaging' from devices. This is relevant to the car context as journeys have end points such as reaching school or the end of a holiday trip, which means wrapping up device use is ever vital. Unlike the home where children may be allowed to negotiate extended time on devices, the car journey is bound by a definite ending. Often, this may not coincide with the completion of a level on a game or stage in the game where the children may be willing to relinquish. Parents often faced difficulties in negotiating to stop or pause media use in the car.

Bringing Device Use to a Close

A key aspect of disengaging from devices involves parents' getting children to wind down ending on-going device use. This is usually seen in requests for device return either because a journey has been reached or because parents think children need a break from using devices. In the first example described here, the family is arriving at their destination (grandparents' house) after a one and a half hour journey across London.

Description: The two children are absorbed in playing games on their parents' mobile phones. The rear seat space has gone quiet for the last twenty minutes. Nearing the end of the journey, the mother requests for the devices back, to which the children in the back seat seem reluctant to give up their devices.

Extract 14.1: Come on boys

```
1   Mum: >Come on boys<, I'll have those things back now, please.
2   (0.8)
3   Mum: ↑Come'[n!
4           (a)looks outside window
5                 [
6   S1 :          [We're no-
7      (b)stretches hand to back and makes grabbing gesture
8                           [
9   Mum:                    Come o::n, S2..
10  (2.0)
11  Mum: ↑S2!
```

a  b 

The extract opens with the mother her two sons by making a request to mobilise their attention, denoted by the "Come on boys" in line 1. She then issues a directive requesting for the return of the devices from the children. Her statement indicating a time referent of

"now" (French and Nelson, 1985) signals that whilst the devices were offered to the children during the journey, the time to return them is "now". When she receives no reaction from the rear child passengers, she starts to reiterates the request as a reminder, raising her voice this time. While doing so, she is upgrading her directive, denoted by her rising intonation and firmness of the directive. In their discussion of directives within activity contracts, Aronsson and Cekaite (2011) discuss how in the conducting of routine activities of having a bath or going to bed at home, parents may add emphasis to the ways in which they issue directives in order to gain the attention and compliance of the children. Here we see a similar situation in car around device use. Given the technology's role in routine aspects of family life, activity contracts around technology use as seen here involve frequent negotiation.

At this point, the older child S1 looks up briefly as if to determine whether the destination is in sight and if it is a good time to end the game. He appears to dispute the mother's request in line 6 by saying what could have been "We're not there?" as he continues playing with the phone recognizing that they have not arrived yet. We can see that he is probably used the visual cue from outside to understand that he can stretch his time on the device. The mother's repeats her request of "Come on boys", this time specifically aimed at the younger child (Lines 9 and 11). Her verbal request is paired with the action of (awkwardly, given its difficulty) reaching across to the back seat to retrieve the phones. Again, this is met with no reaction from the children who seem engrossed in playing.

Aside from the termination of a journey, parents may also ask children to return devices when they recognise children as being restless in the backseat.

In the example of F8 here, the daughter has been on the tablet for the significant length of the journey, when the father indicates that it is time for the child to take a break. This exchange also coincides with reaching the destination.

Description: The journey has lasted about one hour during which the young daughter in the back has been using the parents' tablet. Just before the current extract, the child requested for a new game, which was selected by the mother. The child decides she wants to play another game just as the journey is coming to an end at which point the parents request for the device back.

Extract 15.1: Taking a break

a  b  c 

```
          (a)leans forward and holds tablet towards front seat
   
   D  : Mummy I don't actually want to go on this game
-> Mum: Ok.. No te preocupes, estamos casi allí mi amour ok?
        Ok Don't worry we're nearly there my love, ok?
   D  : Mmm..(making moaning, whining sounds)
   Mum: We're nearly there. We're gonna park the car.

   (2.2)(b) both Mum and dad point to something outside the vehicle
                (c) insistently tapping on screen

-> D  : But I want to go on another game
-> Mum: D, I'm not going to do anything for you if you talk to me like that ok?
-> Dad: She can have a break now.
```

The extract opens with the child informing the mother of a change of preference in the choice of game that she has requested (Line 3). While referring to this, the child leans forward to the front with her tablet, showing through her actions that she seeks the mother's help to change the game (Fig a). The mother quickly responds to this concern by assuring the child in Spanish that they are approaching the end of the journey. This is a response to the child's restless as the mother adds the "don't worry" at the start of her sentence to assure the child that she does not have to sit in the back much longer. The mother's reply here is a dispreferred response because the child here is indicating through her talk and forward body orientation that she is seeking the mother's cooperation in changing the choice of game to play.

The child reacts to this response by starting to make protesting sounds in the back. The mother recognises the child's response as a protest and thus reassures the child by repeating her earlier statement this time in English, stressing that they have nearly reached their destination and are preparing to park, indicating that the journey is ending (Line 7). The mother is not explicitly asking for the device back as in the earlier example, but her response of "We're nearly there" is informative in that she indicates that she does not want the child to start a new game if they are about to park and stop anyway. This is tied to the idea that activities outside and inside the car are closely linked together and affect each other (Laurier et al., 2008). Allowing the child to start another game now, would mean that the parent would need to start the process of wrapping up device use only a few minutes later when the journey ends. Further it is also echoes parents' involvement in the home to

regularly intervene to prompt children's cooperation (Goodwin and Cekaite, 2014) in moving from one activity to the next.

The child responds in a childish manner by trying to insist that on being given a new game and by tapping the device screen impatiently (Fig c). This is seen to annoy the mother who replies with a sharp tone in line 13 makes that the child will not get her way if she speaks in that manner. Here the father steps in saying that 'she' (the child) can have a break, which is a statement directed to the mother. The father's statement at this point is redundant, given that the mother has already explained to the child that they are reaching their destination. The father's comment however, prompts the mother to initiate the action of receiving the device back as a gesture that indicates the termination of game play.

Both examples highlight the temporal importance of handling device use with the journey such that journey ends also correspond to endings in device use and winding down of activities. Children are noticed to be very absorbed in device-related activities and hence stopping them midway through a level or a game can be a challenging task for the parent. At the same time eliciting cooperation from children is difficult in the car as parents are not able to move around and physically intervene as they would in the home (Goodwin, 2006b). Therefore, parents may need to use verbal as well as embodied directives in order to get cooperation. This is discussed further in the next set of extracts.

Requesting compliance and implications for future device use

In the process of completing games and moving from one activity to another regularly involves parents seeking children's compliance. This usually follows the issuing of directives and further upgrading of requests when compliance is not achieved. First, we return to the example of F4 where both sons have been asked to return their devices.

Extract 14.2: Come on boys Continued.

```
 1    (30.0 secs later)
 2     (a) hands the device forward to mum
 3         ┌──────────┴──────────┐
 4    S2: Here you go mummy.
 5    Mum: Thank you darling.
 6    S2 : Give it to daddy.
 7    Mum: I will.
 8    Mum: S1
 9    S1 : Hold on.
10    Dad: ↑No, S1, come on.
11    Mum: (b) tapping S1 on leg
12 →  Mum: Well done S2. Good boy!
13    S1 : (c)returns phone to mum
14    Mum: Thank you S1.
15    S1 : You [think
16    S2 :     [Was I better than S1?
17 →  Dad: ↑Noo::o you were quicker than S1
```

a  b  c 

The mother does not say anything until much later when the younger child returns the phone. This gap in talk could be observed as an opportunity provided by the parent to wrap up the device use and the mother's inability to be able to physically remove the devices given her lack of access to the backseat. Finally after nearly half a minute passes, the younger child S2 returns the phone back (possibly because mum specifically requests him first by name). The older brother does not respond to the mother's request and instead replies with a request of his own in line 8 saying *"Hold on"*. This response is seen as a delaying tactic and a way by which the child can gain a bit more time on the device seen commonly at home as well. On hearing this, the father intervenes by responding with a upgraded warning to the non-compliance exhibited by S1 (Goodwin and Cekaite, 2014).

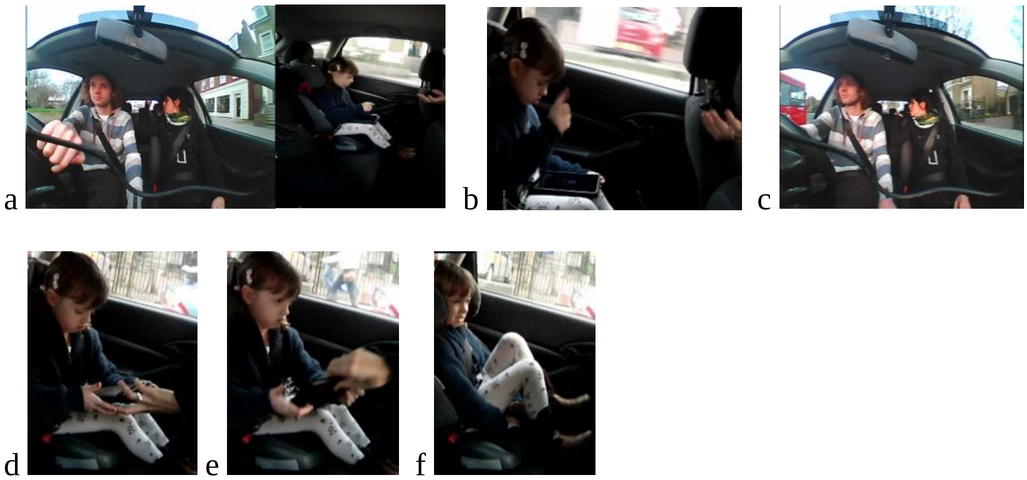
Here we observe the father acting in support of the mother's initiative to reclaim the devices. Interestingly, the mother issues a compliment to the younger child in line 11 saying *"Well done S2, good boy"* while the older son is still holding on to the device. This we can reasonably assume is inclined to encourage them to relinquish hold of the game. She goes further to insist on her request with an embodied action of tapping S1 on his leg persistently as a reminder that it is the time for him to return the device. This can be observed as an upgraded version of shepherding (Cekaite, 2010) where the parent may need to involve embodied gestures in gently coercing the child to understand the importance of returning devices. Eventually the child hands over the phone into the mother's outstretched arm (Fig c). Although the interaction described here appears as a mundane feature of family life, there is a deeper relevance to the impact on family practices around technology.

In line 16, S2 asks if he was better than his brother (a reference probably made to mum's compliment). The father is quick to reply that the compliment was for the speed of returning and not a judgment at who is better/worse. He stresses on the word 'quicker' to ensure that the child understands why he was complimented. Parents have to judiciously make visible what their preference of behaviour around technology is. This is particularly because children tend to pick up and use these parent issued cues to understand what acceptable and approved behaviour around technology is.

This extract provides a description of how disengaging child passengers from media may be seen as equally challenging as providing and supporting children in using media in the first place. This is particularly challenging for parents in the car as initiating pauses and ends to games are all the more difficult to manage and enforce in the car. There is hardly time remaining to wrap up ongoing games with the time needed in re-organizing activities at the end of a journey: repositioning seatbelts, car seats and taking things out of the car. Another problematic aspect to this is that the devices are, in fact, the parents' phones and were offered as entertainment for the children during the journey. More often than not, these are now required for their primary purpose, for making calls. . Secondly, the parents through the exchange would like the children to understand why the devices are being taken away and why it is important to hand them over correctly. In a broader sense, the children are learning how to be responsible users of technology.

Next, we continue with the other example from F8 with another extended non-compliance to a parental request, for the return of a tablet computer.

Extract 15.2: Taking a break Continued



(a) turns towards back
Mum: Yeah. Darle vuelta mi amour
Give it back my love
D : ***Ummmmm… (b) shakes head and finger to indicate refusal (1.1)***
(c) Reaching towards back
Mum: Can I have it <u>back</u> please?
(2.2)
→ Mum: D, Si lo quieres camino a casa, dámelo ahora.
D, If you want it on the way home, give it to me now.
D : ***(d) child hands it over***
(e) Takes tablet from child's hands
→ Mum: Good girl. Right choices
D : ***(f) Child starts to cry and kicks legs***
Mum: You can play again ↑later
D : Uhhh…. ***(crying sound)***
Mum: You can play again <u>later</u>

As we see the extract above, the child is unwilling to relinquish hold of the tablet while a verbal and embodied request is made for its return (See line 3 and Fig a). The mother's request here is framed using an endearment "my love", which is commonly seen in parent-child interactions, which legitimises her authority here as a mother (Craven and Potter, 2010). In response to the mother's request in Spanish in line 3, the child does not seem to react and continues to look down at the tablet. The mother's embodied request of reaching her hand in expectation of the device invokes the child's response of shaking her finger and head Fig (b) at the mother to denote her disagreement with the mother's request for the return. In turn the mother repeats her request for the device in English (line 8) with more firmness and an emphasis on "back", indicating that its return is necessary.

The mother's second request for the device is followed with an upgraded warning to the child about the use of the device on the return journey home which indicates the mother's orientation towards a prospective significance (Goodwin, 2006a). This seems to work as the child relinquishes hold of the device, although she does not look happy about it (Fig e). The action of relinquishing hold of the device is the child acting on her knowledge as a child who it is expected to comply with parental requests, as the consequences may be better for receiving devices in the future. The mother in turn acknowledges this action by commending the child in line 15 in the same manner as the parent in Extract 14.2. However, because the daughter is young and wanted to play another game, she is not happy about being told what to do and responds by crying once she hands it over (Fig f.). Recognising the child's response as resistance to her request, the mother reassures the child that she can have a chance to play later. Still the child does not seem reassured, which prompts the mother to re-state her comment with the emphasis on 'later'. The parent here must make the timely choices to take devices away from the child as not doing so may result in difficult behaviour when they reach their destination.

In both examples, in requesting compliance from children to return devices, parents are also indicating to children about how complying with requests is mutually beneficial to the children. When devices are returned to parents when requested to do so, it is more likely that children will receive them again in the future. In both cases, the children are quite young and are not able to choose the game for themselves. They are reliant on the parents providing the devices to them as well as prompting that the end of the journey means that children have to wind up the use of devices and return them when asked. There is also a normative reference to the Garfinkel's issue of trust (Garfinkel, 1963) where an action has

an expectation of responsibility, which is, the parent forging a sense of trust with the child to use the device properly and give it back when asked. This also ensures that the parent will trust the child to give it him or her in the future.

4.3.5 Discussion

This section has focused on how device use involves careful orchestration between parents and children within family car journeys. Through the data presented here, it is evident that parents manage device use is skilfully in the routine production of family car journeys. The use of devices involves negotiation between parents and children through talk: including offers and requests accompanied by actions such as showing or reading options on devices.

First, I discussed using examples from the data how the use of media is negotiated through dialogue between parents and children. Talk is used as a way of managing when media is offered and retained for use by children. I demonstrate that by engaging in talk, children may present requests for devices and games, which may or may not be approved, refused or postponed by parents. This involves a careful negotiation between parents and children of what games are offered and considered acceptable for the children to play. In such interactions, the data demonstrates that parents orient to what is appropriate for the child as well as the journey while children as well have their preferences for devices and games. The postponement or refusal of offers does lead to a lengthened exchange (Wootton, 1981a) where children may argue and rationalise the reasoning behind requesting for particular devices. Devices also offer a means for parents to keep a child occupied while they conduct conversation (see Extract 10.1).

Second, I showed how parallel use of media within the shared space of the car can lead to some problematic issues around the conflicting "auditory concerns". Entertainment devices may be considered noisy and disruptive to those co-occupying the space. In such instances in the data, parents are seen to deal with this by issuing directives to children and request their compliance (Kent, 2012a). This is manifest through explicit requests to turn down the volume or issuing of warnings about taking the device away (see Extract 12). Unlike the home, parents are unable to physically move around and take devices from the children (Goodwin, 2006b). Yet, with these limitations, parents are seen to work together in resolving issues around device use (seen in Extract 16.2), preventing arguments and supporting the other parent in their action of instructing children.

Third, device use in the car involved explicitly pacing the use of devices over the course of the journey. This is particularly pertinent to the car's moving nature, which suggests that children are oriented to adapting their use of devices to the changing nature of the journey. Being in the car means not having the same access to power sockets that may result in gadgets running out of battery life and children feeling bored and nothing to do on longer journeys. Closely linked to this, another observation evident from the data is that particular devices may index specific activities and purposes. Devices such tablets used for watching movies or listening to music have the potential to keep children occupied for a longer period for example on a motorway and children may be encouraged to 'save' them for these periods (See extract 14). In contrast, games tend to be time-limited or level-based which means children are prone to get bored after a while.

Fourth in keeping with the rhythms of car journeys, device use over the course of car journeys also requires that parents mobilise efforts to request the return of devices when necessary. In the car, this is strongly influenced by the fact that car journeys have particular beginnings and endings. Just as the preparations ahead of beginning a car journey involves getting items ready, on a similar note, nearing the end of journey requires that children are fully disengaged from devices. Parents achieve this by explicitly asking children to return devices, using embodied shepherding cues such as tapping, reaching out to the backseat in order to coax children into returning devices (Refer extracts 15.2 and 16.2). Returning of devices is also associated with good device behaviour, with children receiving compliments when they comply with directives. When children comply with requests, they are more likely to get devices in the future as well. Parents are also seen to display retrospective and prospective orientations (Goodwin, 2006a) to family rules and actions. In all of these examples, what is evident through the analysis is the manner in which parents step in to explain and provide instruction on what is expected behaviour.

4.4 Summary

This chapter focused on how talk between family members is organised and produced around device use in the car. What is evident through the analysis of the data is that in the car, families are not only carrying devices and artefacts, but also the conversations that go along with them. By virtue of devices being carried into the car, there presents opportunities for talk and interaction to take place between parents and children. The data points to how the device and its contents become a focus of discussion in the ongoing journey. This is a result of children being engaged in game play on devices while in the

car. Such activities open up opportunities to share and discuss games with parents. Through the data, it is evident that talk is a way of representing and producing family life. This is done in two ways as is shown through the empirical findings: the first is that device use presents a setting for the production of parent-child talk and the second is how family related talk is involved in orchestrating the management of device use during the car journey.

The first section (Section 4.2) dealt with how family talk is organised around device use. The feature of talk that is drawn on here is 'talk in activity' (Szymanski, 1999)where parent engage and disengage in their involvement with children's device use depending on the availability of their attention. For parents, this is a way of showing interest in what children are doing and sharing in their achievements and disappointments. The production of talk in the car between parents and children is carefully placed in relation to the demands of the driving context. Parents attend to what children are doing and share in their activities by asking questions and looking into their devices when asked to. Children often want to be heard and they want what their parents to share in their world. Portable devices such as the DS or the tablet provide intermittent opportunities over the journey for children to talk and ask questions. The talk has a strong grounding in the "here and now" aspects of the game i.e. children are talking about what they are currently playing and what their position is within the game. Consistent with game play in the home (Aarsand and Aronsson, 2009b), inside the car, children's use of reflexive features of talk such as response cries act as a way of drawing the parents' attention into conversation. Furthermore, family talk observed in the car is strongly influenced by the local production of sequences: i.e. it is a result of knowledge of each other, the game content, expertise and experience with the game itself.

The second part of the Chapter (Section 4.3) dealt with the management of devices. Parents produce talk in a way to demonstrate what children should be doing or allowed to do with devices. In the car, the devices provide entertainment for children and ways of occupying them on a rather boring and mundane journey. Therefore, talk may also involve the management of devices such that children may understand why it is that a particular device should be used or taken away. Again returning to the fact that talk here is focused between family parents and children, usually this involves the issuing of directives and offers that are non-negotiable. Some of these directives are not received positively by children who challenge them while parents need to resort to upgrading of directives (Goodwin and

Cekaite, 2013).This has immense bearing on the way in which family life in conducted in the car.

Pacing, accommodating turn-taking are all an integral part of this. Understanding talk around technology helps to reveal that the car is not a space of passive gaming or simply driving. Parents are presented with several opportunities to talk and engage in children's activities and in their world. However, we also observe that although in the above extracts talk was the central part of the interactions, talk is supported through non-verbal resources of gaze, bodily placement and arrangement of artefacts. The next chapter discusses these aspects in more detail.

Chapter 5 Device use as situated, embodied activity in the Family Car

5.1 Introduction

The extracts discussed so far in the thesis highlight the importance of talk around device use in the family car. I demonstrated that parent-child interaction entails commentary within device content as an on-going activity alongside driving and passengering. Along with talk, a significant portion of activity in the car relies on the multi-modal aspects of interaction between the inhabitants in the car and the material environment. This chapter will shift focus on the *embodied nature* of in-car activity. This is not to imply the absence of talk or that talk or the action does not take place independent of each other. Instead, the data extracts presented in this Chapter place a substantial emphasis on the embodied nature of how activities are organised and accomplished collaboratively in the family car.

Interactions with the social, material and sequential nature of the environment also have important bearing on how the accomplishment of an activity takes place. Goodwin (2000), in discussing a 'theory of action', explains the need to focus on how features of non-verbal activities of gaze and gesture are placed in relation to talk, such that they are coordinated, meaningful and situated in producing actions between participants. One way to account for the ways in which talk or actions are socially organised, aimed at particular recipients, at specific points of the interaction and has been referred to as "sequential environments" (Wilson, 1991). By focusing on this feature, the analysis emphasises on the socio-cultural relevance of actions as achieving particular purposes within interaction. Activities such as shared device use and navigating (all discussed later in this chapter) require careful arrangement and positioning of the participants of the interaction as well as devices. This calls for a greater emphasis in studying the role of non-verbal cues such as the use of gesture, pointing and arrangement of bodies as a way of referring to important features of the interactions-either as a way to emphasise or support talk or device-centred activity.

The role of situated and embodied interaction within family contexts has been studied in the home in detail by examining particular activities that parents and children engage in. These include constructing an activity together such parents and children doing homework (Goodwin, 2007b) or reading (Rouncefield and Tolmie, 2013). Another set of activities involve the issuing and following of directives in getting children to do habitual activities in the home such as brushing teeth (Aronsson and Cekaite, 2011) and tidying up (Goodwin and Cekaite, 2014). In all these activities, the role of material artefacts such as a homework

assignment being completed, a book being read, or toys being cleared up become an integral part of interaction through which parents and children jointly produce action surrounding the accomplishment of an activity.

Within the study of family, the 'work' carried out around parenting or being a child as an activity, it is done in a much taken for granted level given the intimate knowledge of each other. Family members engaging in an interaction make use of biographies as a resource for making sense of one another's actions (Garfinkel, 1964). This further relates to EMCA's interest in producing descriptions of settings based on how social activity is observed as a product of the participants, their actions and the local context of the activities. At the same time, participants are part of a family and belong to particular social categories of family members, be that mother or father, son or daughter and brother or sister (Sacks, 1972). In the car, these roles are shaped through the ongoing interaction (Butler and Fitzgerald, 2010), involvement of participants and access to resources as well as the local circumstances that prevail. For example, when an offer of a device is presented, a parent becomes a co-participant in a game and similarly, on being presented with the parent's phone, a child may take the role of an assistant or co-navigator.

One of the key aspects of the interactive organisation of technology is the importance placed on how activities get done together. For instance, the concept of divisions of labour between workers in a workplace setting, implies that workers collaborate on various activities enable to get the work of a setting done (Suchman, 1997). The accomplishment of activities may involve situated awareness and close coordination of activities and artefacts in the setting. Family life may involve some sort of division of labour between members. There seems to be an understanding of who picks up the kids, who takes the trash out or who does the dishes or children's responsibility in tidying up. There is need to seek out "mutual cooperation" in family, in order to get children to do activities together and to cooperate. However, the family is also prone to the eruption of small disputes that arise within interaction, particularly in relation to device use (Livingstone, 2002). In order to get things done as a family and to accomplish family work, members of a family need to recognise and be sensitised to the resources available in situations as well as the actions and roles of family members.

In the sections that follow, I describe and present two examples of family activities involving the situated use of technology. In presenting two contrasting examples of

collaborative activity, I describe and present the complexity in collaborative and shared use of devices in the context of the family and the car.

The first set of data in Section 5.2, involves collaboratively entertaining children in the backseat. Here the focus is on how parents get children to engage in a joint activity together. In family life, involves parents may want to encourage children to share such as meal times (Busch, 2012). As will be seen in the data extracts, parents actively support and facilitate collaborative activity and intervene when disputes erupt.

The second part of data in Section 5.3, is concerned with how children may assist parents in the front-seat by helping them in navigation. Here the discussion of the data is to highlight how mobile phones increasingly support navigational activities in the car. Furthermore, in constructing the navigational activity, both parents and children are working together as well as engaging in an ongoing learning activity in which children are learning how to read maps, provide assistance as well as to follow and convey instructions.

There are particular differences and similarities across both theses set of activities. First, both activities are achieved through the organisation of joint, family resources over the course of interaction. Contrasting the two activities shows that the spatial organisation of activities takes a particular form as the collaborative entertaining of children occurs predominantly in the backseat (with some involvement across the front and back seat areas); on the other hand, co-navigation is restricted to the front seat between drivers and front passengers. This configuration is based on the access to artefacts and the restraints placed on the prevailing interaction.

5.2 Encouraging joint activity in the backseat

Research focused on the backseat of cars been limited but for a few studies of entertainment systems for the backseat (Brunnberg, 2002, Juhlin, 2010), as most focus has rested on the front seat driver and passenger interactions (Haddington and Rauniomaa, 2011, Osswald et al., 2013). The role of the backseat passenger is usually seen within the larger setting of their involvement with the driving context. In the current study, a significant set of recordings within the car focused on the backseat area. knowledge of what happens in the backseat is relevant to my discussion of family car travel. The backseat is easily accessible to those who co-occupy this area, whereas for front-seat passengers, this may be more challenging because of the spatial arrangement of forward-facing seats.

In the set of family data obtained for the current study, the most common configuration for a family of four travelling together involved the distribution of the two children in the backseat. This meant that entertainment or game play for children took place in the backseat. I describe four key points in the analysis of the data fragments in this section.

First, in getting children to collaborate, I will show that parents play a central role in facilitating collaboration. Either by explicitly asking children to do something together or by supporting collaborative efforts, parents take initiative in setting up joint activities. The level of parental involvement in encouraging joint activity varies depending on how the activity was initiated. Parents may not be available throughout the activity, but may participate intermittently by gazing over at the backseat and providing help when required. As a part of being a family unit, parents may also want to foster qualities in children to share, accommodate and collaborate on activities (Buscher, 2012). They may still retain some involvement by commenting on and observing the activity by way of subtly monitoring what the children are involved in (Aarsand and Aronsson, 2009a).

Second, once a joint activity is configured, depending on who is participating in the activity, there are extended periods of interaction during which two children are engaged in a focused interaction. In a "focused interaction" (Goffman, 1963) participants "*come together to sustain a joint focus of visual and cognitive attention, mutually ratifying one another as persons open to each other for talk or its substitutes".* During this focused interaction, children are seen to orient to the device and the activity through their bodily configurations and orientations (pointing, tilting), while creating a huddle around the shared device in order to successfully collaborate on an activity. Depending on the nature of this activity, the framework of participation may be jointly sustained by both participants or might dissipate for a short period while one of them disengages and later comes back to participate.

Third, while analysing instances of focused interaction between children in the car, the data demonstrates how family life may be prone to small disagreement and disputes that are a common feature encountered while using devices (Livingstone, 2002).These may arise from conflicts arising from social issues such as sharing: e.g. children can fight over taking turns on devices. Other issues could pertain to the material environment of the car and the form factor of devices. For example, inability to find a mutually beneficial position for large devices can also adversely affect cooperative device use in the car.

Fourth, while encountering difficulties in conducting leisure activities in the car, parents may intervene and help children arrive at alternate solutions and work through constraints. Parents utilise their knowledge of their children and the circumstances and draw on their parenting resources to effectively divert and direct children's attention away from disputes. This can mean physically intervening in the situation by reaching across the front and backseat spaces to gain access to the source if the problem. In presenting two different examples of families, I also show how different devices have a bearing on the organisation of social interaction. The form of the device has important implications for how the activity is constructed as well. The first family uses a crossword puzzle as a means of entertainment between two children. In the second family, the children are watching a movie together on a laptop. Both devices come with their own set of advantages and limitations. Over the course of the journey, I describe how the use of the device takes shape.

5.2.1 Configuring and setting up of joint activity

Although the front and back seat areas are distinctly separated, there is awareness and recognition between parents and children of what is going on in the backseat. Parents express a certain degree of interest in what children are doing with technological artefacts in the car as was seen in the earlier chapter. Furthermore, in the effort to establish cooperation or entertain backseat passengers together, parents may support the setup of joint activities between child passengers. Car travellers are facing forwards in the car leaving limited opportunities to move around or look over to see what is happening. However, where family travel is concerned, there is some form of regular monitoring of what is happening in the backseat whether this is to check on whether children want something to eat or if they are doing their homework (Laurier et al., 2008, Goodwin and Goodwin, 2010). This may be prompted by objects being moved around, or hearing something being said, as is seen in the examples that follow. The first example is from F4[7] where the parent is prompted the two children to engage in a joint activity.

[7] In this family of 4, interaction is now centred on an interactive crossword puzzle device which is an individual game. This was considered a 'morally good game' as it had educational qualities. In addition, its use opens up opportunities for collaboration, turn taking and engagement of the whole family during journeys as well as good battery life-which made it particularly popular with family car journeys.
S1-elder son S2- younger son

Description: S1 (aged 9 years) is playing on a crossword puzzle game while receiving assistance from the mother. Younger brother S2 (aged 7 years) is restless in the backseat-expressed through his fidgeting with the seat belt. On noticing this, the mother suggests that S2 be included in the game so he can try some of the words. This leads to S2 taking a turn on the device.

Extract 16.1: Lucas' Turn

a 

b 
c 

```
 (a)looking at runners outside to window
              ↓
S2 :      Bye bye runners =
 (b) Twists around to the back

Mum: = What darling?
             (c) Turns and looks towards S1

Mum:  ↑S1, will you let S2 have some turns? Let him guess some letters for you.
```

The extract opens with the younger child making a passing comment at a group of runners outside the window to look (Fig a). The mother in the front seat almost immediately picks up on the child's comment and asks a question at Line 6. Although the mother does not refer to the child by name and instead uses an endearment, the mother's action of twisting (Fig b) in the direction of the younger child (S2) makes it apparent that she is referring to him. Although the car makes it difficult for the positioning and sustaining of face-to-face interaction, the parent seems to take the effort to make eye contact. Later into the interaction, it is clear as to why she wants to sustain her monitoring of the situation, as she appears to want to get the children to cooperate on an activity together as well as monitor the involvement of the younger child in the game.

The situation is such that the journey has also progressed some distance now and the older son S1 has been actively playing the game with assistance from the mother. The mother's action of looking over to the back (Fig b) and orientating her talk towards the younger child (Line 6) may be prompted by her recognition of him feeling a bit neglected by the game that the older brother is playing. The mother's concern is triggered after the child's comment to the runners outside the car as well as followed by his earlier action of fidgeting with his seat belt. Recognising that the younger son may be feeling left out she does not

wait for a response from S2 to her question, instead, steps in to ask the older child to allow his younger brother a turn (Line 9).

In turning towards the older child, she looks in his direction and holds her gaze while instructing him to include the younger child in the game. It is also interesting here because rather than telling the older child to hand over the device, she appears to give a very specific instruction. While her statement in line 9 is initially framed as a request, she ends with an imperative indicating that the older brother should involve the younger child by *"let him guess some letters for you"*. By saying this, she indicates her desire to change the nature of the activity from an individual one to collaborative one that includes the younger child. Further, by saying "for you" in line 9, she indicates that allowing the younger child to have a turn would mean that he could support S1's pursuit of the right answer.

We see what happens next as the older brother complies with the mother's request to include the younger child in the interaction. This means that the older brother has to direct his talk towards his younger brother while he was earlier engaging in conversation with his mother.

Extract 16.2 Lucas' Turn

a  b  c 

(a) head bent over and looking at screen

1 S1 : Ok S2. ↑There's a word which begins with 'E'=
2
3 Mum: ***(b) glancing towards S1***
4 Mum: =Show him. It's much easier if he can see it.
5
6 S1: (c)***leans in towards S2***

Following his mother's instruction, the older brother now directs his talk to S2 and involves him into the game. He calls S2's attention by referring to him by name in line 1 and describing the clues of the game. However while doing so, his body is angled away from S2 and is instead hunched over the screen (Fig a). While his talk is framed to include his brother in the game, his position maintains that of individual play. At this point, the mother who has is monitoring the activity, glances back to provide a further directive (Fig b). Her instruction comes in quickly in line 4 wherein she says, *"show him"* as opposed to tell him what to do, which is what the older brother is currently doing. This orientation to the device and the fact that "*it's much easier if he can see it*" may be based on the mother's

own familiarity with the device, observed in previous videos of this family as well as knowledge of the younger son's competency.

Her explanation is also valid because when S1 first addresses his younger brother in line 4, S2 seems to be playing with his seat belt. Following the mother's instruction, S1 angles himself and the device closer to his younger brother as well as seeks eye contact. This re-configuration of stance immediately prompts a response from the recipient S2 who discards the seatbelt and pays attention to what is being said by S1. The younger brother responds to the brother's initiative to move closer to him by turning his gaze from another focus of attention (the seatbelt) to a new one-the puzzle. Where multiple family members are concerned including those from different age groups, game play and device management involves a delicate awareness and realisation of what is going on, who is involved in it and how to cope with the situation in the best way. The mother here knows that she has limited ability to physically intervene in the interaction and thus decides to instruct the children on how to work together to stay occupied.

Moving to a second family example from the F1[8] family data, the extract follows the construction of a similar joint activity. In this case, the difference is that the parent has not initiated the joint activity, instead the children initiate the joint activity on their own. However, the mother is engaged with what is happening in the backseat by supporting the setting up of the activity in the backseat.

Description: After a small delay caused in their journey, the family of four set off on their journey to visit a friend. The extract starts shortly after they leave the house. The younger brother (S2) chooses to join the activity of his older brother (S1) in the backseat who is watching a movie on the laptop.

[8] *F1:* The second family is a family of four that used technology quite extensively. The parents and children frequently carried their tablets and laptops into the car for use. In the extracts presented here, the children are using a laptop jointly in the car to watch a movie together. The laptop, being physically quite cumbersome to use, does not prove to be the easy artefact to use jointly.
S1-elder son S2- younger son

Extract 17.1: Watching Together

a 

b 

```
1    Dad: [(a)Leans over and looks at backseat
2    S2 : [Who are fighting each other?
3
4         (a) Leans towards S1 to look at laptop
5    Dad: S1, [why can] we hear your music-your [headset?]
6    S1 :      [Effkof]
7    S2:                                        [Who's] Effkof?
8    S1:     [Because
9    Mum:    [cos'they're going to watch together darling.
10
11                (b) Looks over at dad
```

The extract opens with the father's action of leaning over towards the backseat. From his question in line 5, it becomes obvious why he produces the action of looking at the back. In posing his question in line 5, he is highlighting his awareness of his older son using the laptop. But his action of looking over and framing of the question indicates that he recognises something odd about the activity: the fact that the sound can be heard while S1 should have been using his headphones is something that the parent recognises as being surprising and worth commenting on. In the car, as seen in earlier examples of device use, the interiors allow for sounds and conversations to be heard across front and back seat spaces and they are often picked up and discussed further.

The father asks the question whilst the two brothers are engaged in conversation in the back. At this point (line 8), it appears as if S1 is about to explain the situation as seen by his lack of response to his brother's question in line 7. Instead, he starts to say "*because*", in line 8, indicating the start of a turn that indicates providing a reason. But his talk is superseded by his mother's quick explanation that the children are engaged in a shared activity in the backseat. From her position in the car, she has greater visibility of what is going on in the backseat and is also able to talk to the driver more easily. She is already aware that the children were setting up the activity. In addition, during the earlier set up of the activity, when S2 expressed interest in his brother's activity, she was in a position to observe this. Further, it is evident that the children are quite engrossed in their activity as a parallel conversation ensues with the two children. The younger brother now has to catch up on what is going on in the movie.

Similar to a game where the player needs to brief a new player in the rules, the older brother has to effectively introduce the characters and what is going on. This explains S2's

question in lines 2 and 10. At first S2's question is interrupted by the father who questions the source of the sounds from the backseat. Once the mother provides the explanation, S1 is able to address his brother's earlier question in line 7 "*Who's Efkoff?"*. Simultaneously, his younger brother repeats the question. While this conversation is going on, the mother steps in to re-organise the activity in the backseat. It is important to notice that this is going on as the family have shortly left from their residence, making it an appropriate time to set up the laptop.

Despite not being the one to initiate the joint activity, as the exchange progresses, the mother's role in supporting the setting up of the activity is evident. This not only requires that the two children re-configure themselves, but also the device itself in order to effectively engage in the activity of watching together. The mother appears to take an active involvement in setting up the activity for the children. While the children have not raised any concerns about the positioning, the mother from her position probably notices that the younger child leaning over to look at the screen. She may also not want S1 to have the laptop on his lap. She therefore instructs the children in a positioning the laptop at the centre.

Extract 17.2: Watching Together Continued

a  b  c  d 

```
S2:  =[Who's  [Eefkoff                          ]
S1:  =[That's [Effkoff and that's the Jedi      ]

Mum:          [Try to put that down here S1.    ] S1-
               |_____________________________|
              [Gestures to the floor of the car ]

S1: Moves forward to bring laptop down to ground
Mum: Try to put it down here
     |_____________________|
  (d)Holds the laptop and helps the child place it on the floor
```

The mother's instructions are placed while the children are engaged in talk about the movie. There is an overlap of talk from three speakers simultaneously that inherently makes the production of talk slightly messy (Jefferson, 2004b). This is not strange to the setting of the car as interactions are made complex by the proximity of people and the activities that go on simultaneously. The way in which the overlap is dealt with is quite interesting. The older son (S1) waits to complete his turn at talk before following the mother's instruction, which has overlapped with his response to his brother who has joined

in the activity. The mother's insistence (line 4) by calling S1's attention results in the children giving priority to her instruction. This could be because she is instructing them as their mother, but also because she calls the older son's attention twice in line 4.

Her instruction is further embodied through her act of reaching to the back and pointing to the floor, thus achieving its aim in gaining S1's attention (Fig b). Her suggestion is to place the device on the floor. She extends her right arm across to the backseat to physically support the placement of the device on the floor (Fig d). The joint efforts from both S1 and S2 to move the device indicate that the device is bulky in contrast to the crossword puzzle in the earlier example or the tablet computers that are intended to be easy to move around. Furthermore, the children are limited in their access because of the seat-belts and car seats that restrict their movement, resulting in the floor of the back seat as a 'dead space', as described in other studies (Wilfinger et al., 2011). Here the mother's physical intervention to help move the tablet supports the activity. Midway through the action of placing the laptop on the floor, the mother realises an alternate option, which is to make use of the armrest.

Extract 17.3: Watching Together Continued

a   b  c 

```
1                                          (a) points to arm rest
2
3   Mum: Try to put that-or li- bring that thing down. Bring that thing
4        (b) Reaches for armrest
5
6   S2 : Oh yeah-this thing.
7   (1.0)
8    (c) Looks up at mum while reaching for armrest
9
10  S2 : This thing?
11  Mum: Yeah.
12  S2 : S1
13  (S2 pulls down armrest and both place the laptop in the centre)
14  Mum: Now put that in the middle, now you two can watch.
```

While instructing the children to place the laptop on the floor, the alternative possibility of placing the laptop on the armrest, emerges. This results in the mother engaging in a repair in her instruction in line 3 from "try to put that" to "bring that thing down". She now frames the request to the younger child to bring the armrest down. She points to the armrest in the back (Fig a), referring to the armrest as 'it'. This is done as the older son is bent towards the car floor (Fig a), leaving S2 in her line of vision and being able to see her

gesture. The younger son (S2) effectively identifies what she is pointing at and starts to pulls it down. While doing so, in line 10, he confirms if the armrest is what the mother is indicating towards, by looking at her as he produces the action (Fig f). Here we see the child actively seeking help from the mother to facilitate the joint activity.

The activity of watching a movie now shifts from being an individual one to one that is re-configured to fit two children, much like the earlier case where the mother prompts the brother to include his younger sibling. This requires that the screen of the laptop must now be adjusted to accommodate the younger brother's line of vision as well sharing the audio. The mother in line 14 clarifies this when she indicates that the children, having positioned the laptop in the centre can now watch the movie together. Further, in the car there is very little scope for movement as children are strapped into car seats. However, this means that the rest of the environment-including artefacts have to be re-configured to support the activity.

In both examples of getting children to do an activity together, it is seen that parents express and display involvement in setting up of the activity. The level of involvement certainly varies across the activities. For example, in the first family, the mother is verbally suggests that the younger brother be included in the game. Whereas in the second family, on recognising that the younger child has already started to participate in a shared activity with his brother, the mother's role is to step in and provide assistance to facilitate the set up of the activity. While setting up this activity, there is an increased importance on how the participants are oriented towards the devices. Devices such as the laptop in F1 prove to be more challenging to support shared activity.

5.2.2 Focused interaction within joint device use

Once the joint and shared activity is set up, the next step is to observe how this unfolds within the interaction. In engaging in play activities, children are seen to exhibit their involvement in a game by leaning forward, pointing thereby establishing a *'participation framework'* (Goodwin, 2000).The activity becomes one of focused attention between the participants in the interaction and the artefact in question-in the extracts we observe these as being the crossword puzzle and the laptop. We observe that maintaining a focused attention requires that the participants orient their bodies-through physical arranging themselves in a 'huddle' such that they can both engage jointly in the activity. In the maintaining of this huddle, there may be moments of disengagement by one participant to

make way for the other to participate and re-engage. This mutually focused attention requires that resources of talk and more important-embodied action be placed sequentially within the interaction for the successful conduct of the activity.

After the mother's help in setting up the activity, the focus then turns to how the children engage with each other and the device in the backseat.

Extract 16.3: There's a Word

a 

b 

```
1       (a) Points to screen          (b) looks up at S2
2
3   S1: There's a word, which begins with 'E'
4
5   S2:             (a)& (b) Watching screen
6
```

c 
d 
e 

```
7                   (c) slides hand across screen
8
9   S1: These letters here you can use any of these letters to make a word.
10
11   (d) moves his hand away and holds screen towards S2
12
13  S1: So it could be-you could do E, L-(.) [L..
14  S2:
15          (d) leans in towards S1              pulls puzzle to himself (e)
```

f 
g 

```
16  S1: It's hard. I can't even do it.
17  4.0 secs
18  ((S2 is focused on playing game))
19
20  (f)points to screen                  g)points to screen
21                  leaning across to S2
22
23  S1: No you need to start with 'E'. Start with E and use most of those wor-letters to make a
24  word.
```

Now the older brother has shifted to a stance of 'showing' and instructing S2 on what is required in the game. This coming together of children's heads leaning in towards the device is both a result of the mother's earlier instruction to 'show' S2 how to play the game as well because of the device's material properties. The size of the device and its small screen require that the children come together and lean into a position that allow

them to look at the screen together. By instructing his brother and orienting to him through his speech and action, S2 becomes a ratified participant within the interaction. As the children become engrossed in the interaction, a "huddle" is created within which the children are becoming focused participants. Within this formation, the two siblings use their bodies and gaze to show that they are focused and paying attention to each other as observed in previous studies of game play (Goodwin, 2000)**.**

The older brother S1, is providing his expertise of the knowledge in the game to his younger brother to enable him to take a turn. The way in which he instructs and points to resources on the device by sliding his fingers while saying in line 9 *"..you can use any of these letter to make a words"* displays his expertise and the fact that he is instructing his brother as an expert user introducing a novice to the activity (see Goodwin, 1981). S1's stance can also be observed from his role as an older sibling within the family who complies with the mother's instruction to include his younger brother in his game. The spatial arrangement of the backseat allows for such an interaction as passengers are arranged in close quarters. Participation in the activity is supported by the context, the older brother's proximity and his knowledge of the game, in lines 9 & 13 where he tells the younger brother what he needs to do based on his expertise of the game. His pointing gesture achieves the desired effect of gaining his attention as the younger child's gaze is fixed on the device and the feature being indicated on the screen.

The proximity of the two children next to each other also facilitates the natural progression from the individual game play to a joint interaction. Further, the car also allows for such a positioning, which would not be necessary if children were in other settings like the home. The bodily gestures within the interaction of leaning across and pointing towards the screen all orchestrate to constitute the activity of game playing between this sibling pair. Once engaged in the joint interaction, we see that both participants orient to each other through their bodies. S1 holds the device such that both can see, but at the same time, he seems to move away slightly, showing a sign of temporarily disengaging in the talk as well as possibly providing an opportunity for his brother to look more closely (Szymanski, 1999). Another reason for doing so is the form of the device itself: as we see in this extract and others similar ones, the screen of the puzzle appears to be quite small and one that requires scrutiny in order to work out what is required. S1's positioning is therefore both governed by the relevance of the activity, i.e. enabling "the showing" of how the game is played as well as the limited viewing space of the device. Once he has shown what needs

to be done, the older brother retreats his ‘instructing’ right hand and holds the puzzle towards his brother (Fig d).

This action of S1 is coincides S2’s action of leaning closer towards the device in Fig (d) allowing him a better opportunity to take a turn on the device. S2’s action of leaning over is seen as a preparatory move for the next action, which is to reach across and take the device. We observe that similar to other technology-rich contexts like the production of work in office contexts (Heath and Luff, 2000) the production of mundane activities in turn taking and game play also involve individual actions to be placed and timed with the co-participants in the given sequence of actions. Body positioning and movements within talk as observed here in the exchange between the two brothers make possible to organize the way in which talk is configured to display orientations to speakers as well as to the activity at hand (Schegloff, 1998).

The older brother’s interaction does not stop there. Once he relinquishes hold of the device to S2, he admits that the game is hard and even he could not guess the word (Line 16). This appears to be a sort of warning made from his own interaction and issued to the younger one. A possible implication of this could be that the latter is likely to have difficulty playing the turn. Rather than occurring in a mechanical fashion, participants’ exploration and engagement with the device is accomplished in an ongoing manner through sequential placement of both talk and interaction between both parties. In contrast, other activities may not involve such explicit instructions within the context of collaborative use of the device.

We now turn to the other family F1, where the children have come together to watch a movie on the laptop. In this activity of watching contrasts with the game, because it does not involve explicit rules that need articulating. However, it does require that artefacts are placed within view of both viewers and that both can watch what is going on in the screen in an uninterrupted manner. There is very little talk during all this interaction-as in contrast to the other activity; the children here are trying to ‘do watching together’, which involves the observation of the screen as well as orienting the artefacts in the right positions.

Extract 17.3: Positioning Laptop

a 

b 
c 

1 ***((both children are positioned around the laptop and are holding it to keep it steady))***
2 S2: (a) ***places hand on edge of laptop***
3 S1: Take you hand off S2
4
5 ***(b) leans into screen and pushes S2's hand away***
6 (8.0) ***(the two children are watching screen)***
7 S2: (Na::me)
8 (6.0) ***(the two children are watching screen)***
9 S2: S1, you're pushing it backwards.
10
11 ***(C) moves hand to adjust laptop***

In the above extract, there is emphasis on the arrangement of the artefact and the two children around the activity of watching together. The children are attempting to carry out the task of balancing the laptop in the centre in such a way that they can both watch together. However, we can see that it is not without problems as while one child is trying to adjust the screen to improve visibility, at the same time, this obstructs the older child's (S2) view, prompting him to tell his brother to take his hand off (line 4). The car's movement as well makes the laptop move about making the task of watching quite challenging to retain focus on the screen. Unlike the earlier focused interaction where the two children are coming together before handing over the game to one child, the brothers here must retain the 'huddle' so that they can both retain a mutual focus of attention. In the organisation of this activity, it is observed that both children have positioned their bodies towards the laptop and to each other (Fig c).

Thus, the simple activity of viewing a screen together is bound up in the positioning of participants in relation of the artefact. The laptop does not fit easily in the backseat armrest, thus making it unstable to position. Both children must control its position as it shifts with the car's movement, this explains why the participants are frequently seen to be leaning forward and adjusting the positioning of the screen (Fig a and b). This means that actions they produce in front of the artefact must be produced in such as a way as to not obstruct each other's view (as seen in S1's comment in line 3). In effect, the children are constructing and sustaining the activity of 'watching' such that they monitor and produce the actions necessary for sustaining the activity (Ryave and Schenkein, 1974). There are some key features of producing this work. They are spending extended periods of silence 'doing watching' (see lines 6 & 8), which means that whilst there is nothing being said,

they are actively focused on what is on the screen. The children's' position over the laptop is also one that is constantly being shaped as the activity unfolds: the children lean in forward to adjust the positioning of the laptop as well as their own bodies in relevance to the activity. Positioning therefore is an important aspect of collaborative interaction around a device. More so in the context of mobility, the position of the laptop in question is shifting and requires calibration from the participants to orient them to this (Fig c).

Here in both examples, it is seen how through the positioning of bodies and orientation, siblings become ratified participants within a joint focus of attention. They establish a participation framework (Goodwin, 2000) which supports the ongoing activity of play wherein each are conscious of the other's action and the position of the relevant artefacts (i.e. the crossword puzzle and the laptop) in order to help and support the ongoing action. This framework is sustained and shaped over the course of interaction. For example, in the crossword puzzle, the older brother first leans over to orient the screen to his brother. However, once the younger sibling takes the device, his involvement reduces and he retreats from the action. By contrast, the children engaged in the activity of watching together sustain their joint attention on the screen for an extended period.

5.2.3 Dealing with Constraints within Activity

This section continues to follow the same families and follow the extracts a bit further into studying the interaction between the siblings as the artefact interaction. Part of conducting family life is concerned with encouraging practices of accommodating younger siblings and encouraging shared usage of devices (Go et al., 2012). Families may want to encourage this for practical reasons such as not being able or wanting to provide children with two devices or to lose control over device use (Livingstone, 1992). However, particular game configurations make it difficult for both children to look at the screen simultaneously. In the previous extract, the parent has achieved the purpose of engaging the younger child in play with the older son. Through encouragement, the children therefore have been convinced to do something together in the face of games that usually individualize them (Randall, 2011). S1 (the older brother) was playing independently on his crossword puzzle when prompted by his mother to include S2 into the game.

Description: The situation as it stands is that S2 has had a turn on the puzzle and has not been successful in guessing the right word. He has handed over the device to S1 who is

now attempting to seek the mother's help with the game. At the same time, S2 tries to regain the puzzle to have another turn.

Extract 16.4: Tug of war

a  b 

```
1          (a) tilting screen
2              towards mum          (c)retaining hold of device
3
4   S1 : You need to make a word, which begins with-
5
6   Mum: (a)glances back
7          towards screen
8   S2 :                (b)reaches out to retrieve device
9
```

c  d  e 

```
10         (d)Holding screen away
11         and pushing S2's hand away
12              ⇓
13  S1: (0.8)  'S'
14              ⇑
15  S2: (d) reaching for puzzle.
16  (1.2)
17  S2: I have an id::ea S1=
18
19           (e) looks at S1
```

f  g  h 

```
20           (f) reaches behind to take puzzle
21
22  Mum: =Hang on darling,[let me have a look.
23  S2 :                  [(g) leans forward to grab puzzle
24  S1 :                  [ Tell me.
25
26                     (h) glancing at S2
27  S2 : Snooze.
28  S1 : I just tr-
```

The extract opens with S1 seeking the help of his mother with a turn on the crossword puzzle. Although initially, the attempt was to encourage the younger child (S2) to be included in the game, S1 has regained the puzzle as the younger child was unable to find the right answer. While the mother's attempt in the earlier extract was directed at getting the children to play together, it is evident that this is not a simple matter given the challenging nature of the turn. Further, there is the unfolding of a multi-party interaction

between sibling pair and the mother, which results in disputes over who should take a turn. Even within a small set of families, it is clear that family life and travel, frequently involve the outbreak of small disputes, as seen in what follows.

At the opening of this extract, S1 is seeking his mother's help this by orienting the device towards mum in Fig (a) while explaining what needs to be done: *"You need to make a word"* (Line 4). His action of angling the screen towards mum can be seen as an invitation for the mother to participate in the turn. The mother appears to recognises this and turns to look over towards the device screen (Fig a). At the same time, her position remains that of an on-looker. Her stance is such that her arms are crossed and she is not really initiating a movement to receive the device (Fig a). One reason could be that she is waiting out intervening in the joint activity that she initiated, in the hope that the children will sort it out themselves. However, S1 is clearly directing both the orientation of his talk and action to his mother. He does this by effectively, circumventing S2's turn by extending the device to mum in front (Fig d), and pushing aside S2's stretched arm (Fig e). In extending the device to the front, S1 accomplishes two things. First, he makes it clear to the mother that he wants her input (Line 4) and second, he indicates to his younger brother that it is not his turn by holding the device out of his brother's reach (See Line 13 and Figs. d & e).

While passing this to the front, younger brother S2 who has not arrived at the right guess attempts to retrieve the device back (See Fig g). At this point, the older brother does not attempt to offer the turn to S1, but instead attempts to get mum's help with the turn. Further, mum steps in to explain that S2 must wait, as she would like to have a look at the game (Line 22). Children's behaviour often do requires parents to intervene and indicate to them what they believe to be 'appropriate behaviour'. Children may need to be educated on waiting out turns at talk or reminding not to interrupt when talk is not directing towards them (Butler and Wilkinson, 2013). In particular, it is clear through S1's stance and talk that he believes it is the mother's turn to talk. This follows from the earlier part of the interaction that S2 already has had a chance and must now wait his turn (Line 22).

Resulting from S2's interest to be involved in the interaction, the conversation now involves multiple participants and multiple streams of conversations. S1 is seen asking Mum for help and S2 fighting with S1 for access to the puzzle. An argument is building up, as S2 wants to take an attempt at guessing (line 17). S1 here must do two things. He is managing his brother's request to give him a turn as well as, by positioning his gaze and directing the request of *"Tell me"* in line 24. He also retains his orientation to his mother

by resting his hand on the seat in front and leaning forward towards the front seat showing preparedness for her for assistance (Fig h).

Extract 16.5: Tug of War Continued

a  b  c  d 

```
    (a) frowning while looking at puzzle

Mum: I- what game is this?
S1 : Its letter skills.
S2 : Pass mum=

(b) Reaches in front
    for puzzle          (c)Passes device back
                                  ^
Mum:=I don't understand [that.
S1:                     [S2, you don't have a clue.

                              (d)raises hand towards S2
```

On receiving the puzzle, the mother appears to be unfamiliar with the game that is being played. We know this from her surprised reaction from line 1 when on looking at the screen, she exclaims "Ooh" while asking, *"What game is this?"* Her use of the *"Ooh"* as expressing surprise may also be a sign that the game is different from what she may have expected to see. From the ethnographic work, it surfaced that the crossword device offers a choice of several word games, and the one that is selected is not known to mum. S2 takes advantage of mum's doubtfulness at the game and requests for his mum to give the device (Line 6). He immediately grabs the device when it is passed back (Fig b). What follows is then a tug of war for the device that seems to disturb the collaborative nature of the activity. The older brother is frustrated at the situation in line 11, because as he himself (the expert) was unable to find out the right answer, it is less likely that his younger brother (the novice) will. He exclaims at the futility of his brother taking the device because according to him, *"You don't have a clue".*

This may be described as a *direct* complaint (Drew and Walker, 2009) made about the brother as S1's speech is directed towards S2. His comment within the dispute over who should have access to the game can be described as being *self-oriented* (Slomkowski and Dunn, 1992). By this, it means that the older brother draws attention to the fact that he should get the device because he is knowledgeable in the game in comparison to the younger brother who is a novice. Therefore, what is noticed within the interaction is that the artefact itself becomes the focus of the interaction as it is moved to the front and

between the children. For in-car interaction to run smoothly there is a need to be able to seamlessly deal with the distribution of artefacts. This is difficult when there are limitations posed by the spatial constraints of the car and the form factor of the device. The artefact itself allows for the movement, which makes it an ideal choice for the car, but this does mean that a considerable amount of time is spent arguing between who should retain it. From other instances in the data, it was observed that this particular device was used in a collaborative way, often involving the participation of parents in game play.

Returning to our other family, we see that once set up, the joint backseat activity of watching a movie together on the laptop does not carry through without problems. A short while into the journey, the mother turns to the backseat when she can hear some movement in the backseat. She immediately reaches in the back to adjust the position of the laptop.

Extract 17.4: Hurts Our Eyes

a  b  c  d 

1 ***((shuffling movements are heard in the backseat and this is picked up by the mother))***
2
3 Mum: Tch (3.2)
4
5 ***(a) turns towards backseat*** ***(c)glances towards S2***
6
7 S1: Mummy it doesn't work like that. Does it Ben? (0.8) It hurts our eyes, doesn't it? =
8
9 S2: (b) ***leans forward to move laptop*** (c)***looks up at S1***
10 ***(d)reaches to the back***
11 ***and reaches for***
12
13 Mum : =Well, so put it here then.
14 Mum : Can you see now?
15 Dad : >Or just turn it back off actually<
16 S2 : Yes
17 S1 : It really hurts my eyes though.
18 Mum : Ok, close your eyes.

Here we see that the children have reached a roadblock in their initial attempt to pursue the activity jointly. The focus is on the interaction between the children and the placement of the device in question. From the Fig b it is evident that both children have taken a very different stance to what they had earlier when they were engaged in a focused interaction in viewing the screen. The huddle formed by the two brothers is now only retained partially by the younger brother who is leaning over the laptop. The older brother is leaned back in the car seat. Neither of them is engaging in the activity of watching what is on the screen. There is some shuffling as a result of the device's unstable position in the backseat

armrest, which prompts the mother to return her attention to the back seat while reaching in the back to adjust the laptop positioning (Fig a).

When the mother looks over the back, S1 immediately steps in to clarify the situation. He (S1) complains that the position suggested by the mother earlier does not work because it hurts their eyes. This is a reference to the fact that they were conducting the activity jointly and therefore he is speaking for both of them. From the data, we can see that this could be from the prolonged need to lean forward to re-position the device and its uncomfortable placement in the armrest. S1 also confirms this by seeking his brother's support as well (line 7). Here the mother offers some help by way of suggesting placing it on the floor of the backseat. Similar to the previous sequence, she reaches out to re-position the laptop on the floor.

Once the action is completed, the mother seeks confirmation on whether the changed position improves the situation. This prompts two sets of reactions from the children in the back. The younger child replies affirmatively whereas the older child insists that it really hurts his eyes. Having run out of options, the mother's immediate response to the child is to close his eyes (Line 18). Logically, the answer does not have much benefit, closing his eyes would mean that the child can no longer engage in watching. This simply reveals the sense of frustration at running out of other alternatives. In dealing with a limited set of options in the car, there is a need to adjust one's orientation to the set of resources available.

In response to the mother's retort to the child to go to sleep, S1 asks for a third, alternate positioning.

Extract 17.5 : Hurts Our Eyes Continued

a  b 

1 ***(a) gestures towards the centre of front seats***
2
3 S1: Can you put it the::ere?
4 Mum: Well, as you can see, you can't. It's not big enough-it's too big.
5
6 ***(b) Pointing towards centre***

As the extract continues, the child's request does not necessarily help the situation, as the child indicates an area (Fig a) in the car where it is not actually feasible to place the laptop. The mother's proximity and knowledge of the space starts to say that the space is not big

enough to fit the big laptop. The mother does so by indicating to the space, looking down, and verbally indicating to two things in line 4. By referring to "it", she refers to the space where the child is gesturing too as *"not big enough"* and second, in her repair, she also refers to the laptop as "it" being *"too big"* (Line 4).

In the car, we see that both spatial constraints of the car's interiors and the form of the artefact in question can further make the activity of watching together quite challenging. We see a very good example of how cars are not always configured for the use of all devices. Devices that could be used quite comfortably elsewhere seem to be unwieldy and cumbersome in the car. Another aspect highlighted in this extract and follows with others (Laurier et al., 2008) is the idea of dead spaces in the car. Here both parents and children refer to floor space where devices cannot be accommodated and the lack of access leads to the creation of dead spaces. The armrest is a good example of creating some useful features to support interaction in the car. It provides room for leaning over or space to hold a cup, but it is not necessarily designed to support shared technology use.

In both examples of F1 and F4, it is observed that over the course of setting up joint activity, particular interactional problems may be encountered that may be attributed to social issues such as sharing or the spatial organisation of the activity. Over the course of the sequences, it is observed how such constraints lead to disputes about turn-taking, abilities and positioning in carrying out the activity. The next section goes further into discussing how the prevailing arguments are worked through within resources available to the family.

5.2.4 Resolving Disputes within Device Distribution

When encountering difficult situations within everyday family life, there often opens up spaces for arguments between children and complaints to arise from difficult behaviour (Laforest, 2002). Children getting into arguments and disputes are a regular feature of everyday family life seen . In the car, this is exacerbated by the fact that parents and children are separated by forward-facing seats. Parents sometimes find themselves stuck between a difficult situation with children arguing in the backseat. This is a result of both from the issues and limitations from the technology itself as well as the lack of alternate options to resolve constraints (e.g. leave a moving car or separate the children). Parents may regularly intervene such that the interactional climate is restored.

This may lead to the develop of small disputes between children and therefore require that parents need to intervene to solve the problem. First, we turn to F4 to observe what happens in the interaction with the crossword puzzle.

Extract 16.6 : Anagram

a b c d

```
Mum: I don’t understand what it’s [asking me to do
S1 :                               [He sa-,
                                      ↓
                               (a)Leans forward to grab puzzle
(b)Pulls puzzle towards himself
    ⌐────┴────¬
S2: Stop snatching!=

   (c)turns back and looks at S1
        ⌐───────┴───────¬
Mum: =↑Is it an Anagram? Is that what it is?=
                                      (d)Points towards S2
                             ⌐─────────────────┴─────────────────¬
S1 : =no, it’s letter skills. S2 keeps saying that[it’s SNOOZE.
```

The situation continues following the mother’s return of the puzzle (Extract 16.5) to the younger child in the backseat. The mother has been unable to help with the game as she admits she is not clear about what the game requires. At this moment, S1 attempts to retrieve his device back from S2, which causes the latter to get upset (Line 7). Now the older child is engaged in a tug of war with the younger child, trying to regain access to the device. The mother looks towards the backseat while trying to stay focused on clarifying what the game is. The mother’s attempt here is seen as a neutral way of addressing the dispute by focusing on the part where she can help rather than feeding the dispute. The older child responds with the name of the game, but brings the issue of S2’s failure to make a correct guess the mother’s attention. He describes to her, the younger brother’s unsuccessful efforts in the game (Line 14). The complaint is that the younger child is doing something that perhaps should not be done in the game: *“S2 keeps saying it’s SNOOZE”*. Children’s disputes often involve blaming siblings or other peers with the source of the dispute. Here we see that the orientation of the complaint is such that it is directed at a third-party (Drew and Walker, 2009) where the child is complaining to his mother about the behaviour of S2.

In many instances of everyday family life children often get into disputes over sharing items of play. However, parents may try to verbally deal with the issue or when necessary, physically intervene by separating children in different spaces. In the car, this is a

challenging situation as parents are neither able to physically intervene nor have the alternative to leave the car or separate the children. Hence, parents attempt to verbally intervene and restore peace while trying to work through the concerns of the situation. Even before S1 finishes his complaint, we see that both parents attempt to intervene to prevent the situation from spiralling into a full blown dispute between the children.

Extract 16.7: Anagram Continued

a

b


c

d


```
Dad:[S2, look! [S2..Look out the window
Mum:           [↑Look S2 it's an Argos truck!

                                   (a)Looking outside at truck
S1 : (looks outside while holding hand out towards S2)
S2 : (looks up at truck)

S1 : (c) reaches out to grab puzzle      Ple::ase give it    (d)reaches inside bag
S2  : (c) retains hold of puzzle                                 for something

Mum:                                    S2, give it back. [Give it back.
Dad:                                                       [Looked 'lot like yours.
S2 : Can I-
S1 : Noooooo
Dad: S1.
```

e

f

g


```
S1: But I. But I asked mum..
                                                   (f)turns behind to S2 with
                                                       phone from her bag
                (e)
Mum:  takes a phone    Do you want to play bounce tales? S1? Bounce tales?
        out
Dad:                                                  (f) reaches below and takes his phone
S1 : Yay! I'll play bounce tales instead.

                (g)S2 throws the device back to S1
```

The extract opens with a statement from the father who has so far been silently driving without getting involved in the dispute in the backseat. He attempts to steps in to divert the child's attention by drawing attention to an object in the outside environment (Line 1). This is further upgraded by the mother who adds to the father's comment as they both spot

an Argos truck outside the car/ one that they both know will capture S2's attention. The father's interception arises from being a witness of the dispute that is on-going is intended to prevent the situation from deteriorating further (Laforest, 2009). This is a thoughtful approach adopted by parents in order to divert attention from disputes. At this point we observe that everyone's attention is diverted to look at the blue Argos truck outside. S1 uses this moment of distraction to lean across and grab the puzzle from his brother (Fig c). However, this action does not fully achieve the desired goal of getting the younger child to relinquish hold of the device. This follows a request by the older brother to S2 to give it back. This request is further upgraded by the mother who asks S2 to give the device back. While doing so, she starts to initiate another activity of searching her handbag for something. We see that the parents are together trying to accomplish the same goal-to get the children to remain free from fighting, but approaching the issue from different sets of resources.

The father being the one driving, is unable to directly intervene in the backseat. However, he contributes to resolve the issue in trying to offer his own phone as an alternative distraction (Fig f). This is seen as an extension of similar family efforts to produce co-operation in the home with regarding to activities such as family meal times where parents may encourage children not to fight over food or to eat in an appropriate manner (Busch, 2012). Their shared efforts similar to previous examples, point to the familiarity with the child's interests and drawing on their own parenting resources. When the child still does not return the device, the mother firmly tells S2 to return the device (Line 11). Her verbal intervention here is seen as a move to restore order back in the social situation of sharing (Busch, 2012). The older son's second attempt to grab the device (Fig c) and the father's admonishment (Line 15) provides us with the indication that her directive has not worked. What follows this is her action of rummaging through her purse and retrieving her phone to offer a second distraction with an offer of playing another game on this instead.

What is to be noted here is the *immediacy* with which these actions are accomplished. While in the car, parents cannot wait out a dispute; dealing with it calls for an immediate response, or here, as we see, a number of responses, before the situation can be resolved. In this manner, we see the joint work of parents in dissipating disputes around devices in the car. We also notice how the mother's offer of *'bounce tales'* is made in order to draw attention away from the puzzle.

It also reveals a sense of how disputes may be worked through using the resources of parenting and points to the practical actions of diverting attention through distraction (calling attention to the outside) and alternatives (offers of a different entertainment media).

Similarly, with the next family, we observe that the children have not been able to resolve the issue of where to place the laptop. This leads to a situation where the mother blames the lack of alternative devices to address the issue.

Extract 17.6: Should have brought the Blackberry

a  b  c 

```
1                                                    (a) turns to back seat and points to S2)
2
3   Mum : Oh in that case you can't share.(.)I told you to bring your- your Blackberry, didn't
4   I?
5   S2 : It's not mine.
6   Mum: =[Well I told you to bring the
7   Dad: =[That's not the point-you should have
8   Mum: =T-to bring the blackberry. You didn't bring it, so it has to go back on your lap.
9   (.)and S2, go to sleep.
10  S2 : [No..
11  S1 : [S2, just put it on your lap
```

d  e 

```
12  Mum : And how about you?
13  S1  : °I'll go to sleep° ((turns head towards window))
14  S2  : (b)reaches down for the laptop and places it on his lap
15          (c) looking at S2
16
17  Mum: S2-you think that's right?
18  S2 : What?
19
20  (d) looks up and smiles
21  Mum: ((e)Turns away toward front with a disappointed look)
```

The extract continues on from the child's complaint that the positioning of the laptop on the car floor. The mother here states responds to this by saying that the children cannot share in the current situation. Often this is the case in the car, where access to artefacts is not immediately available and resources must be adjusted to what is available. The parent's resigned response to the situation here shows her frustration after having tried several options to help resolve the situation. Closely followed by this, she draws attention to S2's

error in not bringing another device, “the Blackberry”, as a way of explaining that the shared nature of the activity could have been avoided.

The younger son here comes up with a quick comeback to the parent (Line 5), that it was not ‘his’ device. The emphasis on ‘mine’ in the child’s statement highlights that because he does not have ownership over it, he cannot be held responsible for not having brought it. He is therefore distancing himself from the blame. At this point, both mother and father step in. The father who has not contributed so far, points out that the ownership was not the issue of concern here. The mother’s statement is a reiteration of her earlier statement that the child should have brought the device. Similar to the other family (F4), at significant points of family disputes even in the home, both parents may join in to help alleviate a difficult situation when children’s disputes are involved. The parents are both focusing on the fact that the error was in not bringing the other device. The mother is unable to help with the situation because she is unable to provide a solution to re-position the device nor able to provide an alternate device.

In line 8, the mother’s only solution is to suggest a bargaining tactic such that each child is able to do something different such that the scope for further disputes is reduced. Here she offers a seemingly ‘fair’ solution. Recognising that it was the older son who was watching the movie first, she suggests that he should be the one to continue, while the younger brother goes to sleep. This too, is met with some dispute, as the younger child starts to protest and is not willing to give up on the activity (Line 10). Finally, the older child gives in and says he will go to sleep while his younger brother can watch (Line 11). S2 gladly picks up the laptop and continues to watch it. The mother turns at this point and questions S2’s action, asking if it’s fair to take the laptop. To this, the younger child (nonchalantly) smiles. From the mother’s expression when she turns back, it is visibly clear that she is not pleased with the outcome. Sharing and turn taking on devices are common reasons for dispute in families (Davidson, 2010) and are often magnified in the car because in the car, children are restricted by the need to make use of what local resources are available.

As seen in the resolution of issues across both situations, families are not always able to arrive at a decision that will benefit both sides. Parents are seen to intervene by providing alternatives, resort to bargaining in order that peace in maintained in the back seat. In engaging with the resolution of disputes, parents are required that to address children’s concerns swiftly and pursue viable alternatives. Often parents have to make fair decisions

in dealing with disputes. In both examples, parents usually ensured that the child who was first using the device has priority over deciding how and with whom to share it.

5.2.5 Discussion

In all the extracts discussed in the chapter, the focus is on how device use is prompts the supporting of joint activity between children in the backseat.

First, it is observed that the getting children to jointly use devices of in the backseat is strongly shaped by the material context of the car and the placement of the children within the interaction. Depending on who has access to the device, the collaborative nature of the activity and the situated and sequential nature of the interaction influences the ongoing collaborative activity. In both examples, the older child was using the devices alone while they were encouraged to involve the participation of the younger child. Once re-configured to a joint activity, participants must adapt their interactions have to also be adapted to the particular form and shape of artefacts. For example, both extracts involved that the children needed to lean in and form a huddle while they maintained focused attention. In this case the form of the device also has some bearing in sustaining the focus. Similar to game play in the home, parents are directly involved in helping support device use (Danby et al., 2013) and accommodating turn-taking (Davidson, 2010). Some devices are easier to share than others, because of their screen size. Parents may or may not be able to physically intervene in the backseat, but when this is not possible, they are seen to verbally instruct and encourage actions that support joint use between children (See Extracts 17.1 and 17.2).

Second, as the activity unfolds, sharing a device together provides an opportunity for the children to engage in a ‘focused interaction’ wherein participants mutually orient to each other through talk and action. The backseat of the car enables child passengers to be engaged in a sustained form of interaction. The activity of play together as a family presents unique opportunities and limitations to parents and children in the car. For example, some instances can be supported with more involvement from family members than others. Proximity to the participants is an integral feature of being able to initiate and sustain an activity as well as make one’s actions visible to the other which is an important concern in game play (Goodwin, 2000). In the back seat, we observe that the child passengers are placed close to each other and can therefore engage in activities together. At the same time, parents who are non-driving passengers also involve themselves in

facilitating in supporting the running of these activities. These activities also have an expectancy of mutual co-operation in achieving a joint activity (Goodwin and Cekaite, 2013). In the examples presented, children are expected to accommodate and adjust to each other. Parents seem to facilitate this either by direct involvement as in the first family where the mother explicitly asks the child to allow his brother a turn. Here we observed older siblings supporting and taking the lead in helping younger siblings understand what needs to be done in a game. Parents draw on their resources of being parents to tell them 'how' to play together and monitor their behaviour. Parents may jointly direct ways in which children should behave.

Third, because of carrying out joint play activities, there are instances where child passengers can get into disputes over devices. These disputes may be the result of technological limitations such as the screen of a shared device being too small or the interaction of such factors with the material environment with the car. For instance, the example of the laptop, which was too large to fit in the back seat, which was then arranged on the armrest. Despite locating this position, it still was prone to instability because of the movement of the car. Such factors bear on the interactions between passengers, resulting in friction between and susceptibility for fights. The car's limitation as a mobile space is also highlighted as children cannot simply 'leave' the car or find another device to play with. In turn, they find ways of working around these constraints.

Fourth and finally, dealing with disputes over device use seems to be something that parents have to do even in the car. Unlike other contexts, disputes needs to be dealt with immediately, often with the support of both parents. Parents are observed to draw on past experience and knowledge of children's biographies that enable them to know what would to offer as a way out of the dispute. More importantly, parents need to make fair assessment of alternatives so that children do not get into further dispute (Laforest, 2009). In other instances such as the case of the laptop, there are often no mutually beneficial alternatives, where parents then have to agree. Further parents also jointly mobilise their resources such as providing alternatives in the case of F4 where the parents quickly offered their devices to resolve the issue.

While this chapter has solely focused on activities carried out jointly in the backseat, the next chapter turns attention to how front seat activities may be initiated and sustained between parent-drivers and child passengers.

5.3 Navigation as a front seat family activity

Apart from providing entertainment for children, technology use in the car can have an important bearing on the driving itself. Navigating using a SatNav Device is understood to be a common reason for technology use in the car (Leshed et al., 2008, Brown and Laurier, 2012). In this section, I discuss navigation as a collaborative activity that can take place between parent-child units. Contrasting with the previous examples of entertainment device use, the activity of assisting in navigation is governed by the fact that it is aimed to help the driver get to a particular location. However, this does not mean that navigation in real-life driving happens in a pre-planned, mechanical way. Instead, in keeping with other ethnographic findings (e.g. Brown and Laurier, 2012, Haddington, 2012), the data demonstrates how navigation is usually seen as a peripheral activity to driving. As a result, drivers and passengers may be otherwise engaged in talk, play, or simply driving when navigation is occasioned.

Currently, there is very little information on how navigation is constructed as activity between parents and children. However, in the current data corpus, children were seen as assistive, front-seat passengers in supporting the parent's use of mobile phones to navigate. One explanation for this is children's increasing familiarity with a range of technologies that has made it possible for them to use technology for navigational activities. At the same time, the navigational activity is also an opportunity for children to learn skills of map reading and assisting. While handling devices may be fairly unproblematic for children, navigation requires a very particular set of skills around spatial and temporal reasoning while being mobile that can be challenging for children (Bell, 2002). The data presented in this chapter will describe the construction of collaborative navigation as an activity while showing the concerns associated with such activity.

A limited number of studies have reported on how navigation is carried out using mobile phones in the car as largely, navigation has been seen in using maps (Brown and Laurier, 2005) or an independent GPS device (Leshed et al., 2008, Brown and Laurier, 2012). The use of mobile phones for way-finding is becoming increasingly popular as phone functions extend beyond the making and receiving of phone calls but also support navigational purposes (Line et al., 2011, Brown et al., 2013). The examples presented for analysis in this chapter focus on navigation-centred instructions and are produced while using mobile phones. Navigating with children is a motivating activity to study as it is the one activity that places emphasis on combining what goes on in the inside the car with the outside

environment. In navigation, both the driver as well as the navigator must work together in order to pay attention to the progress of instructions on the device whilst remaining aware what is going on outside. Wayfinding as a social activity involves drivers and passengers engaging in extended periods of interaction about ongoing route planning as well as coordinated recognition of upcoming junctions (Haddington, 2012, Laurier et al., 2012).

Navigating using technology can be particularly problematic for drivers and co-passengers- for various reasons. As Brown and Laurier (2012) suggest: *"A GPS offers a very particular form of 'instructed action".* By this, they suggest that while driving, drivers must not only listen to the instructions given by the GPS, but also understand these instructions in relation to the car's position in the moving environment. In order to follow instructions drivers must also pay heed to the sequential arrangement of instructions. More so when there is the added presence of a navigator who acts as a link between the device and the driver, their instructions and interpretations of the instructions must be taken into consideration. Therefore, navigation is seen to be a socially constructed activity, where drivers and passengers jointly make each other's actions recognisable. Their responses and actions are negotiated throughout the on-going activity (Haddington et al., 2013).

In the data, the production of navigation places emphasis on all the following elements: the role of the technological artefact (in this case the mobile phone), the enactment of instructions through talk and embodied action, the temporal relevance of navigation, and sustained engagement with the environment.

First, I focus on how the mobile phone is used as a tool for co-navigation in the context of family journeys. Within this, there are three key issues I will highlight through the data.

- The first issue relates to the role and relevance of the phone in shaping the activity of navigation between family members over the course of a journey. In the instances of collaborative navigation seen here, children are involved in the activity with little preparation and the handing over of devices occurs without much warning.
- The second issue is that navigating while using a phone requires that the activity is set up and configured properly in order that the child navigator may be able to carry out the supportive role of navigation. This means that first, the child needs to disengage from any activity he or she may be engaged in and second, the phone's features need to be set up for the activity (e.g. opening the Google Maps application for navigation), for which the parent is usually the one who sets up this activity.

- The third issue is that navigation requires the careful coordination of actions and talk between the device, the navigator and the driver. The screen is not consistently available throughout the navigation. This may lead to disputes and errors while discussing instructions. Hence, the parent and child must frequently confer with each other to see if they are both on the right track: the child with reading, comprehending and relaying the instructions and the mother with following the instructions.

The second point made is that constructing the navigational sequence between parent-child dyads presents several opportunities for constructing embodied directives and instructions. Giving and following instructions in conversation is commonly observed parent-child interactions in the home (Craven and Potter, 2010, Kent, 2012b) and driving instructor-student driver interactions during driving lessons (Mondada, 2011). In the family car, both families in this chapter comprise of relatively young children who assist parents. The child does not necessarily immediately pick up cues for when to initiate a navigation sequence. Both parents and children must take turns at instructing the other on the progress and timing of navigational steps. The mobile context of the car establishes a more embodied approach to applying instructions to refer to the temporal and spatial positioning of the car and its occupants.

As a third point, the temporal organisation of the turns and actions are key part in making sense of the organisation of interactional work involved in navigation. Paying attention to the sequence of actions is necessary in completing activities such as reading maps (Brown and Laurier, 2005), assembling instructions (Garfinkel, 2002b), and following recipes (Mondada, 2014a). More so, the importance of temporality in the sequential organisation of navigational assistance brings focus to the fact that activities are closely linked to each other. This emphasises the timeliness in communicating directions so that parents can work out their driving. At the same time, children must be sensitised to look for environmental cues to enable them to prepare for the upcoming turns.

The extracts presented in this chapter are from two different families. Both families in the examples use the mobile phone extensively in the car, both for making calls and for navigating. The data presented here, includes two journeys of the mother-daughter dyad from F10 using the phone to navigate. Another set of extracts follow the mother-daughter pair from F6 is using her mobile phone as a prompt to read a message with directions to a spot inside a campsite. She has an in-car GPS running in the car, but does not use it because they are within a campsite: an area with no navigational map coverage.

5.3.1 Mobile Phone as a situated resource in navigation

In the examples presented here, navigation is carried out using the support of mobile phones emphasising its role in managing the on-going navigation. As a situated resource, the mobile phone bears important relevance to the initiation and progression of navigation as well as supporting the communication of instructions between co-navigators (Reilly et al., 2009). Past work examining pairs of individuals navigating with mobile phones (Reilly et al., 2009) indicated the importance of social interaction and participants' orientation to the device in managing the navigation. To start with, the set up is done in a careful and purposeful way and is then handed over to the co-navigator to support the navigation. In the family data that follows, we observe how parents offer the phone to children as a resource to provide instructions for navigation. Over the course of navigation, the phone acts as a particular reference point, one that enables both drivers and co-navigators the opportunity to study the progression of the journey.

Occasioning a navigation request

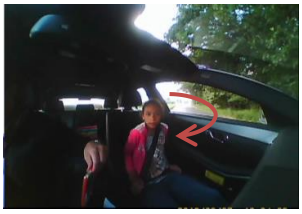
In gaining the support or assistance of someone to help with an activity, one usually asks for help by way of making a request. The car is a place where a driver can reasonably seek the help of a front passenger without much explanation because of the importance placed on the driving activity. Co-passengers usually cooperate and step in to provide assistance to support wayfinding (Perterer et al., 2013) or answer a phone call when they are driving (Haddington and Rauniomaa, 2011). Parent-child pairs are an interesting front seat configuration, as child front seat passengers usually engage in driving supported activities only when they are explicitly asked to do so. This is probably due to the nature of parent-child interactions outside the car as well. In the home, parent-child interactions largely comprise of directives, which involve asking children to comply with instructions to tidy up or move from one activity to the next (Cekaite, 2010, Aronsson and Cekaite, 2011).

During the handover, the analysis also focuses on both the speaker and initiator of the interaction, as well as the response of the recipient. The initiation of the activity happens swiftly over the course of driving or talking and therefore both participants in the interaction must cope with the demands placed on them. The parent who is driving must choose a relevant time to initiate the navigation and the child who is prompted with the navigation request must cope with the sudden demands placed on them. We turn to the first

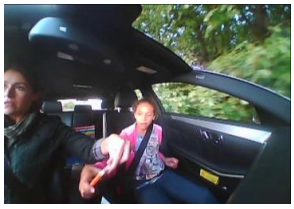
example from F6[9] where the mother-daughter pair are re-tracing their journey back to a campsite.

Description: The mother-daughter pair (D, aged 9 years) have been driving to a camping site where the daughter is meeting with friends. At this point in the journey, the two have left the campsite after an unsuccessful attempt of spending 15 mins in locating their friends inside it. The mother stops by the side of the road and prepares by consulting her phone while they re-route back. This time, the mother instructs her daughter to read the instructions from a message on her phone as she wants moment-by moment directions. In the background, there is in-Car GPS announcing directions (it is not being used for navigation) and music running from the radio.

Extract 18.1: Here's My Phone

a  b 

```
1       (Music running in background)
2                    (a)turns car around
3
4  →    Mum: Right and you're going to direct me.
5       0.8
6       D  : Oh (.) Ok.
7
8
9  →       (b) turns from window towards front
```

c  d 

```
10      (c)lifts phone and     d)Hands phone over
11        glances at screen      to her daughter
12
13      Mum: So, there's me' phone
14
15      D :(c)reaches for phone (d)takes phone from mum
```

At the point where this extract opens, the mother has decided to re-trace the route back to the campsite. The exchange above involves the mother's delegation of the navigation work to her daughter to assist her with the navigation. This is done while the parent turns the car

[9] F6: This family of four decribed themselves as highly reliant on technology. Both parents had iPhones and iPods in the car. The children (aged 6 and 8 years) each carried their own iPads and DS in the car. The children often travelled in the front when the father was not travelling with them. The mother typically relied on the car GPS, in this particular journey, the mother is reading directions from a phone message.
D-Daughter

around to position the route back towards the campsite. She starts her sentence with the imperative *"And you're going to direct me"* (Line 4). At that point, the mother is attending to the outside environment of oncoming traffic while trying to turn the car around. The sentence is conveyed in a way as to indicate that the child here is not really being asked to do something but is instead delegated to assist the mother. This catches the daughter's attention when the *"you"* is clearly referring to the child here, as there is no one else travelling with them. At that point, the child turns from looking outside the window towards the front of the car (Fig b) and responds to the mother's statement rather weakly with "*Oh ok"* in line 6. One reason for this could be that she is taken by surprise. This is observed by the focus of the child's attention shifting from outside the window to the front of the car when she hears her mother. While the child makes the action of turning around, the mother quickly reaches in the middle to retrieve her phone (Fig b) child, who is prepared and anticipating the handover (Fig c).

The way in which the mother holds the phone upward shows that she wants to first check the screen before passing it on. While holding the phone in the air, she also indicates to her child that the phone will be passed on to her as seen in the statement to the child in line 13: *"there's me phone"*. In doing so, she is indicating to the device (mobile phone) through which the child is going to direct her mother to the destination. This is important to note here as will be seen later in the interaction, for understanding how both parents and children orient to it in order to navigate efficiently.

Next, I turn to two examples from F10 [10] to demonstrate how the mother involves her older daughter in several occasions to support navigation. This is one of several observed instances of this family.

Description: The family of three, mother along with her daughters (aged 9 and 5 years) are travelling to an infrequent destination. After about 10 mins into the journey, the mother requests her older daughter to help her with assisting in navigation using her mobile phone. There is very loud music going on in the background.

[10] F10: This family consisted of a single mother and two daughters. The family used technology extensively in the car: the mother frequently used her iPhone for navigational assistance and both children used tablets, DS and iPods on both long and short journeys. Both daughters took turns travelling in the front with the mother. In the extracts presented here, her older daughter is travelling in the front with her. She is frequently asked to support her mother in navigation.
D1- Elder daughter D2-younger daughter

Extract 19.1 : Put that down

a  b  c 

```
1     (a) Reaching for phone  (b)looks up at road ahead while reaching in front
2
3     Mum: Can you put that [down and do this please?
4                           ↑
5     D1 :                  (b) looks up at the action
6     Mum: (c) continues reaching for mobile phone
7     D1 : (c)reaching out to receive phone
```

In the above extract, the mother forms the request to the daughter while simultaneously reaching out to take the phone (Fig a). At the same time, the child's attention is directed towards the iPod on her lap. When the mother forms her request, she seems to be aware that the child's attention is focused elsewhere, as she verbally asks her daughter *"Can you put that down"*. In line 3 we understand that "that" refers to the iPod. We understand it because of its placement within the talk as an indication to leave one activity and start another. The second part of the mother's request to *"do this please"* is presented while the mother's hand is reaching for the phone indicating that the *"this"* in fact refers to the phone that the mother is reaching for (Fig b). The use of this deictic term 'this' here is made meaningful through the mother's action of reaching towards the dashboard (Streeck, 2009).This seems to have its desired effect, as the child immediately looks up even before her mother fully completes her request. Her gaze is then drawn to the mother's focus of attention, which is the dashboard where she is trying to retrieve her phone (Fig b).

Once they establish their mutual focus of attention, the daughter leans slightly forward and couples this with an extension of her hand towards the direction of her mother's action (Fig c) to show apparent willingness to do the activity. The immediacy with which she responds and the lack of questioning what *"do this"* in line 3 means, displays that this is a familiar activity. Similar to the first example, the parent here is not really giving the child a choice: the child is expected to leave her activity and assist the parent in navigating. The indication that the child needs to leave her activity is a reference to the mother's indication of her prerogative towards her child as her mother as well as a driver.

In the examples discussing the occasioning of navigation, what is noticeable is how co-participants engaged in navigation may be drawn into the task without much warning. In the two examples, the action of handing over the devices is integral to the initiating of co-

navigation. This usually involves the passenger's disengagement from one activity and engagement to the activity of navigation. A key observation in these examples is that the child must not only orient and prepare for the activity of navigation, but also towards the device which supports the activity. It further requires that attention turns to that of the task at hand rather than on any other involvements. Drawing children into co-navigation is done with familiarity. The manner in which it happens (overlooking politeness) is the taken for granted nature of family relations such that parents do not have to explain their actions and children do not need to wait for explanations.

In contrast, there are other instances of co-navigation for a journey where there is some comment from the child passenger before any attempt is made to initiate collaborative navigation. Usually this involves some kind of comment about the progress of the journey. Here we turn to another example of the same family (F10) to show how children are invited to assist in navigation.

Description: In example extract from F10, the child is the one to comment on the directions, which then leads up to her supporting the parent in navigation.

Extract 21.1: Do you know which way to go?

a 
b 

c 
d 

```
                 (a)looking towards front

D: Do you remember where we're supposed to go?
Mum: Pardon?
                    (c)Looks at mum

D: Do you remember which way to go?
Mum: I[ have-oooh
((car swerves in front))
D:    [now?
Mum: >I have it set on the SatNav<
Mum: >You can do it if you want<
Mum: (d) Reaches forward for her phone
D  : Ok.
```

In this extract, we observe that the child is the one to initiate the discussion about the progress of the journey. There is a reference made to the where the mother needs to go next. This could be prompted by the fact that they have now reached a junction and the car has slowed down (See Fig a). The child also poses the question while looking to the centre of the car console where the phone is kept, indicating that she may be already have noticed the phone. The mother does not hear the child's question at first and the child repeats

herself, this time looking towards the mother, clearly directing the speech towards her (Fig c).

The way in which the child asks the question is also interesting. Her question *"Do you remember which way to go"* may indicate that this is a route they have done before, and perhaps one that the mother has trouble remembering. Further as the navigation progresses, we observe that this is in fact the case. Consequently, the child's statement acts both as a prompt to orient to the device and as a reminder to the parent of the progression of the journey. This is not uncommon as the social nature of navigation prompts passengers to make references to upcoming turns and junctions to indicate their interest in the ongoing journey (Haddington et al., 2013). At first, there is a slight hesitation in the driver's response, which can be caused by the driver's simultaneous involvement in responding to a car swerving in front of them (line 9). However, the parent recovers swiftly and responds that she has set the Sat Nav (line 10).

While mentioning the Sat Nav, the parent quickly adds the suggestion of the daughter assisting (line 11). Although the mother's statement ends with *"if you want"*, leaving it open to the child, the mother does not wait for her affirmation. She quickly extends forward to retrieve the phone (fig d). By doing this, the mother expressing her desire to include the child in the navigational assistance and that she welcomes her support. This action coincides with the child's acceptance in line 14. This example contrasts with the others in the sense that there is some conversational exchange before engaging the child passenger in the navigational activity. At the same time similar to the other examples, there is the dispensing of detailed talk or waits for confirmation before the activity of co-navigation is started.

Configuring the device for navigation

The next aspect that is integral to navigation using a mobile device is accurately setting up the device in the correct layout in order for the smooth running of navigational tasks. Where the technology is concerned, the mobile phone does not also have the same default interface layout as a SatNav unit. As the phone here is a doubling up as a navigation device, the features must be adjusted in order to cope with the demands of navigation. On the interactional side, children need to understand how and when features within the device need to be oriented to. This often requires that during the handover of the device to the child, parents may need to confer with the child and check the device to ensure that it is

configured to effectively support navigation. In the first example, we turn to F10 where the mother is preparing the phone for her daughter.

This extract follows the earlier request (Extract 21.1) of the mother asking her child to disengage from one activity (playing on the iPod) and assist with the activity of supporting navigation.

Extract 19.2: Take This

a  b  c  d 

```
1    Mum : (a)Takes phone to herself
2    D1  : (a)starts to close iPod
3    D1  : (b)holds hand to receive phone
4          (b) looks down at phone
5          ┌──────┴──────┐
6    Mum : No- (Not yet)
7    ((29 secs pass, during which the mother is setting up the navigation)
8    Mum: °Take this°, >don't touch the screen<
9          └──────┬──────┘ └──────┬──────┘
10   (c) extends phone towards child   (d)hands phone to child
```

The transition from one activity to another does not happen quickly. Instead, the mother has to finish setting up the phone for navigation before handing it over. The mother's actions allows the child to effectively bring to a close her own activity before turning to the next one (Fig a). Her action of shutting down the iPod takes a shorter span of time as she then turns her attention back to her mother who is still operating her phone. The child is seen to display her readiness to accept the phone by extending her hand in Fig b. At this point, the mother says what sounds like "not yet" and through her actions, is it visible that she is not yet ready to relinquish hold over the phone. The activity of setting up navigation is made complex as the mother is doing this while driving, and she must pay attention to both the road as well as the screen simultaneously. Over the gap of nearly half a minute (line 7), the mother cautiously divides her attention between the screen and the road at timely periods so that she can effectively set it up.

Moving on, what is interesting is how the hand over is carried out. On completing the set up, the mother extends the device over to the child explicitly instructs on two things: she tells the child to "take" the phone and closely linked to this, she explicitly supports her action with an instruction to the child in line 8 saying *"Do not touch the screen"* when the device is handed over to her. At the same time, the way she presents the phone shows that the mother is being careful not to touch the screen (Fig. c). After her careful set up of the

navigation, having it disrupted would be problematic. One explanation for this is that while interacting with a touchscreen device, the act of touching the screen may be seen as being problematic and associated with errors in navigating or altering the location of the positioning of the car in relation to the navigation (Haywood and Boguslawski, 2009). As a frequent user and the fact that this is the mother's phone, the mother may already have knowledge of this. The child on the other hand is the novice and therefore requires some instruction on how to carefully manage the device. The parent is seen issuing a directive to the child while at the same time; she is also educating her on how she should hold a touch screen device while navigating. Other researchers (Brown and Laurier, 2012) have similarly pointed out that Sat Navs can be educating the driver about routes and the environment. Here the data goes further to indicate that the SatNav can have educational value for passengers as well.

Next, we return to other journey of the same mother-child pair from F10 where the parent identifies an issue with how the phone is set up.

Description: This follows extract 21.1 where the mother has invited her child to assist her in the navigational activity. Once she has secured her cooperation, the mother hands the phone over to the child. During this handover, she realises that some adjustment has to be made to the phone.

Extract 21.2: Too Zoomed in

a  b  c 

```
1   ((mum has just handed over the phone to her daughter))
2    (a) Looks over at phone     (b) reaches back towards phone
3
4   Mum: Is that- Noo.
5   D  : Yes it is.
6   (c)takes phone back
7
8   Mum: No-
9   Mum: °Too zoomed in°
10
11  (d) operates phone on right side as car comes to a halt
12
13  D  : Pardon?
14                  (e) lifts phone up and shifts it to left hand
15
16  Mum: >°Too zoomed in°< that's better
17          (f) passes phone to daughter
18
19  Mum: >Don't touch the screen<.
20
21  D  :      (g)receives phone from mother))
22  D  : That's where it was a minute ago.
23  Mum: No-it was much further.
```

d  e  f 

This extract has followed the mother's invitation for the child to help her navigate in extract: 21.1. At the start of this extract, the mother has just opened the application and passed on the device to her daughter. Just as she completes the action of handing over, she briefly looks over to the screen (Fig a) and seems to hesitate for a moment (noted by her repair in line 4), before reaching out to take the phone from her daughter's hands (Fig b). Her hesitation is visible as her hand is still mid-air (Fig a), indicating a sudden change in the course of action, while she reaches out to take her phone back again. The mother does not explicitly say what the issue is, but seems to recognise something that the child has not identified.

The child seems to contradict the mother in line 8 saying *"Yes it is*", here it is not clear what *'it'* refers to. The mother however, overlooks the child's observation and continues to reach across for the phone, while maintaining her focus on the road (Fig b). At this point, the mother has to make a careful manoeuvre as she maintains her right hand on the steering wheel while using her left hand to balance the phone (Fig c). The car then approaches a build-up of traffic, which enables her to stop and operate the phone (Figs d & e). In this sequence of actions, we see that setting up navigation on a mobile phone while driving is quite challenging in a moving car. The timing of the car's stationary position coincides well with operating the phone. This is similar to examples of mobile phone use in the car where drivers are able to adjust their speech and attention to coordinate to road conditions (Esbjörnsson et al., 2007).

In line 9, there is a clearer indication for why the mother takes the phone back to herself. The mother points out that the screen is *"too zoomed in"* as a response to the child's earlier counter statement. We can understand that this pertains to the configuration of the layout of the application, which needs to be adjusted, as it is part of the set-up of navigational activity. She says so in a low volume, indicating that she may not find it necessary for her comment to be heard by the child anyway, given that she is engaged in producing the actions to rectify the view. The child misses this and asks the mother to repeat her comment. The mother repeats her comment again in a low volume and much quicker, but with the added observation that *"that's better"* in line 16 and the action of moving the

phone up towards the child (Fig e). The mother's reason for glossing over this with the child could be that she wants to just get on with the activity of fixing the view as well as the fact that she must make the best of the traffic build-up.

Again, she supports her action with a warning to the child not to touch the screen (line 19). On receiving the phone, the child disputes this as she points out: *"That's where it was a minute ago"*. A possible reason for this could be that she is not used to adjusting the screen to the needs of navigation. In the examples so far, the preparation for navigation includes an initial set-up of the device by the parent before handing it over to the child. The parent as a driver and the owner of the phone, seems to know exactly how they would want to refer to the device and prepare it in the way it was required.

In both extracts, we see how navigation is set up on the phone before the child can provide supportive help. This involves orientation to the phone's features and setting up of the appropriate layout by the parent. It also involves the mother explicitly telling the child what not to do: *'Don't touch the screen'* as an almost automatic instruction given to the child when the phone is passed over. This is a direct reference to how the device must be used in order that it can support the navigational activity. The setting up by the parent clearly indicates their ownership of the device, familiarity with its layout and functions. Another aspect that is important to mention is the comparison of the orientation towards physical maps and virtual maps as is seen here. While the physical maps are fixed in the positioning (Brown and Laurier, 2005), the virtual maps in contrast are prone to changes in layout because the view is updated based on the progress of the car.

Disputes and Correcting Errors in Navigational Progress

Once handed over to the navigator, both driver and navigator confer with each other in order to check the progression throughout the course of navigation. Collaborative navigation involves a three-step process: reading instructions, comprehending them and then conveying them to the driver. Issues in any of these aspects may lead to disputes over turns and instructions. Navigational instructions must be synchronised to the changing environment outside the car. At the same time, child navigators are not always sensitised to both conditions as they may be focused on interpreting the information on the screen. Here in the following examples, parents and children appear to disagree on upcoming directions. In the first case, from F6, this is because the child misreads the directions.

Description: The child has just read out a sequence of instructions that confuses the parent (Refer Extract 18.6). This then requires the parent to reach across and consult with the phone herself.

Extract 18.2: Wait Until the Bridge

a  b  c 

```
1   (a) Looks at rear-view mirror while                    (c) Tilts her head towards daughter,
2        reaching for phone from Daughter                      her rolls eyes and moves phone mid-air
3
4                (b) Purses her lips while looking at screen
5
6   Mum:     (1.4)  Mhmm..>Follow the road down< under a bridge and then over a bridge=
7   D  : =Oh
8
9   (d) receives phone from mother
10  (d) hands phone over to daughter  (e) points finger to indicate instruction
11
12  Mum: = then it's first left, so wait till I go over the bridge
13
14  D  : (d) receives phone          (e) looks at screen
15  D  : Uhh..over the bridge
16
17  (f) looks up towards the front of road ahead
```

d  e  f 

In this extract, the parent is has just terminated an on-going navigational sequence due to the fact that the child has provided convoluted instructions (See Extract 18.6). The mother takes the matter into her own hands by reaching out to clarify the doubt in navigation by referring to the device directly. In doing so, she is also being a responsible driver by checking the rear-view mirror to look for cars behind her (Fig a). While then shifting her focus to the phone, she indicates frustration as seen in the pursing of her lips (Fig b) while she reads the directions on the screen. Her frustration may stem from the child's inability to convey the directions properly as well as mounted by the fact that they have been unsuccessfully navigating the campsite for a while now. On receiving the device, she reads the instructions aloud to understand where the child left off (Line 6). During this time, the child's attention is focused on what the mother is doing (Fig b) in the expectancy of the next sequence of actions or expecting that the mother will return the phone back.

It is interesting here that the mother reads the first part of the instructions at a quick pace (having already completed these actions). However, when reaching the part of the message that relates to the upcoming directions (Lines 6 & 12), the mother places emphasis on the impending actions. In doing this, the mother supports the instructions with a particular set of actions: a tilt of her head, her rolled eyes and moving the phone in the air (Fig c) to emphasise the mention of 'then' and stresses on 'over' to indicate the difference (Line 6). In the sequence of the directions, it becomes apparent that there are two bridges that are mentioned in the instructions, one that they need to go under and the second, which they need to go over (Line 6).

Once completing the action of consulting with the device and while passing the device back to the daughter, she further instructs the child on how to move forward with the instructions. She emphasises by placing intonation on particular aspects of her instruction to highlight the timing of the instructions effectively focusing on what the child needs to attend to. It is important to note that the words such as 'then' and 'wait' have time references to them, which children already have difficulty in following when they are accompanied by several sequence of actions (French and Nelson, 1985). She places emphasis through her intonation and her matching actions to highlight at which points the child needs to pay attention. Here they support the emphasis on the instructions to the child. Furthermore, the mother's modelling of the correct instructions is then followed by her explicit instruction to the child to "*Wait till I go over the bridge"* .

By doing this, the mother indicates to the child how the directions should be read *as well as* conveyed. The daughter responds with *'Oh'*, which can be understood as a realisation of what she, as a navigator did wrong while conveying the directions and that what the mother has told her is informative (Heritage, 1984). She receives the phone as the mother completes the directions in line 12 instructing her to "wait" until she goes over the bridge while pointing straight ahead bringing the instruction's relevance to the outside environment. The child receives the phone and continues reading the instructions, but changes her orientation slightly by looking up to check the road conditions (Fig f). This can be seen as an indication that the child is responding to her parent's instruction to keep sight of the bridge that will signpost the next instruction.

In the last example, there is a mismatch between what the child is reading from the message compared to what the parent expects to hear. Similarly, while navigating using live information from GPS and network based services such as Google Maps, child

navigators may be confused by what is displayed on the screen. In close resemblance to the earlier extract, this results in confusion regarding the car's progress, the environment and the navigator's interpretation of what they can view on the screen.

Description: In the extract below, the child is engaged in an 'out-loud' where she comments on an instruction on the mobile phone. Her question is not directed at the mother, but the device in general. Her exclamation then gains the attention of her mother who also looks to see what the child is referring to.

Extract 21.3: There's no Road

a  b  c  d 

```
GPS: At the roundabout take the second exit
          (a) Looking at screen, tilting head

D  : At the roundabout take the second exit.
                  (b) Looking at screen

D  : What?? Can't go that way, there's no road.
Mum: There ↑is.

D  :  (c) looks up at road ahead
(3.0)
                (d) Looking at screen

D  : Well this is not showing up.

Mum:                        (d) Looks towards screen
```

e  f  g 

```
        (e) holds phone towards mum

D  : Look no road

Mum:  (e)gazing at screen

GPS: At 800 meters [turn left
                         (f) Points straight ahead

D  :                   [Ooh..it's pointing straight forward
Mum: 'Cos the arrow is in front

                  (g)Indicates to pedestrian to pass
((Mum starts singing and daughter does not pursue conversation))
```

As the extract opens, the GPS announces an instruction about an upcoming roundabout. The child then goes on to repeat the same instruction while focusing her attention on the phone. From her exclamation, we can tell that she is closely following the progression of the car. In line 7, she seems to be questioning an instruction displayed on the device. We

can see this in her surprised expression (Fig b) and an out-loud declaring *"What?"* in line 3 while her gaze is fixed on the mobile phone screen. She seems to be engaging in a disagreement with the device as she disputes *"Can't go that way, there's no road"*. We know this because her talk is directed down at the device rather than to her mother (Fig b). Her mother, while listening to this exchange, counters her statement by saying *"There is"* in line 8. At this point, the mother has not looked at the screen, focusing instead on the road ahead.

On hearing the mother's response, the child looks up to confirm if her observation is correct. She then orients her observation of *'this'* in line 14 to what she refers to on the screen. By now, the child has raised the mother's interest as well as concern as the driver, prompting her to peer over to look at the screen (Fig e). This is further encouraged by the child's invitation to the mother to *"Look"* in line 19. She angles the screen towards her mother, inviting the mother's attention. We can understand this as the child possibly asking the mother, to confirm the observation as well as an opportunity for the child to justify her earlier point about the absence of a road.

Before any further exchange can take place between the two, the Satnav announces the next instruction interrupting the daughter's action (Line 23). At this point, we understand that there is probably a shift in the screen as this is marked by the child's changes and she seems to raise her voice as a sign of realisation. The 'Ooh' acts an exclamation indicating surprise, while acknowledging that something that some information has been provided or clarified. She expresses this realisation towards her mother by indicating to the device and gesticulating, *"it's pointing straight forward"* (Fig f). The mother responds to this in a matter of fact way, explaining that the arrow referred to the child as *"it"*, is in fact positioned in the front. Here the function of the gesture highlights a feature within the device. However, the possibility of further conversation is abruptly stopped here as during her turn, the mother has to pay attention to let a pedestrian cross the road. The exchange ends here with no follow-up conversation.

While we do not have access to the child's view on the phone screen, we can assume that it was probably a feature of the application and the positioning of the arrow that caused the child's confusion. Her reference to the direction of the arrow later in line 26 and the mother's agreement, provides some information that this could be what the child was confused about. We can observe here that particular features of applications sometimes

confuse children. In this case, the driving conditions were not busy, thus allowing both parent and child to recover from the temporary issue with the device.

Many times however, tensions while navigating may be exacerbated in particularly pressing driving conditions. We move on to another example of the same family who are on a busy road and there is some tension between the child and the parent as .

Description: The mother and daughter from F10 are travelling while listening to loud music, while at the same time the child is providing information on a key turn within the journey. The parent, who misunderstands this turn, has to then rectify the nearly attempted (wrong) turn.

Extract 19.3: That one

a  b  c 

```
1    D  : °And then turn right°
2     (a) applies brakes, points and indicates
3
4    Mum: What >that one?<
5
6         (b) shakes head
7
8    D  : We-no not that one.
9      (c) points and looks down at device screen
10                 ⩛
11   Mum: Yes it is=
```

d  e  f 

```
12   (d) looking down and pointing to screen
13
14   D  : =No its not
15
16   (d) Changes gears and
17    looks up at rear-view mirror
18   Mum:  >Oh ok<)
19   (e) changes indicator  (g) holds hand up to acknowledge
20                                  the car behind
```

The extract opens with the child reading from the screen softly and a perhaps uncertain voice to *"turn right"*. From her later negation in line 8, we understand that she was reading the instructions and not explicitly directing the mother on where to go. The mother however hears this as an instruction and quickly makes her preparatory sequence of actions to take the right turn. While applying the brakes and switching on the indicator, she seeks confirmation of the right turn to her daughter in line 4 while pointing out the window (Fig

a). Her gesture of pointing here indicates that the gesture is closely tied to the moving environment outside the car (Goodwin, 2007a). From the sequence of actions, it is visible that while the mother is still seeking confirmation, she needs to prepare to turn right, as there is an urgency to make the turn at this point in the driving and a risk that she will miss it if she does not slow down. At this point, the child leans in to shake her head to point out that this is not the turn to be taken (Fig b). This prompts the mother's attention away from the window and back towards the device where the mother counters her negation, fully convinced that it is the right one. The mother confirms this by looking over at the phone screen by leans in over the phone, points to the screen to dispute over the instruction (fig c). For a brief moment, the mother and child extend their attention to the device, with the mother pointing to the joint focus, which is the phone.

The mother realises this is not the turn and attempts to recover quickly from her near attempt of a wrong turn. Immediately, the mother produces the next set of actions to undo the mistake. She has change gears (fig d), turn off the indicator (Fig e), and acknowledge the cars behind her (Fig f), while looking at the back to ensure that the cars behind her are aware of her actions. The child reiterates by indicating to the screen (Fig d) that it is in fact not the correct turn. In the formation of this dispute, it is seen that the car is a difficult and potentially dangerous place to dispute. When the sequence pertains to not missing the right turn, this can be made very complex in busy roads as seen in the orientation of the mother to the traffic behind her. The activities need to take place very quickly and the driver-mother has to respond and make decisions rather swiftly. She must recover from the mistake rather quickly and prepare to take the right turn next.

The dispute and its placement at that point in the journey can point to many different factors. The mother could have been temporarily confused by the loud music and the fact that the child did not sound confident in giving the instructions. There could also be an issue of legitimacy between the parent and child. Although the mother has given the child the responsibility of navigating, the mother may still have doubts about whether the daughter can be relied upon to issue and give directions. Further, the spatial organisation of children also are different and they have to further extend this to the interface of the device (Cornell et al., 1992).

All three examples discuss the way in which disputes can arise during the way finding process. All the examples discuss some the connection and importance of communication between the device, the parent-driver and the road ahead. In the first two examples, the

dispute is a result of the child reading the instructions incorrectly from the device. This is the result of an issue within the format of the presentation of instructions within the device. In the last example, the confusion is caused by a dispute in taking the upcoming turn. The parent and child are seen to focus their attention towards the phone to resolve the dispute. There is recognition that there is far too much happening in the car: the loud music for the purposes of the family, as well as the ongoing navigation.

5.3.2 Embodied instructions within navigation

Another way in which navigation is practically accomplished is through orienting to the setting through non-verbal actions such as gesture. Gesture is routinely seen as a way to emphasise and support the use of talk (Hindmarsh and Heath, 2000). Gesture main purpose within talk is aimed at emphasising the effectiveness of talk as well as to sustain the attention of a recipient. Within her analysis of directives in parent-child interaction, Cekaite (2010) demonstrates that in order to effectively accomplish activities in the home, family members rely largely on coupling directive sequences with a combination of speech and embodied actions such as shepherding. Goodwin (1986) suggests gesture is characterised by two key features: first it enables the sustained attention of the recipient and second, gesture is based on temporal arrangement of talk, thus causing it to change and disappear over time. In the data, it is visible that both the talk and the accompanying gestures are serving particular purposes. The talk is initiated to instruct the navigator to orient to what is coming next and the gesture is accompanying and supporting the work of talk.

Gestures to support, emphasise and accompany instructions

We will turn to an example where the use of gestures by the parent helps understand and keep up with directions given by the child. They serve as mutual cues to help the child follow and keep up with instructions. Here the gestures are therefore prompting a confirmation: am I going the right way? what's next? or even preventing further instructions until the first set of instructions are completed For e.g. Wait until I reach.

Description: The following extract follows extract: 18.1 where the phone has been handed over by the mother to the child. Now, the mother is instructing the child to prepare her for what she is going to do, i.e., reading the instructions from the phone. She does this by orientating her speech and matching this with gesture to emphasise what she is saying.

Extract 18.3: Wait till I get there

a  b  c  d 

```
1                        (a) points to device   (b)indicates upwards  (c)downward pointing motion
2
3   Mum: Sally's (Porch) she's got direction (.) it says ↓through the gate (0.67)
4   D  : Yeah=
5   Mum: = >then something about under a bridge<.
6
7                        (d)Retreats gesture
8
```

e  f  g  h 

```
9          (e) holds palm up                          (g)looks towards phone and spreads fingers
10
11  Mum: So wait till I get there and then I want you to read the through the gate bit.
12  (2.0)
13                                  (f)Moves hand down and turns     (h)looks at road and retreats gesture
14  D  : 0 Ok.. 0                      towards daughter
15  Mum: Got it?
```

The extract follows the handover of the phone to the child navigator in extract 18.1. At this point, the extract starts with the mother's action of directing her daughter's attention to the directions in the message on the phone. While the mother has already established that the child will be supporting her in navigation, being a child as well as someone who is supporting her in an activity, the mother first provides a brief overview of what to expect in the forthcoming navigation. This is accompanied by a pointing gesture that is synchronised with her speech (Fig a). For example, when she says, *"she's got directions"* in line 3, the parent points to the phone in the child's hands. This gesture is a reference to the directions and the fact that they are in the phone. Furthermore, the gestural supports the intonation of her speech where the falling intonation is sign-posted with a downward arrow gesture (See line 3 & Fig c). This emphasis of intonation of specific words is thus indexical to the current activity of gesticulating (Haddington, 2012). The gestures are made meaningful through the verbal instructions that they support.

The parent's production of actions here is quite interesting. The mid-air gesture is serving particular functions within the interaction. The mother stretches and retreats her fingers in a way to refer to what she is saying. She is also seen to hold her hand in the air to place emphasis at particular instructional points. In line 11, the mother emphasised on the

imperative verbs ‘wait’ and ‘read’. This is coupled with her non-verbal action of holding up her palm as a way to stall the child from reading what is on the screen (Fig e & f). This seems to work as the child fixes her attention on the screen until the time she has to provide the next instruction for her mother. So the mother has effectively conveys to her child, the ‘*what’* and ‘*when’* of providing the navigational instructions. While saying this, the mother’s gaze is briefly focused towards the phone and the child (Figs f & g).

When the mother looks at the child’s direction, it is when she refers to something she wants the child to do: *“then I want you to read”* (Line 11). Her monitoring through gaze of the child could also be a way to check if the child is following the verbal instructions. There are several reasons why she may have coupled her instructions with gesture. Perhaps one reason could be that the task is unfamiliar to the child who is assisting. She is instructing a child, a novice with navigation, so it makes sense that she emphasises this. The gestures could also be serving a particular purpose for the mother, to remind herself of the directions and in order for her to instruct the child. Here the mother’s gestures do not seem to be picked up by the child, who is focusing on the phone handed over to her. However, in one way it can be seen that she is indeed responding to what the parent is suggesting as she is preparing to read the instructions.

Her gesture and intonation seem to change over the course of formulating the instructions. She retreats her hand and brings the gesture to a close when she makes a reference to a relatively non-significant instruction (Line 5, Fig d). This is denoted by her casual reference to the bridge saying *“Then something about under a bridge”* in line 5. Previous work on gesture seems to imply the fleeting nature of gesture. Gestures are made relevant to particular points of emphasis and then can change shape over the course of interaction (Goodwin, 1986). The child at this point is orienting to the phone and not the mother, so the gestures are actually missed by the recipient. Another way to explain the use of gesture is where speakers use gesture in the production of their own talk to support verbal instructions. So one explanation for this could be that she is therefore using the gesture to remind herself and her co-navigator of what is going to happen. She orients her speech and gesture towards the device, which is the focus of attention here. She finally seeks a verbal confirmation from the child, which avails no response. However, the absence of questioning here seems to indicate that the child has understood what the mother has asked her to do.

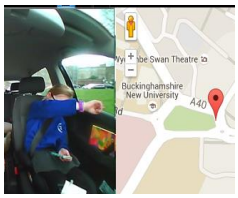
Similarly, the child navigator may also make use of gestures to indicate to the driver as to where to go.

Here we follow the mother-daughter pair from F10 to observe how child passengers use gesture to hold and maintain an instruction to the parent driver. The gesture is seen to be shaped over the course of the movement of the car and awareness of outside environment.

Extract 21.4 : Round Here?

a  b  c 

```
1          (a)raises head slightly
2   Mum: Round ↑here?
3   D  : Yeah, down there
4
5        (b) & (c)Points to the right and holds
6
7   D  : Right, and >then go that way<   (f)— (g)--(h)
8
9   (d)points finger    (e) points towards left
10     towards left
```

d  e  f  g 

The extract opens with the mother's request for a confirmation in line 1 to prompt the child to direct her on where to go next. The car is coming up to a junction with several roads, which makes it an appropriate time for the mother to ask the way to go (See Fig a). The child then uses her right hand to point the direction that the mother has to take just as the car comes up to the junction point. Her gesture here is supporting a different function from the earlier extract where the parent is using gestures. The child must match her instructions while referring to the phone to the outside environment. What is seen here is that she is uses her hand somewhat as an extension of the interface to guide her mother on where to drive.

In this case, we see that the gesture itself is shaped over the course of the instructions as the child moves her arm to synchronise with the movement of the car. Furthermore, the child's use of the deictic term 'there' further makes the gesture more meaningful (Streeck and Hartge, 1992).The child divides her focus of attention between the screen and the outside but maintains her action of displaying orientation to where the mother must go.

Here we observe that she is doing the dual work of reading the instructions and conveying them. Her gaze shifts between the screen and the on-going progression of the car. For example, the gestures serve as a reference between the outside environment and the screen. In turn, when she refers to the screen again, the child in turn shapes the gesture to match the car's progression. The curving of the child's hand is observed as a "path-gesture", minimising the need for talk (see Haddington and Keisanen, 2009).

We can see in figures b & c as well as f &g the child indicates the instruction with her outstretched arm and holds it. The corresponding progress on the map indicates that this gesture matches particular points in the car's progress on the road. The child's gesture is an environmentally-coupled gesture that follows the progress of the car in relation to the outside environment (Goodwin, environmentally coupled). For example, the curving gesture is a reference to the fact that they are going around a roundabout. Her initial action of holding her outstretched arm in front of her mother and towards her line of vision indicates that she wants to make her instruction 'visible' to her mother.

Even though gestures are easier to monitor when eye-contact is maintained, the mother is able to follow the instructions presented by the child and does not ask for clarifications, indicating that she may still able to see part of the gesture from her peripheral vision. While explicitly not 'directing' her mother's attention to the hand, the gesture instead seems to support the work of the speaker. This seems to be similar to what was seen in the earlier extract where the parent-driver used gesture to support her own talk. Here, the child's outstretched arm seems to support and direct her gaze. While her gaze is focused on the screen, her arm seems to what is displayed on the screen. While looking up, the gesture appears to direct her as to where she must look (See Figs. b, d & e).

So far in the two extracts, I discussed how gesture may be used to support and place emphasis on navigational instructions between parent drivers and child navigators. The construction of the gesture is timed to the ongoing talk and actions that sustain the navigational activity. In the extracts seen so far, through the movement of the hand, the parent or the child is indicating that they are orienting to the task of navigation, referring to the device as well as placing emphasis on instructing the child on the use of the device. These observations echo the findings seen in the study of gestural work to support and make meaning of navigation as a socially constructed activity between adults (Haddington and Keisanen, 2009). However, between parent child pairs there is an additional layer of complexity where the parent must guide the child is *how* to read and pace instructions. At

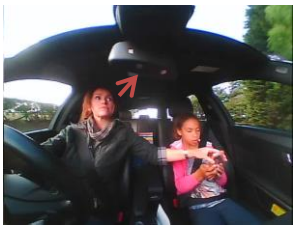
the same time, children are also seen to communicate using gestures to minimise talk as well as to extend the progress of navigation from the device to the outside environment.

Clarifying and Instructing Action

As seen in the course of navigation, both parent drivers and child navigators frequently resort to using gesture to support verbal directions. While the recipient does not always consistently observe the gestural work, they serve particular purposes in that they may help clarify or signpost when something is wrong in the navigational sequence and in effect be used to support the correct sequence of actions.

In the example here, we return to the F6 family in an extract that follows on from when the phone is handed over to the child (see Extract 18.1). Here the parent is using gesture to indicate an error in the flow of navigational instructions.

Extract 18.4: Back Right Up

a  b  c 

```
1  →Mum:    Right sure…↑the::re's the Holiday park. So it says, through the gate…
2    D  :    No it says through the  [gate ]=
3    Mum:                            [Check]=
4    D  : =and left on the grass before[turning right
5   →Mum:                              [No-Back-back right up.
6
7            (a) Listening face        (b) turns towards the Daughter and
8                                        makes backward movement with hand
9
10   Mum: (c) checks rear-view mirror before retrieving phone from daughter
```

At the start of the extract, the mother is indicating both through her words and rising intonation that the arrival at the "Holiday Park" is an important 'announcement' and something that the recipient must pay attention to in order to start assisting in navigation. This is indicated by the mother's rising intonation and extended emphasis on the word *"there"*, while indicating to the outside environment in line 1. Further, she then prompts the navigation sequence by starting with the statement '*so it says through the gate'* in line 1. This seems work as a prompt for the child to start to read the instructions, as it is an incomplete statement on its own and is formed in a questioning tone, inviting a response.

While the child reads the instructions, the mother appears attentive and is seen to be using a system to provide acknowledgement on the key directions. This system involves the mother providing feedback by way of her verbal acknowledgement of "Check" for the first

part of her daughter's instruction (line 3). The 'Check' acts as a cue for the child, as well as serving as a cue for the outside environment, as the car makes it way through the gate and onto the grass path.

The mother's indication provides the recognition that they have completed one part and can move on to the next instruction. This may also be seen as an attempt by the mother to develop a way to pace the child's instructions. However, the daughter who is reading the directions from the phone is not aware of what is going on outside as her gaze is fixed firmly on the screen. Neither is she using the mother's cue of the word "Check" to pause and look outside. She continues to read the instructions from the phone without pausing, pacing the instructions or looking up to see where they are in the journey (Line 4). Pauses and intonation of speech bears relevance to the hearer because instructions are interpreted on the basis of how they are produced. Furthermore, making eye contact is a way of following the structure and organisation of the sequence of actions (Goodwin, 1984). In this case, both these resources are unavailable, making it difficult to process the instructions.

The lack of intonation of the child's speech prompts the mother to take on a thinking expression on her face (Fig a) as she tries to make sense of what the child is saying. It seems that she is expecting something different from what the child is saying. She interrupts the child midway through her sentence (Line 5) probably in realising that the child is moving too far ahead in the instructions. She supports her verbal interruption with a gesture to the child that she has gone too far in the instructions. She gesticulates by using her hands in a backward motion while verbally instructing her to *'back right up'* in line 5. Here its emphasis is to stop what the child is doing-because it is incorrect and she needs to rectify that. Following her instruction, the mother retrieves the phone and consults with the message. Again, this is done carefully, while consulting the rear-view mirror to ensure that there are no cars behind her before bringing the car to a halt.

Similarly, apart from difficulties in keeping up with instructions, children (as well as adults) express confusion with regard to spatial orientation of left and right directions as will be seen in the next extract on how such issues may be dealt with by parents.

Next, we return to F10, where the daughter is instructing her mother on an upcoming set of instructions. The daughter seems to express confusion here with her left and right directions, which prompts the mother to clarify this early in the navigation.

Extract 19.4: Left or Right


```
D : We're almost there now.
   (a) lifts head up

Mum: What am I doing? Left or right when we get there? ((lifts head up)
D  : At the end of the road, tu::rn right.

→ D : ↑No-left            (b) lifts left finger towards left on lap

(c) uses left and right hand to indicate

→ Mum: Left? ↑That way or ↑that way? ((uses left and right hand to indicate))
D  : Not yet.
Mum: >No, but ↑which way?<
→ D  : That way

 (d) lifts left arm
Mum: Right.
(2.8)
D  : Not yet. You've got a lot more to go.
Mum: Right.
```

The child's announcement in line 1 indicates that they are almost 'there' prompts the mother to ask for instructions on what the next steps are. She does this by asking a very specific request. This pertains to which direction (left or right) she must turn when they reach 'there'. The child does not provide any explanation of where this 'there' is, but both parent and child assume it to refer to as something that is relevant to the destination (e.g. a junction). The child's response to the mother's question in line 5 seems to be formed with some doubt. This is expressed by the child slightly extended the word right and then a quick correction of this to 'left' in line 7. From Fig b, we can also see that the child is holding up her left finger as a way to clarify the direction for herself. While this is not visible to the mother (her focus is on the road), the child's hesitation and subsequent repair (lines 5 & 7), prompts the mother to seek a confirmatory response in line 11. The mother's confirmation is question is produced along with a gesture that is intended to help aid in the child's description (Fig c).

There are particular reasons why the discussion about direction, i.e. being left or right becomes relevant. The mother is seen to orient to the 'transition space' in the ongoing interaction, which indicates when a participant in an interaction may use gesture to clarify something where the other speaker's verbal instruction was not clear or confusing (Streeck and Hartge, 1992) . The mother's gesture of forming a 'left and right' by arching of her hands on either direction helps the child physically orient to the two directions in a way

that she can understand. Navigation involves the spatial organisation of the vehicle to make its way through roads. In collaborative navigation, the parent and child are engaging in a conversation about this spatial organisation. Goodwin (1986) suggests gestures are "*where the temporal and sequential organisation of conversation intersects with its spatial organisation"*.

Further, in referring to Fig c it is evident that the mother forms the gesture close to her daughter's line of vision to ensure that she is able to orient to it. Although the daughter is looking down, the gesture is formed while she is about to look down, indicating that she would be aware of it. At first, the child does not understand the urgency for the need to clarify. She dismisses the confirmation by saying that it is not yet important (Line 12). For the mother who is driving, having advance notice of where she is going seems vital. For example, she may need to maintain a lane to take a turn or slow down to prepare to turn. Streeck (2009) suggests that while producing descriptive gestures, the accompaniment of deictic terms such as 'that' simultaneously with gesture indicates that there is some meaning attached to the gesture, here the "that" replaces the need for "right" and "left" as it is a direct reference to the gestures. In turn, we know that it is meaningful because the child then responds by recycling the mother's gesture and speech by indicating *"that way"* in line 14. The mother responds with an affirmation in line 17 indicating that she has understood it. The child follows up her instruction later to indicate that the instruction is not for now, but later as the mother has "*a lot more to go".*

In both the examples seen, parents use embodied actions to clarify the sequence of instructions. However, there is an important recognition that these actions are relevant because of their placement within the stream of talk. The backward motion is relevant because it is produced within the talk of asking the child to backtrack her instructions. In the second extract, the mother's action of demonstrating left of right is meaningful because of recognising that both the speech in conjunction with the action of using both hands will enable the child to recognise which direction is the one to follow. Overall, the extracts in this section discuss the role of gesture in supporting navigational instructions. The first set of extracts discusses how gesture works to support and accompany the verbal instructions that the co-navigator provides. The next set of extracts describe how gesture, may to be used to clarify and indicate to the child navigator issues and concerns with the ongoing navigation.

5.3.3 Conveying the Temporal Significance of Navigation

The success of navigating collaboratively depends on the driver and passenger' sensitivity to the temporal organisation of the car journey. The anticipation of next-ness is an important quality of talk and the production of talk between two interlocutors (Sacks et al., 1974). Similarly, both navigation and driving involve the expectancy of turns. In an interaction participants can be more sensitised to the progression of talk because of its importance to another activity for example, the driver must carefully listen to what is being said by the child navigator in order to take the correct turn. If navigators are unable to keep pace with driving, there can be some conflict within the delivering and following of instructions. Errors in temporal concerns are seen to arise from two things, namely the role of monitoring the environment as well as in disputes arising from the inability to signal temporal markers in navigation.

Monitoring the Environment in Navigational Progress

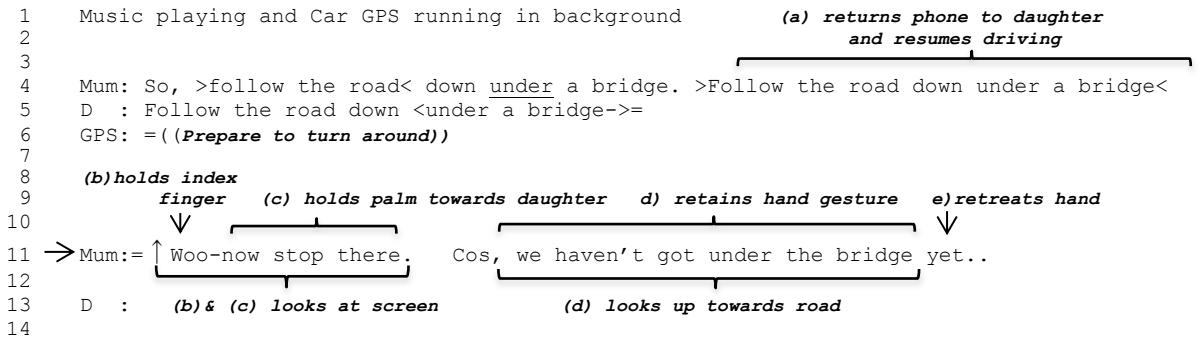
One of the reasons that account for delays and uncertainties on the part of the child navigator is around the lack of awareness of what is coming up ahead in the environment. Monitoring the environment is important, as temporal issues are a result of the interaction of both spatial and temporal factors. This may result in the parent needing to intervene or stop the child before carrying on with the next turn. Parents may explicitly instruct children on what to look out for over the course of driving through the route. In an unfamiliar route, such as the mother-daughter pair navigating the campsite, this begins to worry the driver.

Description: At this point, the mother has consulted with the phone (Extract 18.4) and now turns her attention to the activity of driving. While doing so, she is indicating to her daughter to hold off reading the instructions.

Extract 18.5: Stop There

a  b  c 

d   e 



As the extract opens, the mother has just consulted her phone to clarify an instruction that the child has provided. In line 4, the mother first reads the instructions from the phone and then repeats it to remind herself of what she must be looking for while driving. While repeating the instructions, she turns towards the child and passes the phone back to her. When the mother resumes driving, the child is observed reading aloud the instructions from the phone (Line 5). When the child finishes the instruction, the mother almost immediately stops her daughter in Line 11. The mother is probably trying to avoid the same issue seen in the earlier Extract: 18.4 with the child where she produces a stream of instructions without paying attention to the pacing of the instructions. She indicates to this by explaining to her daughter *"we haven't got under the bridge yet"* in line 11.

On hearing the mother's instruction to "stop" her instructions, the child looks up (Fig d) to follow her mother's observation about the upcoming landmark (the bridge). Here we see that the parent is making a reference to the outside environment as a way of indicating to the child an important aspect of navigating: which is to position directions onto the space for which the instructions apply (Presson, 1982).The explanation also highlights to what the child is doing wrong and that she is not pacing her instructions to keep up with the moving environment. Following the mother's explanation of *why* she should stop at that point, the child (Presson, 1982) begins to orient to the outside.

The process through which this is achieved is quite interesting as similar to the earlier example of this mother-daughter pair (Extract 18.3), here the parent uses her gesture to effectively support her verbal instructions. She uses her index finger in Fig b to ask the child to stop her instructions after the child's instruction in line 5. Next, she shifts to a gesture of her whole palm as a way to stop the child from proceeding (See Figs c and d). While doing so, she is pointing out that they have not reached the bridge as yet, which is the landmark in the instructions. This seems to be effective as the gesture along with the accompanying seems to gain the mutual orientation of the child's attention towards the environment (Goodwin and Goodwin, 1986).

As the child is reading for the parent who is driving, she must learn how her instructions must then be applied as *instructed actions* that the parent must carry out in order to reach the destination. The instructions therefore must lead to the actions that the mother needs to produce in order that they can successfully navigate to the destination. As the extract moves on further, we see how the parent supports the child's navigational instructions along with the journey's progress.

As the extract continues, we observe how the mother orients to the outside environment, which she has been preparing the child to notice so far in the instructions.

Extract 18.6: Stop There Continued

a  b  c 

d 

```
1                 (a) does checking action (b)forms action (c) does downward action (d) holds downward action
2
3   Mum: Follow the road down ↑check, under the bridge ↑check . What's next?
4
5                                    (b)Daughter looks up       (d) Daughter looks down at phone
6   3.0 secs ((Music playing in background))
```

e  f  g 

```
7   D  :  <Bri::dge first>, left- left ah::gain.  Left, and then left again.
8
9    (e) Gestures upward and          (f)looks at daughter  (g) reaches across take phone
10     makes thinking face
```

Further into extract, the car is seen to be approaching the landmark of the bridge. At this point, we observe that the parent adopts a particular system of making announcements while crossing the landmarks provided in the instructions. She is seen to use the word "Check" earlier in extract 18.4, but this time, she supports the verbal indicator with a gesture. She uses her left hand to form a check mark in the air and uses this to support her verbal indication of crossing the environmental cues. As observed in the earlier sections of this chapter, gesture is used to complement and support what is being said. She says the

"Check" with a rising intonation and it works to gain the attention of the child navigator. Both the gesture and the emphasis on the verbal announcement seem to act as a cue for the child is now also keeping track of the progression of the outside environment by looking up at the road ahead (Fig b).

Further, the relevance of gesture within navigation is particularly useful as the mother here times her gesture and speech in a systematic fashion in relevance to the progression of the journey. Gestural configurations are seen to be connected to speech in a manner that they are mutually affiliated to each other (Schegloff, 1984). For example in Figures b and c, the mother does not actually wait to cross the bridge before she checks the completed action of crossing the bridge. Instead, she forms her action as she produces the talk in line 3. She is seen to announce the completion of the step early in order that she can prepare for the next instruction. Another observation is that the "Checking" gesture is different for different instructional sequences. First, after following the bridge, the mother makes an upward "Check" gesture. Next, when they go under the bridge, the mother makes a downward action with her hand. This seems to indicate that different gestures index different instructional sequences. Another observation is that the gesture is preserved for as long as the next sequence is requested. This freezing of gesture momentarily could be an indicator that the mother wants to continue using this system for future instructions as well as a cue to prompt the navigator to continue the instructions (Schegloff, 1984).

Next, the mother prompts the next sequence by saying, *"what's next?"* To this, the child remains fixed on the mobile phone screen, concentrating on reading the next instruction. There is a long pause (3.0 secs) during which the child spends a considerable time focusing on the screen. When she does finally respond, her instruction is formed in a convoluted manner. The mother's response to this is quite interesting as her facial expression changes from readiness (Fig d) to confusion (Fig e). All the while, the mother's gesture of pointing downwards is still frozen in the same state. As the child continues her long-drawn instruction in line 7, the mother turns to look at her (Fig f) and then finally withdraws her gesture so that she is able to physically retrieve the phone from her daughter (Fig g). This action indicates that, given the child's convoluted set of instructions, the assistance is not beneficial and the mother would save more time by referring to the phone herself.

The example presented here discusses the importance of grounding the navigational activity constructed between the driver and child passenger inside the car, with its relevance to the outside environment. Another aspect of this orientation is that similar to

gesture, the orientation to the outside environment within a navigational sequence is jointly produced between the parent and child. The mother's use of gestural cues and instructions to the child seem to support and emphasise the importance of temporally matching the navigational instructions to the driving activity.

Disputes in Pacing On-going Navigation

As seen in the examples so far, the nature of navigation is such that child navigators need to keep pace with the demands of driving while providing accurate direction to the drivers. When directions are not given in time or if there are some confusions in conveying the directions, parents and children can get caught in small disputes relating to on-going navigation. Most of the time, this relates to children not being able to provide instructions at the necessary pace for the parent.

In the example below from F10, we see that the parent is requesting confirmation about a turn about a particular intersection. The extract follows an earlier segment (Extract 21.4) when the parent indicates and makes a wrong turn and has to abruptly rectify the situation. When they reach this point, she is keen to ensure that she is making the correct right turn.

Extract 19.5 Being Aware

a  b  c  d 


```
(a)raising left hand to indicator

Mum: This?
D  : Uh.(hesitates).┌(b)Looks down at phone
                    │
                    │(b)Turns on indicator
Mum:                │   ↑>Turn right<?
(c)Looking at screen└
     V
D  : Yeah=
Mum: =Well I got to now.
Mum: You need to-listen. ↑You need to- if you got to do it you need to be a bit more aware
of (.) what's happening
D  : I am aware.
Mum: Well then you got to be more aware. I got cars behind me. Otherwise I'd do it myself.
```

At the start of this extract, the mother says *"this"* in a questioning tone (Line 3) as the car is approaching a junction (Fig d). We know that the mother's focus of questioning is on the next turn as her question is coupled with a movement of her left hand to the indicator. At this point the child wears a look of confusion says "Uh.." and seems to hesitate as she looks down to refer to the map on the mobile phone. At this point, the turn is fast

approaching and the mother has to make two actions, indicate to the cars behind as well as move to the right lane. She comes back quickly to ask again if she should *"Turn right?"* in line 7. She produces this question very quickly and while she has already turned on the right indicator. It appears that she is unable to wait for a confirmation as she is pressured to make a decision as a driver. The daughter's affirmation in line 12 appears to come in late as the mother responds *"Well I got to now"* indicating to the child that the choice or whether to take the turn or not does not apply anymore. This is evident through the sequence of actions that the mother has carried out: her movement to turn on the indicator as well as moving into the right lane, which are all indicators to the traffic behind that she is taking the upcoming right turn.

Here it is important to consider what could possibly account for this delay from the child conveying the directions to the mother. There is already a mismatch between the pace of instructions on the screen (delay from phone networks), the ability for the navigator to process the route and convey this to the parent. Furthermore, when difficulties arise with prompting indicators of direction or if the road conditions are crucial for immediate response, this causes further friction between drivers and navigators. Our attention then moves to the mother's issuing of an imperative to the child to highlight the consequences for delaying the instruction for navigation. This is not desirable, as the mother cannot cope with the driving demands. She emphasizes on the fact that the child 'needs to be aware' of the road conditions while assisting in navigating (line 12). The emphasis on the 'listen' is used here to draw attention of the child. This signals the fact that what the mother is saying is important and requires the attention of the child. This is followed by an explanation for why the child is required to provide the instructions at the correct time (Line 12). The mother initiates a repair where she indicates to the child that she needs to be prepared to keep pace if she is to support the parent in navigation. Here the parent is referring to the child's assistance in providing navigational instructions, which appears to be delayed in comparison to her mother's actions of driving.

The exchange reveals a mismatch in the pacing of the directions in relation to the driving activity. The situation is further made complex by the fact that there are several activities running simultaneously in the background. There is very loud music in the background, the whole family is singing along to the music. Further, in line 15, the mother is also making a reference to the fact that she is relying on the child to assist her and her expectation that this should make the driving easier and not harder, which would prompt her to do the

navigation herself. The mother conveys a sense of urgency of the situation as she points out to the child: *"I've got cars behind me".* This is a reference to the fact that in the car, navigational decisions need to be made quickly. The mother's expression of frustration resembles similar work around the affective responses of family members navigating together (Laurier et al., 2012).

In this extract as well as extracts that have been discussed before this, navigation is an activity that is jointly constructed by parents as a way to support driving, What must be understood is that while it serves a supportive function, parent-child navigation is essentially seen as a learning activity as well. While the child is helping the parent navigate with the phone, parents are also allowing the sharing of responsibility, experience of driving and difficult driving conditions.

In the next example, we see the development of a dispute between the parent and child over the child's placement of navigational instructions.

Extract 21.5. Pay attention:

a  b 

Mum: >Can you see that road? I always go wrong up here and we have to go up that big hill.<
GPS: At the next junction, bear right
D : Up there

(a) Pointing forward

c  d  e 

(b) looks down at screen

D : You have to pay attention to me Ok? [Cos I say]

(c) Turns towards window

Mum: [You have to] pay attention to what you're doing rather than [going telling me-] =
D : [yeah I do but]
Mum: =After I've turned a corner-after >I've gone past then you temme me where to go<
D : Yeah well the last time-the first time I [did
GPS: [In 400 metres at the roundabout take the third exit at A414A2

d) Mum and daughter look at phone

D : The first time you gave me, I was telling you where to go, and you said ↑No that's wrong and then we went the wrong way.

(e) mother and daughter look at each other

At the start of this extract, we notice that the parent directs the child's attention to a past difficulty in navigating this particular route. This is comment made while the child is providing directions from the mobile phone. The child does not immediately respond to this comment as she first attends to conveying the next instruction in line 4. Once she completes the instruction and action of pointing *"there"*, the child responds to the mother's earlier comment. This leads a small disagreement between the parent and child.

On following her mother's comment about the route, the child instructs the parent that she must pay attention to what she says in Line 9. Here we observe that the daughter makes an assertion where she takes on a different social role from that of a child. Typically, a parent would tell a child what to do, as we seen in the earlier examples of how children are asked to support the navigation activity. In contrast, we see the daughter expressing her authority as the 'navigator' and on whom the driver relies on to effectively navigate. In saying this, she establishes her role as the one whom the parent is reliant on in order to follow the right directions. Further, the daughter seems to support this instruction with an attempted explanation in line 10. Before she can do this however, the mother is quick to come in and defend her position as a driver and as the parental authority. She shifts the blame to the child emphasising on the "*You*" in line 4, pointing out that she needs to change how she instructs the mother in navigation.

She recycles the child's same words in line 4, *"<u>You</u> have to pay attention to what you're doing rather than-"* while changing the *tone* and *emphasis* of the instruction. By referring to the child's past actions, she effectively tries to alter the course of impending actions (Goodwin, 2006a). She makes a reference to the child's lack of recognition of the outside environment in providing instructions. The complaint from the mother is that the child provides the instructions when the mother has "*..gone past then you temme me where to go"* (Line 15). It seems here that both the parent and the child have different ideas of how the navigational assistance is being carried out. The child feels the parent must listen to her, whereas the parent feels that the child must do more to keep pace with the driving. This rings closely with other studies of intimate groups of individuals carrying out activities such as wayfinding in the car (Laurier et al., 2012), which include instances where family members can express frustration, a feeling of repeating the same mistakes similar to what is experienced here.

After the mother's complaint, the child starts to provide an explanation for her earlier instruction in line 16. Again, she is forced to stop her talk midway as the GPS announces

the next instruction. At this point both mother and daughter shift their focus to the phone to concentrate on the instruction (Fig d). Once the instruction is complete, the daughter returns to defend her position in the disagreement by following the mother's example of referring to prior navigation to substantiate her authority as the navigator in line 21. She goes on to explain how *"The first time you gave me, I was telling you where to go, and you said No that's wrong and then we went the wrong way."* She effectively demonstrates here with evidence from the past evidence of where the mother was. At this point, it is posed as an open challenge to what the mother has just said. On completion of the comment, both mother and daughter seem to be fixed in a position of challenging each other (Fig e). In this exchange, what is observed is the way in which there is a mismatch between the parent-driver and the child who is supporting the navigation. Furthermore, the mother and child orient to this mismatch is very particular ways. The mother blames the child for providing instructions late and not paying attention, while the child orients to past instances of navigation to justify why the mother makes an error while taking this route (Reference to Line 1)

In both extracts discussed here, there is a distinctness of orientation in how the instructions are placed alongside driving and the implications of this to the driving. In both examples, the parents are referring to the same thing, which is the pacing of instructions. In both extracts, the parent tells the child to keep better pace with the driving mother. In the first example, the mother highlights the importance of this action to the traffic behind her and her responsibility as a driver. In the next example, she says the same thing to the child, but this is countered by the child's statement that the mother needs to listen to the child. There is an interesting display of dynamics here where the child as a navigator is also taking responsibility for the unfolding navigational activity.

5.3.4 Discussion

The set of data described in Section 5.3 draws on recordings of parents and children engaging in navigational sequences. From examples in my data, I demonstrate how navigation as an activity is occasioned and formed within the course of the interaction between parent-child pairs. It shows how navigation can be a activity that families do together, yet highlighting the constraints that come with navigating with a child.

First, I focused on the use of the mobile phone as a device that supports collaborative navigation between parents and children. Parents offer the phones as navigational devices,

but at the same time, they orient to this differently because it is then handed over to a child passenger. This means that the positioning and arrangement, set-up of the phone is done by the parent prior to handing it over. The use of this technological artefact shapes the social interaction around the navigational activity. First, there is emphasis was on the familiarity and spontaneity with which the activity of navigation is set up between parent-child dyads (See Extracts 18.1 & 19.1). I demonstrate how the talk about navigation, is also accompanied by the action of physically indicate to the device which is to be used for navigation (See Extract 18.1). The device must be oriented to, set up and accurately positioned in order to display the right screen for the child to effectively navigate (Reilly et al., 2009). Over the course of the journey, the data also pointed to how parents and children orient to the device as situated resource in checking the progression of the navigational activity. Some of these instances may also result in disputes over reading the instructions and following the progress of navigation. Such disputes need to be resolved during the navigational activity, with parents indicating what is the correct layout and sometimes physically intervening in making the change (Extract 18.2). Here these observations add to existing studies around wayfinding between family members (Laurier et al., 2012) as well as navigation as a collaborative front-seat activity (Perterer et al., 2013). The current findings extend this work by discussing the role of child passengers as well as mobile technologies in supporting collaborative navigation.

Next, the data pointed to the use of directive-response sequence as a practice by which drivers and child navigators co-produce the navigational activity. I show how instructions to navigate are embodied within spatial and social configuration between parents and children (See Extract 18.3). Gestures are formed and shaped over the course of interaction and in support of the ongoing navigational support (Goodwin, 1986). Particular emphasis is placed on the sequential arrangement of the conversational and non-verbal turns while engaging in an on-going navigational activity. In this, I discussed the importance of how parents adopt the use of gesture for question and clarifying sequences of action (See Extract 18.4). This may be a replacement to communicate the direction of left and right, which is often challenging for children (See Extract 19.4). Other reasons may also include use of gestures to extend the extension of the virtual navigational interface (See Extract 21.4). In such cases, the environmentally coupled nature of the gesture indicates that the gesture interacts with the moving environment of the car and is mutually affiliative of instructions that are produced. Consistent with other researchers (Haddington, 2012) , I

discuss how pauses and gaps in instruction are interpreted and accounted for by parents and children through the navigation. For example, I show how parents adapt their speech and actions to support the understanding of children. They may use repetition, interrupt talk as ways to adapt to the demands of navigation (See extract 18.5). It is also apparent through the analysis that the navigator must stay keenly aware of the progress of the car outside while monitoring the navigational instructions on the device.

Thirdly, I discussed the temporal organisation of navigation over the course of collaboration between parents and children. Through examples from the data, how parents are not just following the child's instructions, but also monitoring what is going on between the screen, the child and the outside. Herein, issues around when to talk, how to orient to the device as well as to the environment become relevant to the progression and successful completion of navigation (Extract 19.5). In using examples from the data, I point to the occasional mismatch between parents and children's timing and orientation to the outside environment (see Extract 21.5). In some cases, parents may use gestural work to highlight the importance of sequentially following the instructions. Within this, I also discuss how the eruption and resolution of small disputes occur because of this mismatch and how this is resolved over the course of interaction. For example, parents and children draw on multimodal resources of gestures to clarify or emphasise verbal directives (Mondada, 2014b). These gestures are also shaped to the context of the moving nature of the car environment and the dual demands on drivers. For example, the mother who indicated a wrong turn must quickly rectify the situation both my referring to the device, the child (who is navigating) and the other drivers behind her.

Overall navigation is seen as a socially constructed activity between parents and children. This echoes with earlier studies of SatNav use (Leshed et al., 2008, Brown and Laurier, 2012) in the car where there is a significant social component to navigating which is produced through talk, gestures and references to the environment in a sequentially coherent and meaningful way. In the examples presented here, parents are seen to confer with child navigators about doubts in navigation as well as prompt the next instruction by asking questions and pointing to features in the environment. Navigation is also seen to include elements of a collaborative learning activity wherein the child learns how to help, how to identify navigational progress in a map, to be sensitive to the driving context, as well as to keep pace with the progress of the car. Similar to answering of phone calls in

other work, the data elucidates how parents and children can become jointly engaged in navigation.

5.4 Summary

The car is a very particular spatio-material context where the access to mobile devices, coordination of actions between passengers and drivers occurs simultaneously with regard to the placement of people and artefacts within its confines. The overarching aim of this Chapter was to show how device use can be situated to the car by its careful placement within the orientation to the material and

To begin with, Section 5.1 dealt with the construction of activities within the spatial and material confines of the backseat. I discussed two examples of collaborative participation in a joint activity by children in the backseat. These activities involved the active role of parents in setting up and sustaining the activity. In the examples of playing on a crossword puzzle and watching a movie on a laptop, I discussed the significance of the interaction between front seat and back seat areas. It is observed that encouraging joint use of devices may be a result of lack of enough devices to share between passengers as a result of the limited resources of access in the car. While families may use this as a way to support children to do use media together, at the same time, this also opens up issues of conflicts and disputes. Here parents may resort to drawing on their experiences and knowledge of their children to actively help resolve dispute. Here the emphasis is on how families accomplish family life through enactment of relationships.

Second, I drew on navigation as a collaborative front seat activity between parents and children. It is observed that children are drawn into the collaborative activity of navigation with little warning or choice in participating. This is often a result of children in the front-seat being in a good position to assist the parent-driver. The focus of collaboration turned to the mobile phone as an object that supported the on-going activity. In order to navigate successfully, parents conferred with children and the devices frequently. They also frequently used embodied activities such as pointing and gestures to support collaborative navigation. References were frequently made to the layout of the device and the changing outside environment. Parents and children also got into small disputes about the pacing of navigation and its impact on the driving. Overcoming these disputes were important to successfully carry out navigation.

The observations point to families' notions of being together, sharing and accommodating device use, as displayed through collaborative activities. Acknowledging the limitations of devices, children's skills as well as the physical space are referred to over the course of interaction. Another vital aspect of these activities is that there is particular emphasis on 'situated' nature of talk and activity within the car. While in the car, the driving conditions, arrangement of bodies and devices all are important considerations in the use of technology by families. Creation of complex participation frameworks: posture, positioning is also challenged both by the spatial constraints in the car as well as the features of the device itself. The essence of this section of the analysis is the focus on embodied interaction within material stuff and device use. Further, the discussion also provides some ideas into how technology design for the family may need to consider the intimate relationship between family members and the complexity of the family car. There are multiple demands in a child who must orient to the road, the device and the parent while assisting in navigation.

Chapter 6 Synthesis: Practically Accomplishing Family life in the Car

6.1 Introduction

The analysis in this thesis aims to explore the ways in which digital media including a range of mobile devices are situated within the context of the family car. This chapter will bring together the findings of chapters 4 and 5 to highlight the main discussion points raised through the analysis of the empirical material.

Chapter 4 first focused on the ways in which interactions, in particular talk, unfold between parents and children in the presence of devices. More specifically, the analysis showed how conversations are formed around device use and operation over the course of car journeys (Section 4.1). This was useful to consider how devices can act as facilitators and conversational resources for the doing of family life. In addition, the chapter then turned to instances of data (Section 4.2) to discuss how parents orchestrate device use over the course of car journeys. Here, attention was placed on how media use is constructed through offering, negotiating as well as handing over of devices.

The data presented in chapter 5 then shifted emphasis on the embodied and situated nature of device use in the family car. In describing the construction and unfolding of two different collaborative activities, I articulated the importance of the spatial, temporal and material concerns in the conducting of in-car activities. The first set of data (Section 5.1) dealt with parents getting children to 'do activities' together such as sharing a device in the backseat. The second set of data (Section 5.2) involved parents and child passengers engaging in co-navigation. Here the construction of activities was seen as socially organised and dependent on ongoing production of talk and activity.

Taken together, findings from the two chapters provide a lived account of family members' activities from the perspective of ethnomethodological studies. The analysis highlighted the importance of the situated nature of talk and actions around device use as core features of the production of family life in the car. By looking at the ways in which parents assist and mediate media use, I was able to make visible and articulate the routine activities in the family car. In the sections that follow, I discuss key insights that follow the data analysis.

6.2 The Social Ordering of Family through Technology

At the start of the thesis, one of the objectives was to understand the social organisation of the family through the study of technology practices in the car, and this is achieved with a concern for the "here and now" aspects of family life. This is described through the sub-sections that follow. First, for members of a family, the production of family life is made visible through the on-going production of talk and talk-related activities such as gaze, gesture and embodied actions. The nature of these activities is such that they take place in an orderly, sequential and accountable manner. They are orderly in the sense that they are produced in a meaningful and consecutively relevant way, for example, questions are followed by answers, and requests precede offers. Second, as well as the talk and actions being sequential, through their orderly and local production, the talk displays the ongoing membership and roles of family members (Sacks et al., 1974). Finally, these actions are described as accountable in the sense that during the production of these activities, parents may account for their actions and talk in a manner that reflects the social roles assigned within the membership of being part of a family.

6.2.1 The Emergent, Moral Character of Family Talk and Activity

In the analysis, it is evident that the features of family talk emerge over the course of car journeys and the interactions around family members. In this respect the first research questions was:

RQ 1. How is 'doing family' evident through the features of talk and activity that constitute the routine features of driving and travelling together as a family?

The data analysis presented in this thesis demonstrated how the construction of family life in the car is enacted through the production of activities between parents and children around device use in everyday family journeys. This interactional description provides explanations of how parents and children develop normative associations with acceptable behaviours around the use of technology. For example, the existing literature already discusses the concerns that parents may express with regard to children's' usage of technology (Plowman et al., 2010, Stephen et al., 2013). The current study further directs attention to the specifics of *how* parents express these concerns and indicate acceptable ways in which technology is expected to be used by children.

In constructing the social order of family in the car, it is expected that parents will often explicitly tell children what they can and cannot do as children with limited rights as

speakers (West and Zimmerman, 1977). At the same time, the analysis sheds light on how children responded to these expectations. In response to parental instructions, children are acting on their own experience of being told what to do by parents as well as trying to negotiate what is offered to them. Sometimes, not being given a game of their choice or prompted to give a device back resulted in children resisting directives and responding with disappointment, resistance, and difficult behaviour (refer Extract 15.2 in Section 4.3.4). Studying the relevance of these behaviours to the family car enables to observe how these parent-child interactions are manifest in a mobile context.

A manifestation of the "limited rights" of children can be described through the offering of specific devices and content (e.g. a game) while in the car. In the section on Offers and Requests of Media (Section 4.3.1) parents indicated very clearly that what was offered to children was the *content* of devices rather than the device itself. When children make requests that are not compatible with what is offered or what the parent is willing to offer, parents usually held their ground. In the construction of these activities, it is observed that parents are trying to be "good parents" by exerting control over device use while on the other hand, children are "being children" when they complain about being refused what they want. Parents further rewarded children with compliments when they displayed 'good media practices' (Pasquier et al., 1998) such as returning devices in a timely manner. In the car, device use also prompted parents to explicitly indicate the prospective orientation of current talk and behaviour. For example, complying with good device behaviour had an effect on whether the devices were offered in future journeys. Whereas when children refused to comply with directives or threw tantrums, parents made it explicit that such behaviour is not acceptable and may result in the taking away of devices (refer Extract 12, Section 4.3.2) or withholding future use (see Extract 15.2 Section 4.3.3).

Another way in which parents enact concerns is in discussing and prompting children towards the practical concerns around device use. An example of this is how parents instruct children in pacing device use to address issues such as having one device run out of battery due to extended use. Parents are educating children that, while in the car, finite resources such as battery life of devices must be taken into account alongside other regular resource limitations (e.g. number of devices available). In everyday family encounters, parents are often observed to teach children socially appropriate behaviour such as "politeness" during mealtimes (Blum-Kulka, 1990, Busch, 2012) or while making them understand "turns at talk" (Butler and Wilkinson, 2013) in family gatherings. Similarly, in

the same ways as to learning "to eat properly", "share fairly", parents in the current analysis made references to positioning talk in the car and discussing what is proper behaviour around device use. In encounters with adults, children often have to wait turns at talk as they are not always considered in the same rights over turns at talk as adults (Sacks, 1972). Similarly, while engaging in conversation with a driving parent, children were told to be sensitive to traffic conditions. Children were also encouraged to respect the shared auditory space of the car. When children used their devices loudly and this became intrusive, parents reprimanded children to lower device volume (Section 4.3.2). Auditory clashes in the car are a pressing matter to both a driver that needs to concentrate on the road or adult front passengers who may wish to engage in conversations with drivers.

Taking turns at talk is an important feature of adult-child interactions in family gatherings. Children are explicitly told that they could speak only after adults completed turns at talk (Butler and Wilkinson, 2013). Within the data presented, children were encouraged to share and take turns on devices (when there were not sufficient devices between them) or include other children passengers into game playing (See Section 5.2.1). Parents encouraged such collaborative activities between child passengers given the fact that limited devices made shared usage necessary within the settings of a car.

Closely linked to the earlier point, another observation relating to how the car provided a way for the moral order of family life to be displayed is in maintaining peace between co-passengers and showing consideration for others who occupy the car space. This drew attention to the car as a space for immediate resolution of disputes between children. In the car, there is higher immediacy to address dispute resolution such that it does not cause danger while driving or unpleasantness during long journeys. Parents were observed within the dataset to discuss and demonstrate 'fairness' when referring to disputes over devices (Laforest, 2002). For example when complaints emerged from children's interaction, parents made significant effort to distribute devices and resolve disputes in a fair manner. Collaborative efforts may go wrong, as seen in Section 5.2.3, when children become caught up in a "tug-of-war". To ensure that a 'fair' decision is made for everyone involved, parents often explicitly turn to children over the course of interactions to discuss 'good' behaviour.

6.2.2 Relationships as On-going, Situated Accomplishments

The ethnomethodological view of studying family life involves observing family activities as locally produced to the circumstances as well as displaying orientation to family membership. In keeping with this, a second research question was as follows:

RQ 2. How do the instances of technology use by family members draw attention to the enactment of on-going family relationships in the car?

Conversations between family members do not explicitly involve references to the roles of "mother" or "children. Instead, family membership is produced as on-going part of the actions that constitute the activity and setting (Sacks, 1972); it is mainly relational membership pairs that operate over the course of interaction between individuals (e.g. parent-child, driver-navigator, older-younger sibling). Family life as observed in the examples presented in the thesis informs on how interactions with technology are placed in a meaningful, orderly fashion depending on who is present at a given point in time. One way in which family members account for this is in orienting to their membership within social units as being a 'parent' or being a 'child' or being a 'sibling'. I demonstrated through the data how these references to membership are displayed through the sequential and situational production of talk and actions within the car. The data reveals the particular ways in which technology supports families' time together, to conduct conversation and relate to the world and activities around them.

Similar to organisational work around the home space, the findings pointed to the organization of family activities in the car as involving family tasks of 'keeping children occupied over long journeys' and 'keeping children from complaining'. This situated accomplishment of activities is based on who is present at a given point in time and what resources those individuals have in order to accomplish the activities. For example, the parent who does not want to be drawn into a singing activity with the child (refer Extract 10.1 in Section 4.3.1) responds with a counter-offer to play a game so that the child is distracted from pursuing the conversation. Here the mother draws on her competence as a member of the family unit who is knowledgeable in what the child may show interest in (e.g. a game on the phone).

Speier (1970) explains that children learn very early in life to associate social roles assigned to parents and how this is reflected in the interactional work of talk and related manifestations such as gesture and gaze. In turn, this provides children the impetus to

respond and recognise and in ways relevant to their own membership in the conversation as "children". For example, children familiarise themselves with parental instructions not to complain or protest as they know that such behaviours may lead to them having limited rights to access devices in the car. This is evident in the dataset in the organisation of turns in talk and activities between parents and children. Parents were aware of what children were playing with in the backseat through subtle glances in their direction or more actively by assisting in game playing (Refer Extracts 16.1 & 17.2 in Section 5.2.1). Parents also asked questions during activities as a way to show their involvement and supportive role (See Extract 6.1, Section 4.2.3).

The data further pointed to how parents exhibited displays of concern and care where they made use of opportunities to touch, care for and show concern for children while adapting their interactions to the nature of the car (See Extract 6.4 Section 4.2.3). For example, parents were showing sympathy when a child lost a game on a device or displaying delight at children's feats (See Extract 7.1 Section 4.2.3). As such, children drew parents into mutual orientation to the device that is the topic of conversation and centre of interaction (Goodwin, 2000). This draws the importance to the role of 'family talk' as a part of family life. Rather than being simply about the device or a game, the discussion is about having awareness of what children are doing as well as taking an interest in what children enjoy. Parents are also able to display their knowledge of children's activities. Parents are investing interest in the game while displaying their own knowledge of game-play. They demonstrate (through conversation) what they know of characters in the child's games within the limitations that driving places on their attention. This is much like the conduction of activities in the home where in arranging activity contracts (Aronsson and Cekaite, 2011) for routine tasks, parents may gently 'orient' children to tasks through embodied actions such as shepherding (Cekaite, 2010, Goodwin and Cekaite, 2013).

Another manifestation of relationships is observed through opportunities for child-directed talk and related features such as gaze and body orientation in relation to siblings. Children accommodated each other in collaborative play or activity by positioning their bodies, using gestures and engaging in instructional actions such as teaching game-rules or adjusting the position of device screen so that siblings may be included (see Section 5.2.2). These exchanges displayed aspects of the interaction that pointed to the lived nature of family life and awareness of the 'here and now' of the situation. They also revealed how occupants in the family car may act within the familiar notions of knowledge of each

other's behaviour (Tolmie, 2003, Pomerantz and Mandelbaum, 2005). In practically accomplishment of family life, parents and children discuss and talk about devices as a way of enacting family life. The technology provides an impetus for talk and this talk unfolds and allows family members to understand and respond to what is going on. In the car, talk between parents and children was observed to display retrospective as well as prospective orientations reported in earlier work (Goodwin, 2006a). In the former, parents associated current behaviour with past incidents or occasions of similar behaviour (See Extract 12, Section 4.3.2). In orienting to prospective events, the ongoing behaviour around devices may prompt parents indicate to children that current behaviour around devices will determine how children will receive devices in the future (See Extract Section 4.3.4).

The spontaneity with which activities take place is a key feature that is highlighted in the conduct of family life in the car. There appears to be a natural flow on occasioning talk while initiating activities such as navigation (see Section 5.3.1) or receiving a call (see Cycil et al., 2013) where family members seem to overlook pleasantries and politeness. The ways in are interactionally managed however is dependent on the access to media, levels of expertise of those using the technology and level of parental intervention required.

6.2.3 Accountable Characteristics of Family Work

This research is specifically interested in how family members orient to each other and make their talk and actions recognisable to each other in order to conduct interactions. In keeping with this, the third research question is:

RQ 3. How do family members account for their actions by drawing on present and past resources in engaging and disengaging with one another, whilst using media?

Within ethnomethodological studies, *accountability* refers to the way in which members within a setting make their behaviours recognisable to those around them in response to the environment and the interactional significance of their talk and actions (Geist, 2012). Participants in an interaction make their actions and talk meaningful in a manner that those engaging in the on-going conversation understand them. The participants are orienting to their inter-subjective understandings of objects, rules and patterns of communication. For families travelling together, technology use and appropriation is closely linked to the family practices around familiarity with the child's interests and preferences. In the data,

the activities of initiating talk with children while playing a game and engaging through play is accomplished by paying attention to each family member's interests and capabilities as well as the resources available at a given time. This awareness of each member is created jointly through the background knowledge as well as the sequential production of actions (both verbal and non verbal) within the current context (Garfinkel, 1964, Sacks and Garfinkel, 1970).

As seen in Section 4.2.1 on dealing with device talk, examples in the data pointed to the ways in which families develop conversations around device use by relating to a particular device or game. Parents engage in conversations with children about games, ask questions based on their knowledge and familiarity with children's activities and routines (Pomerantz and Mandelbaum, 2005, Butler and Wilkinson, 2013). Parents are then able to reflexively produce their activities by orienting to the game as known by the family unit, either because the parent has played it before or is drawing on prior instances of play (Fatigante et al., 2010). While at the same time there are things that children know well for example about applications and games on devices that parents do not have much knowledge about. This can lead to examples as we saw in the data where children shared their knowledge of games and the gaming situation with their parents.

Another way in which parents make their orientation to family work accountable is through efforts of resolving disputes with children or between children. Parents resourcefully distract children and avoid disputes, (See Extract 16.7, Section 5.2.3) by drawing on their knowledge of children's biographies and their experiences that help deal with difficult situations (Kent, 2012b).This may be displayed through the collective efforts of both parents, as seen in requests for the return of devices where the father supports the mother's instruction to the children. Similar observations are observed in Extract 15.1 in Section 4.3.2, where the father supports the mother in indicating that the daughter can take a break from using the tablet in the backseat. The emergence of these practices often rests upon which family members knew *what* should be done, *when* it should be done and *how* it could be done in the most effective and fair way possible.

Another way in which parents may account for their actions is to make references to their role not just as parents, but also as responsible drivers while in the car. For example, when children are engaging in navigational activities with parents, delays or mistakes in providing navigational interactions led to parents discuss the relevance of these concerns to the driving context. For example, parents are seen to explicitly tell children that they need

to warn them early in advance as they have to conscious of traffic behind them (See Extract 19.5 in Section 5.3.3).

6.3 Organisation and Production of Family Activities in the Car

In the practical accomplishment of family life, one of the key concerns is in studying the 'activities' of family members. Conducting of these activities is dependent on the arrangement of people, artefacts and associated practices within a given setting. The importance of situated and embodied conduct has been extended within the role of the material environment in supporting the conduct of activities. Access to particular objects is seen to facilitate the production of sequential actions.

6.3.1 Mobile Devices as Situated Resources

Devices become relevant within an interaction when participants orient to them over the course of activities. In general, objects are made meaningful over the course of social interaction that they support whether this is through talk, gaze or gesture. According to Hutchby (2001) the functional and relational affordances of objects are made relevant through references to them in a range of human practices. In this regard, one of the research questions was:

RQ 4. How do families travelling together orient to the material and situated properties of mobile technologies during their use over the course of car journeys?

In the car, mobile and digital technologies may be seen as supporting and sustaining interaction. For example, devices often provided entertainment value for children and peace of mind for parents as children could be occupied on long journeys. Garfinkel's account of 'oriented objects' (Garfinkel, 2002a) suggests that such as maps or instruction booklets that are intended to support on-going activities of way finding or DIY (Do-It Yourself). Similarly, the devices used in the data extracts discussed in this thesis are made relevant through the activities that they support whether this is navigation, game-play or conversation.

The analysis in this thesis examines the impact of devices to family life in the car demonstrates their clear relevance over the course of conversation and embodied interaction. Within the field of CSCW, the construction of action and conversation around physical objects such as phones or computer screens have been significant in understanding the on-going production of action (Heath and Luff, 2000, Hindmarsh et al., 2000). They can be meaningful in in facilitating interaction as well as supporting the

routine work of technologically rich settings such as the workplace. The family car differs from settings such as workplaces because for one it does not involve a professional context and thus technologies are not meant solely for functional purposes. Further, family members bring with them varying range of abilities and preferences. In the car, devices such as tablets and gaming consoles serve an entertainment purpose as well as facilitators of conversations between parents and children. They act as a source of reference for both parents and children to orient themselves into producing commentary about ongoing activities like playing a game. In the examples in Section 4.2, we can see how both parents and children orient their speech to communicate through the device. Children use devices to orient parents to what they are doing; parents orient to this content by recognising it from past experience or posing questions to stimulate further conversations with children.

Beyond communication, another impact of devices in the car concerns their role in supporting and facilitating collaborative activity between drivers and passengers. There are three aspects to this role. First, devices can aid in supporting focused encounters where both participants in the interaction are orienting to the single object through their gaze and bodily orientation (Goffman, 1963). This was seen in the use of the Crossword Puzzle shared between two siblings or the laptop used as a shared device for watching a movie together (see Section 5.2.2). The use of the device here draws attention to the importance of objects in the car to be 'mobile' such that they can be moved around easily, such as to the parent in the front seat seen in Extract 16.5 in Section 5.2.3.

Second, the use of devices for such collaborative encounters also presents an opportunity to study potential problems that can arise in their use, for example, the disputes due to turn-taking issues in gaming may become problematic and require parental intervention. Disputes may also arise from the form of the device and its inappropriateness to support activity in the car. Large devices might not be convenient due to space constrains (e.g. difficulty in positioning the laptop between children in the backseat in Section 5.2.3). Smaller screens on devices may fit the available space better but make the sharing of views more difficult.

Third, the use of devices has potential to bring meaningful orientation to the journey by supporting users' understanding of a changing environment. In the example of navigation (Section 5.3.1), the phone serves as a reference for parents and children to understand the car's movement in the outside environment. Features of the device, like the arrow on Google Maps' pointer (see Extract 21.2 Section 5.3.1) act as indicators to prompt co-

navigators of when there are problems in the upcoming journey. At the same time, it supports the interaction only when the devices' features are oriented to appropriately. For example, when parents pass the devices to children to navigate, the touchscreen nature of the device requires that the device is carefully oriented to so as to not accidently press anything.

6.3.2 Spatial and Temporal Concerns

Collaborative interactions involving the front and back seats of the car beg the question of wider implications that the spatio-temporal arrangements of the car can have. This brings our attention to another question posed at the start of the thesis:

RQ 5. How do the temporal demands of journeys: the length of journeys and their progression as well as the spatial constraints: arrangement of seats, limited mobility interact together while travelling in the car impact the ways in which families orient to technology use?

The analysis in this thesis exemplified the role of the car as a unique mobile and spatially dense site for the unfolding of family activities.

When examining the role of devices in the family car, deciding what device is offered to children on journeys is closely linked to the journey's temporal significance. In the data, it is observed that devices were usually offered early on in the journey (See Extract 9.1 Section 4.3.1) or when children become restless. Once identified, what is necessary is to attend to the careful arrangement of the device in relation to the passenger and the journey. For example, in Section 4.3.3 on "Pacing Device Use", parents decide that the child must relinquish hold of one device because of the likelihood of it running out of battery, while being offered another. Here, it is observed that parents are exerting some of their knowledge of the journey and the devices to determine what was offered to children. Further, the temporal needs of specific devices place significant importance on how the device interaction needs to be matched to the journey's rhythms. For example, parents may find that particular devices are more suited for some parts of journey than others. A second feature of the temporal organisation of device use is that the endings of journeys must coincide with winding down of device use. This means that parents request for devices back from children and may sometimes need to coax children into returning their devices back when there is a sign of the journey's end (see Extracts 14.1 & 15.2 in Section 4.3.4).

Not doing so might mean that not doing so would mean that there is the added work closing down devices in addition to getting things ready for arrival at the destination.

The spatial configurations of the car significantly affect the ways in which activities are produced between passengers. For example, between front-seat passengers and drivers there is far more easy access to involve in showing of devices and engaging in discussion around device use (as seen in Section 4.3.1). In the backseat, whilst passengers are in close proximity to each other, they are restricted by their seatbelts and are only able to carrying out activities within this constraint. For non-driving parents who may need to intervene in a backseat activity by prompting assisting in a backseat activity (See extract 17.3 Section 5.2.1) or helping with a game (See extract 16.5 Section 5.2.3) the extent to which they can physical intervene or support children is quite limited. Whereas in the home, it would be common for parents to go around and gently facilitate the co-operation of children by embodying directives by shepherding (Goodwin and Cekaite, 2014) them away from situations.

6.3.3 Asymmetries in Knowledge and Skills

This section draws attention to instances in the analysis that highlight the contrasting abilities of children and adults in using technology in the car. This highlights the research question set forth in the beginning:

RQ 6. How does the data demonstrate the ways in which parents and children jointly construct technology-supported activities in the car?

Children as digital natives are significantly more adept in picking up technology skills yet, they still may have knowledge of driving for example as an activity. Here they rely on the parent to instruct them on how to pace produce talk to match the needs of the mobile space. Their problem solving and spatial reasoning skills may depend on their stage of development (Cooper, 2006). This was evident through the analysis particularly with regard to activities when children provided navigational assistance for parent drivers.

Spatio-temporal Asymmetries: In the analysis, children orient to the driving conditions in a different manner to adults and are not able to make the same judgements about the moving environment. For example, in Section 4.2.2, the extracts on device talk examine how young children may initiate talk at times that is not conducive to what the parent may consider appropriate. Children are orienting to their child-like nature of indicating to something that is relevant to them, at a time that is important for them, for e.g. clearing a

level on a game console. In turn, it is observed that parents adapt to this invitation by offering their attention when possible. For example, while driving through a busy road, parents may be unable to share their visual attention, but may instead offer a listening ear to the child's talk (see Extract 3 in Section 4.2.2). This is explicitly visible to the child both through the parents' speech as well as through their body positioning.

A second issue linked closely with the temporal mismatch is that children tend to face difficulty matching the spatial and temporal elements of activities such as navigation. For example, children may not be able to understand that instructing parents at the right time has a bearing on the driving activity. Parents in turn become sensitive to this by prompting children to provide instructions at the right time. The device may also have some role to play in this. While children may be aware of some aspects of the touchscreen layout of phones from , reading a virtual map or following instructions from a navigational unit is sometimes frustrating for adults (Brown and Laurier, 2012) and may be seen as even more challenging for children. Navigational instructions from mobile phones (Section 5.3.3) have to be adapted to the driving conditions as well as placed in a sequentially ordered fashion (Haddington and Rauniomaa, 2011) such that the activity is made meaningful to the parent-driver. Therefore participants are involved in a dual orientation to both the devices and what is conducted within them as well as how this bears on the orientation to each other. Further, the passenger's role in level of understanding of the temporal and spatial significance of activities may affect the way in which an activity is carried out.

Asymmetries in following instructions: In Section 5.3.3 of the empirical findings, I describe how navigation may be set up between parents and children as a collaborative activity. Looking more closely at the analysis, it becomes evident that young children encounter trouble in keeping pace with instructions from a device or to infer meaning from conversation with an adult or from a device where the relevant interactional or navigational concerns are implicit (e.g. Extract 18.4 in Section 5.3.2). While trying to carry out a search, children often need to clarify and reformulate queries with an adult, who may not always be able to do so in the car. Further, there is an urgency to complete an activity quickly and often without extensive help from an adult (who is driving). This is also observed through the extensive use of explanatory gestures, emphasis on particular phrases and instructions given by the parent (refer Extract 18.3 in Section 5.3.3) to indicate to the outside environment in helping the child understand that the instructions on the screen need to be made in order to ensure that navigational sequences are followed. Parents and children are

seen to jointly produce gestures such that they are able to fix their attention on a mutual focus such a mobile phone. Parents also provide gestures as a resource for children to mirror their actions in order to develop skills wherein they can display their understanding of directional sequences.

6.4 Social organisation of family activities in the car

The analysis in the thesis points to particular features of the social organisation of family life in the car. The car has a very particular spatial arrangement, which is uniquely different to other settings such as the home, where participants are not able to sustain face-to-face interaction; therefore, this has particular impact on the ways in which activities are distributed between family members. Over the course of the journey and interaction, family members appear to recognise and respond to the particular roles that arise out of spatial configurations inside the car.

6.4.1 Spatial organisation of family members

The organisation of passengers inside the car demonstrates the ways in which family units orient to device use over the course of car journeys. In the example of navigational assistance in Section 5.6.2, the daughters in Extracts 18.1 and 19.1 are drawn into providing their mother assistance with the GPS. The analysis points to how the child (a novice) by being in the optimal position of a front passenger seat, takes the role of co-navigator. The spatial proximity of the child to the driver as well as access to the device itself allows for the joint activity of navigation to take place. In contrast to the child in the back seat, the position of the front seat passenger offers a better view of the road and proximity to the driving parent, which also facilitates viewing and operating the navigational device (i.e. the mobile phone) which is necessary for navigation.

Furthermore, the arrangement of adults in particular seats also facilitates the management of technology-supported activities. In the example of Extracts 16.5 and 17.4 in Section 5.2.3,, we observe that the spatial positioning of non-driving parents, i.e. the mother in the front passenger seat allows her to step in to dissipate any issues that arise from device use over the course of the car journey. In both examples, the parent is able effectively twist around towards the backseat as well as reach out and physically intervene. This is something that they would not be able to do if they were driving. The responsibility of device management also is dealt with this non-driving parent as was seen in Section 4.3.4 where parents in the front passenger seat request for the return of devices when

approaching the journey destination. Thereby by being placed in their position of non-driving parent, they address the immediate issue of device management.

6.4.2 Driving as a priority activity

While studying the organisation of family activities over the course of the car journey, the analysis highlights the importance of driving as the key activity across all family car journeys. In examining the production of family life in the car, it is impossible to overlook the role of driving as an ongoing, seminal activity. Both technology, conversation as well as children play a part in causing distractions in the car (Koppel et al., 2011, Nevile, 2011). The interaction of these factors was further explored through the empirical accounts provided in this thesis.

For example in the extracts in Section 4.2.1, it is observed that parents are frequently drawn into conversation about device use whilst driving. However, when there is an attentional demand placed on driving, the parent may deflect the questions or explicitly make the child aware of her (mother's) responsibility of attending to the driving (see Extracts 3 & 4). Talking to parents whilst conducting gaming activities is something that children engage in quite frequently in the home (Aarsand and Aronsson, 2009a). Furthermore, young children as that seen in Extract 3 are often not aware of the full concentration that driving entails and may need to be sensitised to this by parents. Here, parents are visibly torn between being good drivers, i.e. showing full attention to the road and being good parents i.e. providing a listening ear to their children.

In other instances where conversations are centred around driving supported activities as seen in Section 5.3.3 where children assist parents in navigation, frequent references are made to driving as a priority activity. Here, parents explicitly remind children of the urgency of being in traffic while driving and the need to solve navigational issues quickly (see Extract 19.5). Thus any problems that arise during navigational instruction needs to be quickly resolved so as to prevent frustration for other cars. What is evident in all such examples in the data is that driving is an activity that should be free from distractions as there is an important safety risk associated with distraction.

6.5 Summary

In this Chapter, I brought together the main findings of the thesis in order to highlight the ways in which the analysis of the data directs the understanding of how family life is conducted and supported in the car through technology. This section positions the

empirical findings against the main research questions set forth at the beginning of the thesis. Drawing on the analytical accounts from the empirical findings, I discuss position the findings against the existing literatures in family work, ethnomethodology, conversation analysis and computer supported cooperative work (CSCW). I show how the analysis from video ethnographic data provides a detailed and rich account of how family life and practices may be displayed in the mobile context of the family car.

The discussion presented in this chapter highlights specific concerns that are relevant to understanding the social organisation doing family in the car. The findings from the empirical data also directly informed the explorative design of technology systems for the family car. In keeping studies with the tradition of ethnomethodologically inspired systems design, through the knowledge of the organisation of family life in the car, designers are sensitised to the concerns and issues of families. The findings further supported the design part of this thesis by providing descriptive accounts for designers to use. A full description of this is account can be found in Appendix 9 of this thesis.

Chapter 7 Conclusion

7.1 Introduction

The value of this research lies in the study of the practical organisation of activities that form family life in the car. In developing our understanding of family device use as a highly situated, interactional pursuit, this thesis provides implications for how technology interactions may be understood in the light of this. Hence, from a practical and design-oriented perspective, there are some useful lessons to be learnt. Despite family life and activities being distributed across a range of settings, the car had not been explored before as a site of production of family life in the context of technology use. This thesis addresses this scarcity of relevant research and explores the character of family life as manifest through a range of activities and technologies that support family members in the car. The research particularly focused on how families organise their interactions around the use of technological artefacts in the routine production of journeys. This concluding chapter frames and reiterates the contributions of the study as well as considering limitations and issues of future work.

7.2 Research Contributions

The research contributes to an understanding of family life in the presence of technology in the car. Family life is a unit of interest to social studies, mobility, EMCA and technology designers. In line with the interdisciplinary nature of the project, findings of the fieldwork inform the key research areas of interest discussed in the thesis' earlier literature section. In addition to the intended theoretical contribution in the interdisciplinary studies of social science and technology, including Human Computer Interaction and Computer Supported Co-operative Work, as well as Mobilities, the thesis further attempts to advance the methodological contributions of Ethnomethodology and Conversation Analysis to studying family life. From a practical perspective, the study combines the detailed description of technology use and interactions with implications for future technology design.

7.2.1 Theoretical Contributions

The interdisciplinary nature of the current research supported the reach of the analysis to inform a range of areas where the insights of the findings can strengthen the knowledge understanding the concepts and ideas within EMCA, Family and Technology Studies.

Ethnomethodology and Conversation Analysis (EMCA) Literature

The EMCA literature around technology use has largely focused on work in professional contexts. This originated from Garfinkel's early influence on the value of ethnomethodological orientation to the study of work settings (Garfinkel, 1986). Some notable attempts have been made as seen in a recent compilation of studies in the volume "Ethnomethodology at Play" (Tolmie and Rouncefield, 2013), in which the authors present the exploration of applying EMCA to a range of leisure activities. Further, EMCA's application to study of intimacy and family relationships has been so far limited to a few studies (e.g. Tolmie, 2003, Pomerantz and Mandelbaum, 2005). The current research further extends this line of work by adding to the understanding of family relationships.

Building a description of the practical work of doing family involves an understanding of the production of social order by making sense of activities around them. In particular, the research adds to the understanding of doing family in the unique setting of the family car. The home has been largely a setting for the explorations of family life in both routine activities as well supporting the role of technology. Ethnomethology's notion of orderliness, inter-subjective understandings (between parents and children), mutual intelligibility (of gestures, objects and relationships), and the organisation of sequential activities is manifest through the range of activities that family members engage in the car. Further, the ability of mobile devices to index different range of uses and support a range of interactions are visible through the ways in which family members orient to the use of devices over the course of car journeys. The analysis also draws attention to how social roles such as being 'responsible parents' and 'drivers' are evidenced in the interaction between family members in the car. This adds to the understanding of workings of membership categories as a product of conversation and situated conduct in the family car.

The application of EMCA to studying orchestration of multiple activities in the car's context (Mondada, 2011, Nevile, 2011, Haddington et al., 2013) and the role of objects in mobile interaction (Nevile et al., 2014) also strengthen the relevance of the current findings. However, earlier studies had not scrutinised the role of child passengers in car journeys, which highlights the novel contribution of the current work. Carrying out activities such as supporting navigation or assisting in answering a phone call while being alone, or in the company of adults, changes significantly when such interactions involve children. As seen in the analysis, there are a number of asymmetries in skills between

adults and children, which require that instructions and embodied actions are adapted to the ongoing interaction between family members.

Understanding family life through technology use

Early in the thesis, I reviewed the literature on the impact of technology and mobility on the ways in which family life is conducted. The family practices approach suggested by Morgan (2011b) provides a starting point to address the doing of family within a range of settings. Extending from this idea, the analytical orientation of EMCA provides a tool for describing the accomplishment of family life through scrutinising the activities. Further, I have extended the call in earlier studies to study the "in situ" context of everyday technologies. As a result, the findings presented in the thesis build on and develop earlier work of understanding technology use in domestic contexts such as the home (Aarsand and Aronsson, 2009a, Fatigante et al., 2010). Studying technology use in the context of the socio-cultural aspects of family life has been a call to address in other studies yet there has little reporting of these studies with the exception of a few (Davidson, 2010, Danby et al., 2013). The current study addresses this by its focus on how children's use of devices support the social interaction between parents and siblings.

Extending such work to the mobile space of the car and its emerging technological advancements has implications for our understanding of both for family life and technology. In terms of family life, having examined technology use within the complex social space of the car, I emphasise that the scrutiny of social conduct cannot be separated from the study of technology. The thesis builds on this by exposing the 'visible' production of social order through the everyday interactional context of family life. The analysis of the data demonstrates how features of conversation and non-verbal activities make visible socio-cultural norms around family activities, displayed through the orientation of family members to each other and to the activities at hand. For example, parents are seen to use upgraded forms of shepherding (Cekaite, 2010) such as gently nudging a child in the car in order to coax the return of devices.

In keeping with the understanding that technology has become a routine part of family life in everyday activities, the current research added to the understanding of studying regulation practices around devices within the family car. For example, the study of activity contracts have been useful in studying how parents get children to complete domestic tasks of cleaning, eating and playing (Aronsson and Cekaite, 2011). Similarly, applying this idea to the current research provided an account of how parental management

of technology use takes place. The use of directives and instructions are likewise embedded within technology use.

Furthermore, as children become proficient at using touch-screen and mobile technologies, (Geist, 2012) there is good potential for children to act as supportive assistants in the car as was described in the existing data analysis. The family car in this sense provides a space for learning how to support, assist and navigate. Unlike the home, inside the family car, the absence of an adult requires that a child may need to support the driver in a navigational activity or picking up a call (see Cycil et al., 2013). The accounts presented in this thesis draw attention to how children recognise and cope with requests from driving parents in the car. This analysis informs the understanding of how social interactions within family are a product of both the physical configurations of the setting as well as the material properties of the artefacts in use.

Theoretical Perspectives within HCI and CSCW

The current research follows the line of recent technology studies to incorporate observations of social conduct and human values into the design process. A significant consequence of this is to bring perspectives from sociology, anthropology and ethnomethodology to the design of computer systems. In the interdisciplinary work of HCI and CSCW, both family and the car have held particular interest to a number of researchers. The current research brought these interests together to the study of the car as a site for the production of technology and family activities. The range of activities studied within the everyday interactions between parents and children draws attention to systems design requirements within the social context of the family car. The ethnographic findings are particularly striking to designers because they draw attention to the fluidity and highly localised features of family activities and how it extends to the context of the car.

Whilst the domestic studies of technology have focused on homes have extended concepts from the workplace settings including homes as ‘centres of coordination’ and ‘division of labour’, some elements of this is seen in the car as an extension of the home. However, the focus in the current study moves away from a sole focus on family coordination practices, but instead adds to the understanding of how relationships are constructed, enacted through technology, and intertwined with practices. By scrutinising instances of families using technology in the car, the analyses in the current thesis follows the growing body of ethnographic work with the HCI and CSCW literature on cars that considers the social nature of interactions with devices (Leshed et al., 2008, Brown and Laurier, 2012). For

example, children's participation in collaborative activities of navigation and entertainment use has still been largely overlooked in earlier naturalistic studies. From the analysis, it is clear that the car accommodates the participation from multiple family members and technology often may need to fit these varied needs. The context of family relationships and contribution of past knowledge to existing practices informs the study of in-car technology.

HCI perspectives that consider the usefulness of the role of 'embodied interaction' within systems design (see Dourish, 2004) for example consider the importance of gesture and collaborative work in understanding user-machine interactions. Extending this to the car, given its spatial constraints, the arrangement of physical activity between the front, and between front and rear seats, lends itself to consider the role of gesture, movement, multi-person interaction and speech. It is worth reflecting on how this important feature of car-based, family interaction might be supported and understood in this light. Additionally, pointing gestures within the data proved useful to identify, highlight and emphasise relevant content to co-passengers. These gestures make tasks possible for the driver under surprisingly demanding conditions while speaking, hence adding another mode of interaction. Image processing and computer vision technologies (such as Microsoft's Kinect) are already capable of identifying gestures. In the light of the data presented here, it seems that it may not so much be recognition of stereotyped gestures acting to control aspects of a computerized assistant that is useful, but rather the use of gestures to highlight and identify topics of relevance.

Conversation Analysis (CA) provides a unique perspective to understanding the interactions of users with technology. While examining the applicability of CA findings in HCI, one of the key impacts is in enabling engineers and designers to understand the effects of technology systems better in naturalistic interactions (Norman and Thomas, 1990). Through its description of the sequential aspects of interaction, CA provides insights to systems designers in designing the arrangement of information as well as management of information flows within systems.

7.2.2 Practical Contributions

The practical contributions for this thesis provide an impetus for designers to apply ethnographic findings to systems design. Conversation Analysis and HCI share an important interest in addressing "*practical solutions to interactional problems"* (Norman

and Thomas, 1990). The organisation of conversations as described in this thesis is aimed at informing the orderly work of interactions within instances of human-device interactions. In this manner, the study's interest lies in the study of naturally occurring family talk within technology use, which provides real and lived accounts of human-device and human-human interactions around devices.

Interactive Systems Design

The design of interactive systems for the car tends to place emphasis on the support of the activities of the driver and to some extent adult passengers. However, little research has considered the implications of what designing systems for the car may involve regarding: 1) multi-user contexts such as the family car 2) information flow as scrutinised in natural sequences of interactions with in-car technology 3) addressing family concerns in in-car systems design.

An important implication from the current data in this thesis is to highlight the multi-user needs of family units travelling together. If designers are to consider how multi-user/speaker issues are handled in the car as tasks are delegated to child passenger, or divisions of labour are negotiated between the travellers, user location may help in determining who is speaking, and this may subsequently help identify the topic that they are speaking about. This is still widely overlooked in the area. Further, the study findings emphasise the focus on design of passenger technology. At a more fine level of detail, pointing gestures or even passing tangible (i.e. trackable) objects between travellers may allow a computer-based system to draw meaningful inferences about the current state of interaction, for example, who currently holds 'ownership' of dealing with media content (e.g. music controls) or some problem solving activity (such as locating a destination address). Another aspect that was observed in the analysis is the way in which touch interfaces were oriented to. For example, when passed on to a child navigator, in order that navigational support is provided adequately, it was important that no changes were made to the screen during the activity. In this regard, including the concept of "Navigation Mode" or "Child Navigation Mode" maybe one consideration. This is further explored in one design concept addressing the concern of a Child Navigation System (further details can be found in Appendix 9c)

Interactive systems are based on a strong grounding on the feature of next-ness where the flow of information is at the heart of such design (Norman, 1983). Studying naturalistic accounts of users interacting with technology as recorded in this thesis provides detailed

information on such phenomena. There is limited research on what is natural behaviour around technology in the family car. For example, in the family car, suddenly passing a device to a child and seeking their help to receive a call or co-navigate is a common occurrence. The spontaneous nature in which conversational exchanges take place over device use has important implications for the design of voice-based operating systems that promises 'hands-free' features. Furthermore, incorporating the importance of pacing the sequence of instructions within navigational applications is necessary for collaborative activities between parents and children.

Another important implication relates to the application of family-based systems to technology design in the car. Designers responsible for developing in-car 'infotainment' systems may wish to take account parental concerns in addressing 'good media practices' such as turn-taking, time-limits on device use and device return when journeys conclude. The thesis addressed the potential of collaborative gaming controls for the front-seat, as parents may need access to turn off a device or control it otherwise (Refer Appendix 9a for details on design). Even functional systems such as navigational technology may need to consider the differential skills and orientations of children. While children may be technologically competent in operating touch screen phones and tablets, they are not necessarily competent in reading virtual maps on phones. Systems that present concepts in explicit, more tangible ways or that give visual representations of distances and directions in a manner that children can relate to would appear to be valuable. Mixed media solutions may be more suitable for this purpose given that these features might be challenging to demonstrate in a primarily speech-based interface (i.e. "eyes free") (see Cycil et al., 2013).

Additionally, two key points in the design of family systems were raised while conducting the impact project with designers. The *first*, relates to *adapting systems to changing family patterns***.** The preference from families was to have systems that would adapt to the changing family needs and 'grow' with families as opposed to trying to upgrade a whole car. For example, one design that was found to be more relevant only to a specific family life stage was the HomeCar Organiser (See Appendix 9e) which was eliminated by parents from the shortlisting as they felt its usefulness was limited to families with very young children and a given life stage. This echoes with findings in studies of organisational practices around the home, where Taylor and Swan (2005) where the needs of domestic systems are continually (re)designed to adapt to the changing requirements of families as children become older, gain more independence in the use of devices, etc. The *second*

concern raised was a *preference for application-based systems.* A key realisation of studying the current context of family interaction around technology is in recognising the fact that families are already saturated with digital devices in both the home and the car. Families indicated positively to application-based systems that could easily be imported into existing mobile phones and tablets carried into the car.

The table below summarises the design concepts that evolved from key concerns and observations made from the ethnographic data.

Design Concept	**Corresponding Video Extracts**	**Observations from Data**	**Key Design Goals**
Turn-taking System	Phone and Games (F4)	• Disputes arising from turn-taking on devices. • The device as the centre of joint activities. • Parental involvement in supporting device management.	• Incorporating a fair system of turn-taking between children. • Supporting multi-user device use in the car. • Reducing the need for parent-driver intervention in backseat.
Children's Navigation System	Navigation in Campsite (F5) Everyday Navigation (F10)	• The role of the artefact in sustaining the navigational activity. • The competency of the novice child and expert parent collaborating on the device. • The spontaneous hand over of the device	• Incorporating progress of the outside environment in the interface • Supporting instructional guidance. • Incorporating gestural support in navigational sequences.
Volume Control System	Racing car Game (F4) Turn it off (F8)	• Auditory disruptions arising from multiple device use. • Conflicting use of media across front and back seat areas. • Parental monitoring of device use.	• Prevention of disturbance from multi-device concerns • Provide parental access to control devices. • Synchronising device return to coincide with journey ending.

Contribution to Car Studies

The current research highlights the complex space of the car and its role in supporting a range of different family activities. Here the research findings points to how parents attend to the multiple demands of driving as well as the demands of keeping children engaged during journeys, as well as resourcefully engage in joint use of devices. The study findings

highlight how the car's moving context is ever-changing and continuously renewed as family members engage with each other and the changing environment outside the car.

The findings discuss how various technologies are used by parent-drivers as well as passengers to support the driving activity. For example, the study showed how parents may develop practices of using mobile phones to navigate even when they had access to built-in Car Navigation systems or a Satnav. This highlights the fact that, for many of these technologies, there might be a gap between intended design and actual use. Another aspect to studying such practices is how the car shapes the use of particular mobile devices. For example, navigating one's way using a mobile phone while walking contrasts significantly with its use while driving. Navigating while driving entails that drivers divide their attention between navigation instructions and the road. At the time of the research, there was considerable interest in the potential to design technology for driverless cars. This shifts focus to a greater emphasis on the 'passenger' experience of car travel. The current data discusses the potential for child passengers to engage with the on-going journey in activities such as reading maps or messages on a phone. The findings indicate that there is greater potential for passengers to support drivers in the driving activity if the interfaces can support sharing of screens and even a simplified screen so that children can follow the progress of journeys.

Furthermore, another contribution of this naturalistic approach to car studies is to provide researchers and industry experts with an unmasked picture of how family life and activities are conducted in the car. This sensitises car designers of the complex concerns of the car. This was further materialised through the industry visits as a part of the Impact Grant (See Appendix 8 for details). The visits and discussions with the automotive research units were fruitful in that the research being carried out had significant interest in the way in which real-life concerns could be incorporated into the design of technology. Many of the industry experts were keenly interested in users' views on new devices as well as practices can be incorporated into the design of technology.

Contribution to studying mobile practices and methods

The importance of the study of the construction of interactional practices within mobile objects is gaining significant interest. The methodological contribution of this thesis in the current direction is in how social activities may be oriented to in the context of a moving car. Passengers and drivers orient to each other in ways different from the home or other settings. One reason for this is the lack of face-to-face interactions that is hindered by the

forward facing seats. Studying these practices are particularly challenging as researchers may not always be able to follow participants, and study all aspects of interactions in the car.

The study broadens our understanding of how mobile technologies in particular are situated into the routines and practices of everyday mobile lives of families. The current research builds on previous work of in-car recordings from the work of (Laurier et al., 2008, Mondada, 2012b, Haddington et al., 2014). At the same time, it adds to this body of research by focusing on a very particular feature of family car travel i.e. technology and family life. For example, while studies around orientation to way finding between driver-passenger pairs has been carried out, very little attention has focused on children as collaborative passengers. By focusing on children as active participants of car journeys, the thesis addresses this shortcoming.

The recording of data extends the studies of driver-front passenger and driver-road interactions by including interactions recorded in the backseat area. This part of the car has been overlooked in earlier car studies (Laurier, 2013). The current study addresses this drawback by scrutinising the details of backseat conversations and observations by highlighting its relevance to what is being done in the front seat area. With its particular focus on family units travelling together, the research discusses how what happens in the backseat area can have considerable impact on the ways in which the journey unfolds. The set-up of the backseat, while considering the arrangement of passengers, their devices and their orientation to each other and to the front seat have important implications for the construction and sequencing of interactions around media use.

7.3 Limitations of current research

The current research involved working with participant families largely residing in the West London area. The observations provide a rich picture of family life and the social organisation of family in the car. While I tried as far as possible to look at a range of different family configurations, cars and technology practices the practical limits posed by the PhD in terms of time and scope for recording over long periods posed certain inevitable restrictions. The examples of families used in the data were representative of the entire corpus. As such, the analysis is not intended to generalise the findings for all types of families and cars.

Another aspect that posed limitations was the method of data collection itself. In the interest of collecting a good representation of data and causing minimal disruption to families, the choice of simple, low definition dashboard cameras were set up for data collection in the front seat. The advantage this provided to the current study was that the cameras had extended battery life, were inexpensive and compact to set up (as are intended for use in the car) in comparison to earlier studies of in-car recordings which involve some organising special arrangements for set-up in the car (see Laurier, 2013). Although the quality of video was perfectly adequate for the purposes to which I have employed it: i.e. to study driver-front passenger interaction around device use in the front seat, future work could consider supporting this recording with a better way of capturing audio. While the current means did not act detrimental to the analysis of data, it required more attention in the transcription stages. Further, carrying out fieldwork in the United Kingdom was affected by the limited daylight time available for recordings, which severely impacted the number of journeys that could be recorded over winter periods. This also meant that recording with families was spread out with some gaps between data collection during dark winter periods. While I did consider using cameras that would capture night-time recording, the effort seemed both expensive as well as being an extra hassle for parents to endure while driving.

The data collection involved setting up static cameras in the car, as they would require minimal adjustments through the journey. However, the fixed set-up limited the viewing angle (see Luff and Heath, 2012, Laurier, 2013), which affected the extent to which cameras could capture the screens of devices that passengers and drivers were using during journeys. Further, as with most technical set-ups, there were journeys during which the back seat camera could not be set up or run out of battery life over a long journey. Despite these challenges, families made their best to recharge the cameras and re-position angles resulting in a considerable representation of family journeys.

In the design extension work of the research discussed in Appendix 9, it was found that the findings lent themselves to a stronger emphasis on constructing designs for the parents' perspective. This was further limited by the ethical challenges of including children in the design process as well as the expertise required to work with this group. As a result, the designs had a stronger focus on parental controls and less on the children's perspective of the technology. Further work is required in looking at including children in participatory design research in order to address this limitation.

Ethnographies carried out in the ethnomethodological enterprise with technology studies have so far acquired a respectable place for themselves (Hughes et al., 2000, Crabtree and Rodden, 2004, Taylor et al., 2006). However, there are still some controversies related to this perspective. One relates to the inadequacy of ethnomethodology to result in the design of technological artefacts or systems. In defence of this criticism, the current research uses ethnography to explicate the social organisation of users' activities around technological artefacts instead of focusing solely on designing of new systems (Crabtree et al., 2009). Thus, it should be noted that the aim of this study was to unpack the social organisation of family work such that designers can reflect on these insights. To this end, the research attempted to address this to a significant extent by connecting the ethnographic findings to design insights, through the collaborative work with designers. A second concern within ethnography relates to how the fieldworker's perspective (i.e. subjectivity) affects the analysis of material. The ethnographic descriptions provided in this thesis reflect the interpretive framework of participants rather than the ethnographer's view. By this, the focus of analysis is on developing accounts of participant activities and describing the methods by which their activities are visible and accountable to each other.

7.4 Lessons for future work

In carrying out novel, in-depth research, there are always ways in which new studies can extend the findings in the current work or be inspired by work done in the thesis.

With regards to the methodological approach to in-car interactions, future work in car recordings may want to consider incorporating different approaches to capturing front seat activity. The role of studying the driver and passenger interactions with the in-car console was lacking in the current work. The car's interiors makes the setting up of such recording arrangements difficult and will therefore require a more sophisticated arrangement of cameras or the physical presence of the researcher to focus the camera angles. Such an enquiry would have significant potential as drivers often place mobile phones in the front or may refer to the stereo over the course of the journey. Further research can look into how interactions within this space can enrich the studies of social interaction inside the car.

Additionally, the front-seat cameras provided GPS data of the journeys undertaken by providing contextual information of the journey's progression. This data has particular value in representing the progress of the vehicle when stopped at a junction or in an area

with no navigational coverage. The full scope of its use can be further explored in future studies.

Another aspect that was not explored in the current study is the scope to study the preparations before and after the car journeys. Such observations were made during the 'follow' fieldwork carried out by the researcher while visiting families prior to recording. However, to keep a clear focus on the interactional aspects of doing family inside the car, these observations were beyond the scope of the thesis. However, the importance of these activities certainly has good potential for further exploration.

A future topic of enquiry may be to carry out a longitudinal study of the changing mobile patterns of families over different stages of family life. Technology usage patterns, as well as the frequency and range of journeys are seen to differ across families with children of different ages. Tracing these patterns over the course of family members' lives may shed light on how the families adapt their routines and practices over time. Further, changing patterns of driving such as children reaching driving age and contributing to family driving may be an interesting future topic. Indeed during the course of data collection and follow-up families underwent change in circumstances, including welcoming new family members, re-location as well as transitions from single to blended families to mention a few.

Examining the family car as a technology rich site across cultures may also be an enriching endeavour. While I gathered some data of families in India travelling in cars, discussing the findings here was beyond the scope of the current thesis. Analysing this data would provide an enriching view of family life in a unique cultural setting. Parts of these fieldwork findings were presented in the Future Mobilities Conference in Lancaster University where it received highly positive feedback from an interdisciplinary audience. Further, the lack of accounts of family mobilities in the Indian context is a motivating reason to pursue this work.

A considerable amount of work was carried out on the extension of the current project in the form of collaborative design work with designers in addition to the involvement of users in conceptualising the early designs. Extending the efforts of this collaborative work, there is good scope to test and evaluate the designs with users and carry on further work on how the designs can be further developed and implemented in family cars.

7.5 Closing remarks and reflections

The interdisciplinary nature of the project provided impetus for the research to draw interest from a range of fields. The current study extended interest both for the study of family interactions and the study of the car as a site for the production of family and technology use.

The thesis draws interest from social scientists who are interested in how groups such as families are organised within the complex interactional space of the car that brings together the moving environment along with the social and technology rich interiors. The current research provides a rich understanding of the construction of social activities between parents and children travelling in an automobile. It highlights the way in which relationships between family members are accomplished through technology. The research teases apart the mundane aspects of family life such as talking, sharing, dealing with disputes and provides the enactment of this in the unique setting of the family car. The role of children are active participants in car journeys was particularly highlighted.

For designers of technology, the work provides important implications for how knowledge of how families interact around technology may inform systems design for family cars and systems. The practices observed in the current study can extend the development of connected car technologies for a range of different users. Children have often been overlooked in car studies except as passive passengers, for whom design of technology is meant to be for the purposes of enjoyment alone. However this study shows children as active conversationalists for driving parents as well as co-navigators for joint navigational activities.

The result of such an endeavour is in the design of technologies that are sensitive to nuances of social interactions, relationships between members and that support users in useful and sensitive ways.

In writing this thesis, my challenge was to strike a balance between a social science approaches to the study of family while highlighting the family car's relevance to designers of new technology. The collaboration work with designers as a part of an impact fund became quite useful here, as I was able to use the insights from the field work and translate them into design concerns with support from the designer (refer Appendix 9 for full details).

Reflecting on my fieldwork as a researcher, I was struck by my thoughts on doing fieldwork for the first time both within a new field of enquiry as well within an interdisciplinary context. In any ethnographic study, the issue of access becomes a very real concern for the researcher. I was an outsider to the place (having arrived to London as a foreign student) and I was an outsider to family life as one who did not have children. Having read previous ethnographic work where ethnographers act as their own gatekeepers to the field, I thought that not having children myself, I would encounter a major hurdle in recruiting families. Over the course of data collection, as I met and worked with a few families, I became more aware of the places that families visit, and the routines they encountered (school trips, half-term, and holiday clubs). When families recognised that I was a young researcher without children, they were all the more generous with allowing me to experience their mundane routines. I found that studying something as utterly mundane as family life is more challenging that it seems as many of these aspects are taken for granted. I will always be grateful to the families that made this project possible by generously providing their time and engaging with the project with genuine interest.

Spending time with the families and studying their utterly mundane aspects of their lives helped me develop detailed accounts of human interaction. In drawing up this account of mundane family practices around technology, my hope is that more researchers are inspired to develop accounts and draw up a record of the mundane features of a range of everyday activities.

References

Aarsand, P. A. & Aronsson, K., (2009a). Gaming and territorial negotiations in family life. *Childhood,* 16(4)**,**pp. 497-517.

Aarsand, P. A. & Aronsson, K., (2009b). Response cries and other gaming moves—Building intersubjectivity in gaming. *Journal of Pragmatics,* 41(8)**,**pp. 1557-1575.

Alm, H. & Nilsson, L., (1995). The effects of a mobile telephone task on driver behaviour in a car following situation. *Accident; analysis and prevention,* 27(5)**,**pp. 707-15.

Aronsson, K., (2006). Commentary 1. Doing family: An interactive accomplishment. *Text & Talk-An Interdisciplinary Journal of Language, Discourse Communication Studies,* 26(4-5)**,**pp. 619-626.

Aronsson, K. & Cekaite, A., (2011). Activity contracts and directives in everyday family politics. *Discourse & Society,* 22(2)**,**pp. 137-154.

Atkinson, J. M. & Heritage, J., (1984). *Structures of social action*: Cambridge University Press.

Atkinson, P., Hammersley, M., Denzin, N. K. & Lincoln, Y. S., (1994). *Handbook of qualitative research*: Sage Thousand Oaks.

Barker, J., (2008). Men and motors? Fathers' involvement in children's travel. *Early Child Development and Care,* 178(7-8)**,**pp. 853-866.

Barker, J., (2009). 'Driven to Distraction?': Children's Experiences of Car Travel. *Mobilities,* 4(1)**,**pp. 59-76.

Bell, G., Blythe, M., Gaver, B., Sengers, P. & Wright, P., (2003). Designing culturally situated technologies for the home. *In*: *CHI'03 Extended Abstracts on Human Factors in Computing Systems*ACM,pp. 1062-1063.

Bell, S., (2002). Spatial cognition and scale: A child's perspective. *Journal of Environmental Psychology,* 22(1)**,**pp. 9-27.

Bentley, R., Hughes, J. A., Randall, D., Rodden, T., Sawyer, P., Shapiro, D. & Sommerville, I., (1992). Ethnographically-informed systems design for air traffic control. *In*: *Proceedings of the 1992 ACM conference on Computer-supported cooperative work*ACM,pp. 123-129.

Blum-Kulka, S., (1990). You don't touch lettuce with your fingers:: Parental politeness in family discourse. *Journal of Pragmatics,* 14(2)**,**pp. 259-288.

Blum-Kulka, S., (2012). *Dinner talk: Cultural patterns of sociability and socialization in family discourse*: Routledge.

Bonsall, A., (2015). Scenes of fathering: The automobile as a place of occupation. *Scandinavian journal of occupational therapy,* (ahead-of-print)**,**pp. 1-8.

Bowen, M., (1966). The use of family theory in clinical practice. *Comprehensive psychiatry,* 7(5)**,**pp. 345-374.

Bowlby, S., (2012). Recognising the time–space dimensions of care: caringscapes and carescapes. *Environment and Planning-Part A.*

Boyarski, D. & Buchanan, R., (1994). Computers and communication design: exploring the rhetoric of HCI. *interactions,* 1(2)**,**pp. 25-35.

Brown, B. & Barkhuus, L., (2007). Leisure and CSCW: Introduction to Special Edition. *Computer Supported Cooperative Work (CSCW),* 16(1-2)**,**pp. 1-10.

Brown, B. & Bell, M., (2004). CSCW at play:'there'as a collaborative virtual environment. *Proceedings of the 2004 ACM conference on …***,**pp. 350-359.

Brown, B. & Laurier, E., (2005). Maps and journeys: an ethno-methodological investigation. *Cartographica: The International Journal for Geographic Information and Geovisualization,* 40(3)**,**pp. 17-33.

Brown, B. & Laurier, E., (2012). The normal natural troubles of driving with GPS. *In*: *Proceedings of the 2012 ACM annual conference on Human Factors in Computing Systems*ACM,pp. 1621-1630.

Brown, B., Maccoll, I., Chalmers, M., Galani, A., Randell, C. & Steed, A., (2003). Lessons from the lighthouse: collaboration in a shared mixed reality system. *In*: *Proceedings of the SIGCHI conference on Human factors in computing systems*ACM,pp. 577-584.

Brown, B., Mcgregor, M. & Laurier, E., (2013). iPhone in vivo: video analysis of mobile device use. *In*: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*ACM,pp. 1031-1040.

Brown, B. & O Hara, K., (2003). Place as a practical concern of mobile workers. *Environment and planning A,* 35(9)**,**pp. 1565-1588.

Brown, B., Taylor, A. S., Izadi, S., Sellen, A., Kaye, J. J. & Eardley, R., (2007). Locating family values: a field trial of the whereabouts clock.pp. 354-371.

Broy, N., Goebl, S., Hauder, M., Kothmayr, T., Kugler, M., Reinhart, F., Salfer, M., Schlieper, K. & André, E., (2011). A cooperative in-car game for heterogeneous players. *In*: *Proceedings of the 3rd International Conference on Automotive User Interfaces and Interactive Vehicular Applications*ACM,pp. 167-176.

Brunnberg, L., (2002). Backseat gaming: expolaration of mobile properties for fun. *In*: *CHI'02 Extended Abstracts on Human Factors in Computing Systems*ACM,pp. 854-855.

Brush, A. J. B. & Inkpen, K. M., (2007). Yours, mine and ours? Sharing and use of technology in domestic environments. *UbiComp 2007: Ubiquitous Computing*.

Brush, A. J. B., Inkpen, K. M. & Tee, K., (2008). SPARCS: exploring sharing suggestions to enhance family connectedness. *In*: *Proceedings of the 2008 ACM conference on Computer supported cooperative work*ACM,pp. 629-638.

Bull, M., (2005). No Dead Air! The iPod and the Culture of Mobile Listening. *Leisure Studies,* 24(4)**,**pp. 343-355.

Busch, G., (2012). Will, you've got to share': Disputes during family mealtime. *Disputes in Everyday Life: Social and Moral Orders of Children and Young People***,**pp. 27-56.

Butler, C. W. & Fitzgerald, R., (2010). Membership-in-action: Operative identities in a family meal. *Journal of Pragmatics,* 42(9)**,**pp. 2462-2474.

Butler, C. W. & Wilkinson, R., (2013). Mobilising recipiency: Child participation and 'rights to speak'in multi-party family interaction. *Journal of Pragmatics,* 50(1)**,**pp. 37-51.

Button, G., (2000). The ethnographic tradition and design. *Design studies,* 21(4)**,**pp. 319-332.

Button, G. & Harper, R., (1995). The relevance of 'work-practice'for design. *Computer Supported Cooperative Work (CSCW),* 4(4)**,**pp. 263-280.

Cekaite, A., (2010). Shepherding the child: embodied directive sequences in parent–child interactions. *Text & Talk-An Interdisciplinary Journal of Language, Discourse & Communication Studies,* 30(1)**,**pp. 1-25.

Cekaite, A., (2015). The Coordination of Talk and Touch in Adults' Directives to Children: Touch and Social Control. *Research on Language and Social Interaction,* 48(2)**,**pp. 152-175.

Chambers, D., (2012). 'Wii play as a family': the rise in family-centred video gaming. *Leisure Studies,* 31(1)**,**pp. 69-82.

Clayman, S. E. & Maynard, D. W., (1995). Ethnomethodology and conversation analysis. *Situated order: Studies in the social organisation of talk and embodied activities,* 199(5)**,**pp. 1-30.

Cooper, L. Z., (2006). Developmentally appropriate digital environments for young children. *Library trends,* 54(2)**,**pp. 286-302.

Cornell, E. H., Heth, C. D. & Rowat, W. L., (1992). Wayfinding by children and adults: Response to instructions to use look-back and retrace strategies. *Developmental Psychology,* 28(2)**,**pp. 328.

Crabtree, A., Hemmings, T., Rodden, T. & Schnädelbach, H., (2001). Patterns of Technology Usage in the Home: Domestic Legacy and Design.

Crabtree, A., Nichols, D. M., O'brien, J., Rouncefield, M. & Twidale, M. B., (2000). Ethnomethodologically informed ethnography and information system design. *Journal of the American Society for Information Science,* 51(7)**,**pp. 666-682.

Crabtree, A. & Rodden, T., (2004). Domestic Routines and Design for the Home. *Computer Supported Cooperative Work (CSCW),* 13(2)**,**pp. 191-220.

Crabtree, A., Rodden, T., Tolmie, P. & Button, G., (2009). Ethnography considered harmful. *In*: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*ACM,pp. 879-888.

Crabtree, A., Rouncefield, M. & Tolmie, P., (2012a). Ethnography and Systems Design. *In Doing Design Ethnography.* Springer,pp.7-19.

Crabtree, A., Rouncefield, M. & Tolmie, P., (2012b). Informing Design. *In Doing Design Ethnography.* Springer,pp.135-158.

Crabtree, A., Tolmie, P. & Rouncefield, M., (2013). "How Many Bloody Examples Do You Want?" Fieldwork and Generalisation. *ECSCW 2013: Proceedings of the ….*

Crang, M. & Cook, I., (2007). *Doing Ethnographies*: Sage.

Craven, A. & Potter, J., (2010). Directives: Entitlement and contingency in action. *Discourse Studies,* 12(4)**,**pp. 419-442.

Cycil, C., Perry, M., Laurier, E. & Taylor, A., (2013). 'Eyes free'in-car assistance: parent and child passenger collaboration during phone calls. *In*: *Proceedings of the 15th international conference on Human-computer interaction with mobile devices and services*ACM,pp. 332-341.

Danby, S., Davidson, C., Theobald, M., Scriven, B., Cobb-Moore, C., Houen, S., Grant, S., Given, L. M. & Thorpe, K., (2013). Talk in activity during young children's use of digital technologies at home. *Australian Journal of Communication,* 40(2).

Davey, J. A., (2007). Older people and transport: coping without a car. *Ageing and Society,* 27(01)**,**pp. 49-65.

Davidson, C., (2010). 'Click on the Big Red Car'The Social Accomplishment of Playing a Wiggles Computer Game. *Convergence: The International Journal of Research into New Media Technologies,* 16(4)**,**pp. 375-394.

Dft, 2013. National Travel Survey. *In* Transport, T. D. F. (ed.) United Kingdom: NatCen Social Research.

Dourish, P., (2004). *Where the action is: the foundations of embodied interaction* USA: MIT press.

Dourish, P., (2006). Implications for design. *Proceedings of the SIGCHI conference on Human Factors in computing systems - CHI '06***,**pp. 541-541.

Dourish, P. & Bell, G., (2011). *Divining a digital future: Mess and mythology in ubiquitous computing*: MIT Press.

Dowling, R., (2000). Cultures of mothering and car use in suburban Sydney: a preliminary investigation. *Geoforum,* 31(3)**,**pp. 345-353.

Drew, P. & Holt, E., (1998). Figures of speech: Figurative expressions and the management of topic transition in conversation. *Language in society,* 27(04)**,**pp. 495-522.

Drew, P. & Walker, T., (2009). Going too far: Complaining, escalating and disaffiliation. *Journal of Pragmatics,* 41(12)**,**pp. 2400-2414.

Eardley, R., Hyams, J. & Sellen, A., (2004). In-car concepts to support working parents. *In*: *CHI'04 Extended Abstracts on Human Factors in Computing Systems*ACM,pp. 1547-1547.

Edensor, T., (2004). Automobility and national identity representation, geography and driving practice. *Theory, Culture & Society*.

Ervin-Tripp, S., (1976). Is Sybil there? The structure of some American English directives. *Language in Society,* 5(01)**,**pp. 25-66.

Esbjörnsson, M., Juhlin, O. & Weilenmann, A., (2007). Drivers using mobile phones in traffic: An ethnographic study of interactional adaptation. *International Journal of Human-Computer Interaction,* 22(1-2)**,**pp. 37-58.

Fatigante, M., Liberati, V. & Pontecorvo, C., (2010). Transitions in and out of games: How parents and children bracket game episodes at home. *Research on Language and Social Interaction,* 43(4)**,**pp. 346-371.

Forlizzi, J., Barley, W. C. & Seder, T., (2010). Where should i turn: moving from individual to collaborative navigation strategies to inform the interaction design of future navigation systems. *In*: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*ACM,pp. 1261-1270.

French, L. & Nelson, K., (1985). *Young children's knowledge of relational terms: Some ifs, ors, and buts* New York, USA: Springer-Verlag.

Garfinkel, H., (1963). A conception of and experiments with" trust" as a condition of concerted stable actions. *In* Harvey, O. J. (ed.) *Motivation and Social interaction.* New York Ronald,pp.187-238.

Garfinkel, H., (1964). Studies of the routine grounds of everyday activities. *Social problems***,**pp. 225-250.

Garfinkel, H., (1967). *Studies in ethnomethodology* New Jersey: Prentice-Hall.

Garfinkel, H., (1972). Remarks on ethnomethodology. *In* Hymes, D. H. & Gumperz, J. J. (eds.) *Directions in sociolinguistics: the ethnography of communication.*: Holt, Rinehart and Winston

Garfinkel, H., (1974). The origins of the term 'ethnomethodology'. *Ethnomethodology,* 15**,**pp. 18.

Garfinkel, H., (1986). *Ethnomethodological Studies of Work*: Routledge.

Garfinkel, H., (2002a). *Ethnomethodology's program: Working out Durkheim's aphorism*: Rowman & Littlefield Publishers.

Garfinkel, H., (2002b). Instructions and instructed actions. *In* Garfinkel, H. (ed.) *Ethnomethodology's program: working out Durkheim's Aphorism, Rowman & Littlefield, Maryland.*pp.197-218.

Garfinkel, H. & Rawls, A. W., (2006). *Seeing sociologically: The routine grounds of social action*: Paradigm Pub.

Gaver, W. D. T. & Pacenti, E., 1999. Cultural Probes. *Interactions.*pp.21-29.

Geertz, C., (1973). *The interpretation of cultures: Selected essays*: Basic books.

Geist, E. A., (2012). A qualitative examination of two year-olds interaction with tablet based interactive technology. *Journal of Instructional Psychology,* 39(1)**,**pp. 26.

Go, J., Ballagas, R. & Spasojevic, M., (2012). Brothers and sisters at play: exploring game play with siblings. *In*: *Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work*ACM,pp. 739-748.

Goffman, E., 1963. Behaviour in public places: notes on the social order of gatherings. The Free Press, New York.

Goffman, E., (1978). Response cries. *language*,pp. 787-815.

Goodwin, C., (1979). The Interactive Construction of a Sentence in Natural Conversation. *In* Psathas, G. (ed.) *Everyday language: Studies in ethnomethodology.* Boston University,pp.97-123.

Goodwin, C., (1981). Designing talk for different types of recipients. *In* Goodwin, C. (ed.) *Conversational Organization: Interaction between Speakers and Hearers.* Academic Press,pp.149-66.

Goodwin, C., (1984). Notes on Story Structure and the Organization of Participation. *In* Atkinson, J. M. & Heritage, J. (eds.) *Structures of Social Action: Studies in Coversation Analysis*.pp.225-246.

Goodwin, C., (1986). Gestures as a resource for the organization of mutual orientation. *Semiotica,* 62(1-2),pp. 29-50.

Goodwin, C., (1994). Professional vision. *American anthropologist,* 96(3),pp. 606-633.

Goodwin, C., (2000). Action and embodiment within situated human interaction. *Journal of Pragmatics,* 32(10),pp. 1489-1522.

Goodwin, C., (2006a). Retrospective and prospective orientation in the construction of argumentative moves. *Text & Talk-An Interdisciplinary Journal of Language, Discourse Communication Studies,* 26(4-5),pp. 443-461.

Goodwin, C., (2007a). Environmentally coupled gestures. *In* Duncan, S. D., Cassell, J. & Levy, E. T. (eds.) *Gesture and the dynamic dimension of language: Essays in honor of David McNeill* Amsterdam / Philadelphia: John Benjamins,1,pp.195-212.

Goodwin, C., (2007b). Participation, stance and affect in the organization of activities. *Discourse & Society,* 18(1),pp. 53-73.

Goodwin, C. & Goodwin, M. H., (1996). Seeing as situated activity: Formulating planes. *In* Engeström, Y. & Middleton, D. (eds.) *Cognition and communication at work.* United Kingdom: Cambridge University Press,pp.61-95.

Goodwin, M. H., (2006b). Participation, affect, and trajectory in family directive/response sequences. *Text & Talk-An Interdisciplinary Journal of Language, Discourse Communication Studies,* 26(4-5),pp. 515-543.

Goodwin, M. H., (2007c). Occasioned knowledge exploration in family interaction. *Discourse & Society,* 18(1),pp. 93-110.

Goodwin, M. H. & Cekaite, A., (2013). Calibration in directive/response sequences in family interaction. *Journal of Pragmatics,* 46(1),pp. 122-138.

Goodwin, M. H. & Cekaite, A., (2014). Orchestrating directive trajectories in communicative projects in family interaction. *Requesting in Social Interaction,* 26,pp. 185.

Goodwin, M. H. & Goodwin, C., (1986). Gesture and coparticipation in the activity of searching for a word. *Semiotica,* 62(1-2),pp. 51-76.

Goodwin, M. H. & Goodwin, C., (2010). Car Talk: Integrating Texts, Bodies, and Changing Landscapes. *Semiotica*,pp. 1-44.

Goodwin, M. H., Goodwin, C. & Yaeger-Dror, M., (2002). Multi-modality in girls' game disputes. *Journal of pragmatics,* 34(10),pp. 1621-1649.

Green, N., (2002). On the move: Technology, mobility, and the mediation of social time and space. *The information society,* 18(4),pp. 281-292.

Haddington, P., (2012). Movement in action: Initiating social navigation in cars. *Semiotica,* 191(1-4),pp. 137-167.

Haddington, P., Haddington, P., Mondada, L. & Nevile, M., (2013). Projecting mobility: Passengers directing the driver at junctions. *Interaction and mobility: Language and the body in motion*,pp. 179-209.

Haddington, P. & Keisanen, T., (2009). Location, mobility and the body as resources in selecting a route. *Journal of Pragmatics,* 41(10),pp. 1938-1961.

Haddington, P., Keisanen, T., Mondada, L. & Nevile, M., (2014). *Multiactivity in social interaction: beyond multitasking*: John Benjamins Publishing Company.

Haddington, P. & Rauniomaa, M., (2011). Technologies, Multitasking, and Driving: Attending to and Preparing for a Mobile Phone Conversation in a Car. *Human Communication Research,* 37(2),pp. 223-254.

Hall, S. M., (2014). Ethics of ethnography with families: a geographical perspective. *Environment and Planning A,* 46(9),pp. 2175-2194.

Hammersley, M. & Atkinson, P., (2007). *Ethnography: Principles in practice*: Routledge.

Harper, R., (2003). *Inside the smart home*: Springer Science & Business Media.

Harper, R., (2011). *The Connected Home: the future of domestic life* London, UK: Springer.

Harper, R. H. R., (1998). *Inside the IMF: an ethnography of documents, technology and organisational action*: Routledge.

Harrison, S., Tatar, D. & Sengers, P., (2007). The three paradigms of HCI. *alt. chi*.

Haywood, A. & Boguslawski, G., (2009). I love my iPhone... but there are certain things that 'niggle'me. *In Human-Computer Interaction. New Trends.* Springer,pp.421-430.

Heath, C. & Hindmarsh, J., (2002). Analysing Interaction: Video, Ethnography and Situated Conduct. *In*: *Qualitative Research in Action*Citeseer.

Heath, C., Hindmarsh, J. & Luff, P., (2010). Video in qualitative research: analysing social interaction in everyday life. *Introducing qualitative methods*.

Heath, C. & Luff, P., (2000). *Technology in action*: Cambridge University Press.

Heath, C., Luff, P. & Sellen, A., (1995). Reconsidering the virtual workplace: flexible support for collaborative activity. *In*: *Proceedings of the Fourth European Conference on Computer-Supported Cooperative Work ECSCW'95*Springer,pp. 83-99.

Heath, C., Vom Lehn, D. & Osborne, J., (2005). Interaction and interactives: collaboration and participation with computer-based exhibits. *Public Understanding of Science,* 14(1),pp. 91-101.

Hepburn, A. & Bolden, G. B., (2013). The conversation analytic approach to transcription. *The handbook of conversation analysis*,pp. 57-76.

Heritage, J., (1984). A change-of state token and asqects of its sequential piacement. *In* Atkinson, J. M., And John Heritage. (ed.) *Structure of social action: Studies in conversation analysis.* Cambridge University Press,pp.299-345.

Heritage, J., 2004. Conversation analysis and institutional talk: Analysing data. In. D. Silverman (Ed.) Qualitative Research: Theory, Method and Practice (pp. 161–182). London: Sage.

Hindmarsh, J., Fraser, M., Heath, C., Benford, S. & Greenhalgh, C., (2000). Object-focused interaction in collaborative virtual environments. *ACM Transactions on Computer-Human Interaction (TOCHI),* 7(4),pp. 477-509.

Hindmarsh, J. & Heath, C., (2000). Embodied reference: A study of deixis in workplace interaction. *Journal of Pragmatics,* 32(12),pp. 1855-1878.

Hindmarsh, J., Reynolds, P. & Dunne, S., (2011). Exhibiting understanding: The body in apprenticeship. *Journal of Pragmatics,* 43(2),pp. 489-503.

Hislop, D., (2013). Driving, communicating and working: Understanding the work-related communication behaviours of business travellers on work-related car journeys. *Mobilities,* 8(2)**,**pp. 220-237.

Hjorthol, R. J., (2008). The mobile phone as a tool in family life: impact on planning of everyday activities and car use. *Transport Reviews,* 28(3)**,**pp. 303-320.

Hughes, J., King, V., Rodden, T. & Andersen, H., (1994). Moving out from the control room: Ethnography in system design. *In*: *Proceedings of the 1994 ACM conference on Computer supported cooperative work*ACM,pp. 429-439.

Hughes, J., King, V., Rodden, T. & Andersen, H., (1995). The role of ethnography in interactive systems design. *interactions,* 2(2)**,**pp. 56-65.

Hughes, J., O'brien, J., Rodden, T., Rouncefield, M. & Viller, S., (2000). Patterns of home life: Informing design for domestic environments. *Personal Technologies,* 4(1)**,**pp. 25-38.

Hughes, J. A., Randall, D. & Shapiro, D., (1992). From ethnographic record to system design. *Computer Supported Cooperative Work (CSCW),* 1(3)**,**pp. 123-141.

Hutchby, I., (2001). Technologies, texts and affordances. *Sociology,* 35(2)**,**pp. 441-456.

Hutchinson, H., Mackay, W., Westerlund, B., Bederson, B. B., Druin, A., Plaisant, C., Beaudouin-Lafon, M., Conversy, S., Evans, H. & Hansen, H., (2003). Technology probes: inspiring design for and with families. *In*: *Proceedings of the SIGCHI conference on Human factors in computing systems*ACM,pp. 17-24.

Iliaifar, A., (2013). *Screw 'infotainment,' why can't I just jam an iPad in my dashboard?* [online]. Digital Trends. Available from:< http://www.digitaltrends.com/cars/why-cant-i-bring-my-own-device-for-all-my-connected-car-needs/#ixzz3iRBJKRdv > [Accessed 11th April 2013].

Iqbal, S. T., Ju, Y. C. & Horvitz, E., (2010). Cars, calls, and cognition: Investigating driving and divided attention. *Proceedings of the SIGCHI Conference on …*.

Jain, J., Line, T. & Lyons, G., (2011). A troublesome transport challenge? Working round the school run. *Journal of Transport Geography,* 19(6)**,**pp. 1608-1615.

Jefferson, G., (1978). Explanation of transcript notation. *In* Schenkein, J. N. (ed.) *Studies in the organization of conversational interaction.* Academic Press,pp.11-16.

Jefferson, G., (2004a). Glossary of transcript symbols with an introduction. *In* Lerner, G. H. (ed.) *Conversation Analysis: Studies from the first generation.* John Benjamins Publishing,125,pp.13.

Jefferson, G., (2004b). A sketch of some orderly aspects of overlap in natural conversation. *In* Lerner, G. H. (ed.) *Conversation Analysis: Studies from the first generation.* . John Benjamins Publishing,125,pp.43-59.

Jordan, B., (1996). Ethnographic workplace studies and CSCW. *Human Factors in Information Technology,* 12**,**pp. 17-42.

Jordan, B., (1997). Capturing complex, distributed activities: video-based interaction analysis as a component of workplace ethnography. *Information systems and qualitative research***,**pp. 246.

Jordan, B. & Henderson, A., (1995). Interaction analysis: Foundations and practice. *The journal of the learning sciences,* 4(1)**,**pp. 39-103.

Juhlin, O., (2010). *Social Media on the Road-the Future of Car Based Computing,* CSCW ed.: Springer.

Katz, J., (1999). *How emotions work*: University of Chicago Press.

Kawsar, F. & Brush, A., (2013). Home computing unplugged: why, where and when people use different connected devices at home. *In*: *Proceedings of the 2013 ACM international joint conference on Pervasive and ubiquitous computing*ACM,pp. 627-636.

Keisanen, T. & Rauniomaa, M., (2012). The organization of participation and contingency in prebeginnings of request sequences. *Research on Language & Social Interaction,* 45(4)**,**pp. 323-351.

Keisanen, T., Rauniomaa, M. & Haddington, P., (2014). Suspending action. *In* Haddington, P., Tiina Keisanen, Lorenza Mondada, Maurice Nevile (ed.) *Multiactivity in Social Interaction: Beyond multitasking.* John Benjamins Publishing Company,pp.109.

Kent, A., (2012a). Compliance, resistance and incipient compliance when responding to directives. *Discourse Studies,* 14(6)**,**pp. 711-730.

Kent, A., (2012b). Responding to Directives: What can Children do when a Parent Tells them what to do? *Disputes in Everyday Life: Social and Moral Orders of Children and Young People,* 15**,**pp. 57-84.

Khan, V.-J. & Markopoulos, P., (2009). Busy families' awareness needs. *International Journal of Human-Computer Studies,* 67(2)**,**pp. 139-153.

Khan, V. J., Markopoulos, P., Mota, S., Ijsselsteijn, W. & De Ruyter, B., 2006. Intra-family communication needs; How can awareness systems provide support? ,pp.89-94.

Kim, S., Dey, A. K., Lee, J. & Forlizzi, J., (2011). Usability of car dashboard displays for elder drivers. *Proceedings of the 2011 annual conference on Human factors in computing systems - CHI '11***,**pp. 493-493.

Koops, L. H., (2014). Songs From the Car Seat Exploring the Early Childhood Music-Making Place of the Family Vehicle. *Journal of Research in Music Education,* 62(1)**,**pp. 52-65.

Koppel, S., Charlton, J., Kopinathan, C. & Taranto, D., (2011). Are child occupants a significant source of driving distraction? *Accident Analysis & Prevention,* 43(3)**,**pp. 1236-1244.

Koslowski, T., (2013). *Forget the Internet of Things: Here Comes the 'Internet of Cars'* [online]. Wired. Available from:< http://www.wired.com/2013/01/forget-the-internet-of-things-here-comes-the-internet-of-cars/ > [Accessed 25th November 2013].

Kullman, K. & Palludan, C., (2011). Rhythmanalytical sketches: agencies, school journeys, temporalities. *Children's Geographies,* 9(3-4)**,**pp. 347-359.

Laforest, M., (2002). Scenes of family life: Complaining in everyday conversation. *Journal of pragmatics,* 34(10)**,**pp. 1595-1620.

Laforest, M., (2009). Complaining in front of a witness: Aspects of blaming others for their behaviour in multi-party family interactions. *Journal of Pragmatics,* 41(12)**,**pp. 2452-2464.

Lasch, A. & Kujala, T., (2012). Designing browsing for in-car music player: effects of touch screen scrolling techniques, items per page and screen orientation on driver distraction. *In*: *Proceedings of the 4th International Conference on Automotive User Interfaces and Interactive Vehicular Applications*ACM,pp. 41-48.

Laurier, E., (2004). Doing Office Work on the Motorway. *Theory, Culture & Society,* 21(4-5)**,**pp. 261-277.

Laurier, E., (2013). Capturing motion: video set-ups for driving, cycling and walking. *Adey, P., Bissell, D., et al***,**pp. 493-502.

Laurier, E., Brown, B. & Lorimer, H., (2012). What it means to change lanes: Actions, emotions and wayfinding in the family car. *Semiotica,* 191(1-4)**,**pp. 117-135.

Laurier, E., Lorimer, H., Brown, B., Jones, O., Juhlin, O., Noble, A., Perry, M., Pica, D., Sormani, P., Strebel, I., Swan, L., Taylor, A. S., Watts, L. & Weilenmann, A.,

(2008). Driving and 'Passengering': Notes on the Ordinary Organization of Car Travel. *Mobilities,* 3(1)**,**pp. 1-23.

Lefebvre, H., (1984). *Everyday life in the modern world*: New Brunswick, Transaction Publishers.

Leshed, G., Velden, T., Rieger, O., Kot, B. & Sengers, P., (2008). In-car gps navigation: engagement with and disengagement from the environment. *In*: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*ACM,pp. 1675-1684.

Lindley, S. E., Harper, R. & Sellen, A., (2010). Designing a technological playground: a field study of the emergence of play in household messaging. *In*: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*ACM,pp. 2351-2360.

Line, T., Jain, J. & Lyons, G., (2011). The role of ICTs in everyday mobile lives. *Journal of Transport Geography,* 19(6)**,**pp. 1490-1499.

Livingston, E., (1987). *Making sense of ethnomethodology*: Routledge & Kegan Paul London.

Livingstone, S., (1992). The meaning of domestic technologies. *Consuming technologies: Media and information in domestic spaces***,**pp. 113-130.

Livingstone, S., (2002). *Young people and new media: Childhood and the changing media environment*: Sage.

Livingstone, S., (2007a). From family television to bedroom culture: Young people's media at home. *Media studies: Key issues and debates***,**pp. 302-321.

Livingstone, S., (2007b). Strategies of parental regulation in the media-rich home. *Computers in Human Behavior,* 23(2)**,**pp. 920-941.

Livingstone, S. & Helsper, E., (2007). Gradations in digital inclusion: Children, young people and the digital divide. *New media & society,* 9(4)**,**pp. 671-696.

Luff, P. & Heath, C., (1998). Mobility in collaboration. *In*: *Proceedings of the 1998 ACM conference on Computer supported cooperative work*ACM,pp. 305-314.

Luff, P. & Heath, C., (2012). Some 'technical challenges' of video analysis: social actions, objects, material realities and the problems of perspective. *Qualitative Research,* 12(3)**,**pp. 255-279.

Luff, P., Hindmarsh, J. & Heath, C., (2000). *Workplace Studies: Recovering work practice and informing system design*: Cambridge university press.

Lynch, M., (1994). *Scientific Practice and Ordinary Action* Cambridge: Cambridge University Press.

Macbeth, D., (2011). Understanding understanding as an instructional matter. *Journal of Pragmatics,* 43(2)**,**pp. 438-451.

Manalavan, P., Samar, A., Schneider, M., Kiesler, S. & Siewiorek, D., (2002). In-car cell phone use: mitigating risk by signaling remote callers. *CHI '02 extended abstracts on Human factors in computer systems - CHI '02***,**pp. 790-790.

Marvin, C. A., (1994). Cartalk! Conversational topics of preschool children en route home from preschool. *Language, Speech, and Hearing Services in Schools,* 25(3)**,**pp. 146-155.

Marvin, C. A., (1995). The family car as a "vehicle" for children's use of distant time referents. *Early Childhood Research Quarterly,* 10(2)**,**pp. 185-203.

Mcknight, A. J. & Mcknight, A. S., (1993). The effect of cellular phone use upon driver attention. *Accident; analysis and prevention,* 25(3)**,**pp. 259-65.

Mcveigh-Schultz, J., Stein, J., Boyle, J., Duff, E., Watson, J., Syam, A., Tasse, A., Wiscombe, S. & Fisher, S., (2012). Vehicular lifelogging: new contexts and

methodologies for human-car interaction. *In*: *CHI'12 Extended Abstracts on Human Factors in Computing Systems*ACM,pp. 221-230.
Miller, D., (2001a). *Car cultures*: Berg Publishers.
Miller, D., (2001b). *Home Possession*: Berg Publishers.
Mondada, L., (2011). Understanding as an embodied, situated and sequential achievement in interaction. *Journal of Pragmatics,* 43(2)**,**pp. 542-552.
Mondada, L., (2012a). Coordinating action and talk-in-interaction in and out of video games. *2012): The appropriation of media in everyday life. Amsterdam, John Benjamins***,**pp. 231-270.
Mondada, L., (2012b). Talking and driving : multi-activity in the car Talking and driving : multi-activity in the car. *Semiotica,* 191(1-4)**,**pp. 223-256.
Mondada, L., (2014a). Cooking instructions and the shaping of things in the kitchen. *Interacting with Objects: Language, materiality, and social activity***,**pp. 199.
Mondada, L., (2014b). Instructions in the operating room: How the surgeon directs their assistant's hands. *Discourse Studies,* 16(2)**,**pp. 131-161.
Morgan, D., (1996). *Family connections: an introduction to family studies*: Polity.
Morgan, D. H., (2011a). Locating'Family Practices'. *Sociological Research Online,* 16(4)**,**pp. 14.
Morgan, D. H., (2011b). *Rethinking family practices*: Palgrave Macmillan.
Murray, L., (2009). Making the journey to school: The gendered and generational aspects of risk in constructing everyday mobility. *Health, Risk & Society,* 11(5)**,**pp. 471-486.
Murray, L. & Barnes, M., (2010). Have Families Been Rethought? Ethic of Care, Family and 'Whole Family' Approaches. *Social Policy and Society,* 9(04)**,**pp. 533-544.
Nansen, B., Arnold, M., Gibbs, M. R. & Davis, H., (2009). Domestic orchestration Rhythms in the mediated home. *Time & society,* 18(2-3)**,**pp. 181-207.
Neustaedter, C., Brush, A. J. B. & Greenberg, S., (2009). The calendar is crucial. *ACM Transactions on Computer-Human Interaction,* 16(1)**,**pp. 1-48.
Nevile, M., (2011). Interaction as distraction in driving : a body of evidence. *Semiotica,* 191(1-4)**,**pp. 169-196.
Nevile, M. & Haddington, P., 2010. In-car distractions and their impact on driving activities. *In* Department of Infrastructure, T., Regional Development and Local Government (ed.).
Nevile, M., Haddington, P., Heinemann, T. & Rauniomaa, M., (2014). *Interacting with objects: Language, materiality, and social activity*: John Benjamins Publishing Company.
Norman, D. A., (1983). Design principles for human-computer interfaces. *In*: *Proceedings of the SIGCHI conference on Human Factors in Computing Systems*ACM,pp. 1-10.
Norman, M. & Thomas, P., (1990). The very idea: informing HCI design from conversation analysis. *In* Luff, P., David Frohlich, and Nigel G. Gilbert (ed.) *Computers and conversation.*pp.51-65.
Noy, C., (2012). Inhabiting the family-car: Children-passengers and parents-drivers on the school run. *Semiotica,* (191)**,**pp. 309-333.
O'hara, K. & Brown, B., (2006). *Consuming music together: social and collaborative aspects of music consumption technologies*: Springer.
Ochs, E. & Shohet, M., (2006). The cultural structuring of mealtime socialization. *New Directions for child and adolescent development,* 2006(111)**,**pp. 35.
Ochs, E., Smith, R. & Taylor, C., (1989). Detective stories at dinnertime: Problem-solving through co-narration. *Cultural Dynamics,* 2(2)**,**pp. 238-257.

Osswald, S., Sundström, P. & Tscheligi, M., (2013). The front seat passenger: How to transfer qualitative findings into design. *International journal of vehicular technology*, 2013.

Östergren, M. & Juhlin, O., (2006). Car drivers using sound pryer-joint music listening in traffic encounters. *In Consuming Music Together*. Springer,pp.173-190.

Palen, L. & Hughes, A., (2006). When home base is not a place: parents' use of mobile telephones. *Personal and Ubiquitous Computing*, 11(5)**,**pp. 339-348.

Park, R. E. & Burgess, E. W., (1925). *The City*: University of Chicago Press.

Pasquier, D., Buzzi, C., D'haenens, L. & Sjöberg, U., (1998). Family Lifestyles and Media Use Patterns An Analysis of Domestic Media among Flemish, French, Italian and Swedish Children and Teenagers. *European Journal of Communication*, 13(4)**,**pp. 503-519.

Patten, C. J., Kircher, A., Östlund, J. & Nilsson, L., (2004). Using mobile telephones: cognitive workload and attention resource allocation. *Accident Analysis & Prevention*, 36(3)**,**pp. 341-350.

Perry, M., Juhlin, O., Esbjörnsson, M. & Engström, A., (2009). Lean collaboration through video gestures: co-ordinating the production of live televised sport. *In*: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*ACM,pp. 2279-2288.

Perry, M., O'hara, K., Sellen, A., Brown, B. & Harper, R., (2001). Dealing with mobility: understanding access anytime, anywhere. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 8(4)**,**pp. 323-347.

Perterer, N., Sundström, P., Meschtscherjakov, A., Wilfinger, D. & Tscheligi, M., (2013). Come drive with me: an ethnographic study of driver-passenger pairs to inform future in-car assistance. *In*: *Proceedings of the 2013 conference on Computer supported cooperative work*ACM,pp. 1539-1548.

Plowman, L., Mcpake, J. & Stephen, C., (2010). The technologisation of childhood? Young children and technology in the home. *Children & Society*, 24(1)**,**pp. 63-74.

Pomerantz, A., (1984a). Agreeing and disagreeing with assessments. *In* Atkinson, J. M. & Heritage, J. (eds.) *Structures of social action. Studies in conversation analysis.* Cambridge University Press,pp.57-101.

Pomerantz, A., (1984b). Pursuing a response. *In* Atkinson, J. M. & Heritage, J. (eds.) *Structures of social action: studies in conversation analysis.* Cambridge University Press,pp.152-163

Pomerantz, A. & Fehr, B. J., (1997). Conversation analysis: An approach to the study of social action as sense making practices. *Discourse as social interaction*, 2**,**pp. 64-91.

Pomerantz, A. & Mandelbaum, J., (2005). *Conversation analytic approaches to the relevance and uses of relationship categories in interaction* Mahwah, NJ: Erlbaum.

Presson, C. C., (1982). The development of map-reading skills. *Child Development***,**pp. 196-199.

Randall, D., (2011). All in the game: Families, peer groups and game playing in the home. *In The Connected Home: The Future of Domestic Life.* Springer,pp.111-131.

Randall, D., Harper, R. & Rouncefield, M., (2007). *Fieldwork for design: theory and practice*.

Rauniomaa, M. & Heinemann, T., (2014). Organising the soundscape: Participants' orientation to impending sound when turning on auditory objects in interaction. *In* Nevile M, H. P., Heinemann T, Rauniomaa M, (ed.) *Interacting with Objects: Language, materiality, and social activity.* John Benjamins Publishing Company,pp.145-168.

Redshaw, S., (2007). Articulations of the car: the dominant articulations of racing and rally driving. *Mobilities,* 2(1)**,**pp. 121-141.

Redshaw, S., (2008). *In the Company of Cars: Driving as a Social and Cultural Practice*: Ashgate Publishing, Ltd.

Reilly, D., Mackay, B., Watters, C. & Inkpen, K., (2009). Planners, navigators, and pragmatists: collaborative wayfinding using a single mobile phone. *Personal and Ubiquitous Computing,* 13(4)**,**pp. 321-329.

Romero, N., Markopoulos, P., Baren, J., Ruyter, B., Ijsselsteijn, W. & Farshchian, B., (2006). Connecting the family with awareness systems. *Personal and Ubiquitous Computing,* 11(4)**,**pp. 299-312.

Rouncefield, M. & Tolmie, P., (2011). Digital Words: Reading and the 21st Century Home. *In The Connected Home: The Future of Domestic Life.* Springer,pp.133-162.

Rouncefield, M. & Tolmie, P., (2013). Reading for Pleasure: Bedtime Stories. *In* Rouncefield, M. & Tolmie, P. (eds.) *Ethnomethodology at Play.* Ashgate Publishing, Ltd

Ryave, A. L. & Schenkein, J. N., (1974). Notes on the art of walking. *Ethnomethodology***,**pp. 265-274.

Sacks, H., (1972). On the analyzability of stories by children. *Directions in sociolinguistics: The ethnography of communication***,**pp. 325-345.

Sacks, H., (1984). On doing 'being ordinary'. *Structures of social action: Studies in conversation analysis***,**pp. 413-429.

Sacks, H., (1995). *Lectures on conversation*: Blackwell Publishing.

Sacks, H. & Garfinkel, H., (1970). On formal structures of practical action. *Theoretical Sociology. New York: Appleton-Century-Crofts***,**pp. 338-366.

Sacks, H., Schegloff, E. A. & Jefferson, G., (1974). A simplest systematics for the organization of turn-taking for conversation. *language***,**pp. 696-735.

Schatzki, T. R., Knorr-Cetina, K. & Von Savigny, E., (2001). *The practice turn in contemporary theory*: Psychology Press.

Schegloff, E., (1991). Reflections on Talk and Social Structure. *In* Boden, D. & Zimmerman, D. (eds.) *Talk and Social Structure: studies in ethnomethodology and conversation analysis.* Cambridge: Polity Press

Schegloff, E. A., (1968). Sequencing in conversational openings. *American anthropologist,* 70(6)**,**pp. 1075-1095.

Schegloff, E. A., (1984). On some gestures' relation to talk. *In* Atkinson, J. M. & Heritage, J. (eds.) *Structures of social action: Studies in conversation analysis.* Cambrigde, United Kingdom: Cambridge University Press,pp.266-296.

Schegloff, E. A., (1996). Confirming allusions: Toward an empirical account of action. *American Journal of Sociology***,**pp. 161-216.

Schegloff, E. A., (1998). Body torque. *Social Research***,**pp. 535-596.

Schegloff, E. A., (2007). *Sequence organization in interaction: Volume 1: A primer in conversation analysis*: Cambridge University Press.

Schmidt, K. & Bannon, L., (1992). Taking CSCW seriously. *Computer Supported Cooperative Work (CSCW),* 1(1-2)**,**pp. 7-40.

Schroeter, R., Rakotonirainy, A. & Foth, M., (2012). The social car: new interactive vehicular applications derived from social media and urban informatics. *In*: *Proceedings of the 4th International Conference on Automotive User Interfaces and Interactive Vehicular Applications*ACM,pp. 107-110.

Schwanen, T., (2008). Struggling with time: investigating coupling constraints. *Transport Reviews,* 28(3)**,**pp. 337-356.

Schwanen, T. & Kwan, M. P., (2008). The Internet, mobile phone and space-time constraints. *Geoforum,* 39(3)**,**pp. 1362-1377.

Sellen, A. & Harper, R., (1997). Paper as an analytic resource for the design of new technologies. *In*: *Proceedings of the ACM SIGCHI Conference on Human factors in computing systems*ACM,pp. 319-326.

Sellen, A., Rogers, Y., Harper, R. & Rodden, T., (2009). Reflecting human values in the digital age. *Communications of the ACM,* 52(3)**,**pp. 58-58.

Sheller, M., (2004). Automotive Emotions: Feeling the Car. *Theory, Culture & Society,* 21(4-5)**,**pp. 221-242.

Sheller, M. & Urry, J., (2000). The City and the Car *. *International Journal of Urban and Regional Research,* 24(December).

Shepherd, C., Arnold, M. & Gibbs, M., (2006). Parenting in the connected home. *Journal of Family Studies,* 12(2)**,**pp. 203-222.

Shove, E., (2007). *The design of everyday life*: Berg.

Slomkowski, C. L. & Dunn, J., (1992). Arguments and relationships within the family: Differences in young children's disputes with mother and sibling. *Developmental Psychology,* 28(5)**,**pp. 919.

Speier, M., (1970). The everyday world of the child. *In* Douglas, J. (ed.) *Understanding everyday life: Toward the reconstruction of sociological knowledge.*,pp.188-217.

Stephen, C., Stevenson, O. & Adey, C., (2013). Young children engaging with technologies at home: The influence of family context. *Journal of Early Childhood Research,* 11(2)**,**pp. 149-164.

Sterponi, L., (2009). Accountability in Family Discourse: Socialization into norms and standards and negotiation of responsibility in Italian dinner conversations. *Childhood,* 16(4)**,**pp. 441-459.

Strayer, D. L. & Johnston, W. A., (2001). Driven to distraction: Dual-task studies of simulated driving and conversing on a cellular telephone. *Psychological Science,* 12(6)**,**pp. 462-466.

Streeck, J., (2009). *Gesturecraft: The manu-facture of meaning*: John Benjamins Publishing.

Streeck, J., Goodwin, C. & Lebaron, C., (2011). *Embodied interaction: Language and body in the material world*: Cambridge University Press.

Streeck, J. & Hartge, U., (1992). Previews: Gestures at the transition place. *In* Auer, P. & Luzio, A. D. (eds.) *The contextualization of language.* Amsterdam/Philadelphia: John Benjamins,pp.135-157.

Suchman, L., (1997). Centers of coordination: A case and some themes. *In* Resnick, L. B., Clotilde Pontecorvo & Säljö, R. (eds.) *Discourse, Tools and Reasoning.* Springer,pp.41-62.

Suchman, L., Blomberg, J., Orr, J. E. & Trigg, R., (1999). Reconstructing technologies as social practice. *American behavioral scientist,* 43(3)**,**pp. 392-408.

Suchman, L. A., (1987). *Plans and situated actions: the problem of human-machine communication*: Cambridge university press.

Sundström, P., Baumgartner, A., Beck, E., Döttlinger, C., Murer, M., Randelshofer, I., Wilfinger, D., Meschtscherjakov, A. & Tscheligi, M., (2014). Gaming to sit safe: the restricted body as an integral part of gameplay. *In*: *Proceedings of the 2014 conference on Designing interactive systems*ACM,pp. 715-724.

Swider, J. R. a. M., (2015). *Apple CarPlay: everything you need to know about iOS in the car* [online]. Tech Radar. Available from:< http://www.techradar.com/news/car-tech/apple-carplay-everything-you-need-to-know-about-ios-in-the-car-1230381 > [Accessed 20 June 2015].

Szentgyorgyi, C., Terry, M. & Lank, E., (2008). Renegade gaming: practices surrounding social use of the Nintendo DS handheld gaming system. *In*: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*ACM,pp. 1463-1472.

Szymanski, M. H., (1999). Re-Engaging and Dis-Engaging Talk in Activity. *Language in Society*,pp. 1-23.

Taylor, A. S., Harper, R., Swan, L., Izadi, S., Sellen, A. & Perry, M., (2006). Homes that make us smart. *Personal and Ubiquitous Computing*, 11(5),pp. 383-393.

Taylor, A. S. & Swan, L., (2005). Artful systems in the home. *In*: *Proceedings of the SIGCHI conference on Human factors in computing systems*ACM,pp. 641-650.

Ten Have, P., (2004). *Understanding qualitative research and ethnomethodology*: Sage.

Ten Have, P., (2007). *Doing conversation analysis*: Sage.

Tolmie, M. P. & Rouncefield, M., (2013). *Ethnomethodology at play*: Ashgate Publishing, Ltd.

Tolmie, P., 2003. Everyday'intimacy': the social organisation of an ascriptive device. PhD Thesis. University of Lancaster.

Tolmie, P. & Crabtree, A., (2008). Deploying research technology in the home. *Proceedings of the ACM 2008 conference on Computer supported cooperative work - CSCW '08*,pp. 639-639.

Tolmie, P. & Crabtree, A., (2013). A Day Out in the Country. *In* Tolmie, P. & Rouncefield, M. (eds.) *Ethnomethodology at Play*. United Kingdom: Ashgate

Tolmie, P., Pycock, J., Diggins, T., Maclean, A. & Karsenty, A., (2002). Unremarkable computing. *Proceedings of the SIGCHI conference on Human factors in computing systems Changing our world, changing ourselves - CHI '02*, (1),pp. 399-399.

Urry, J., (2003). Social networks, travel and talk. *The British journal of sociology*, 54(2),pp. 155-75.

Urry, J., (2004). The 'System' of Automobility. *Theory, Culture & Society*, 21(4-5),pp. 25-39.

Van Maanen, J., (2011). *Tales of the field: On writing ethnography*: University of Chicago Press.

Voida, A. & Greenberg, S., (2012). Console gaming across generations: Exploring intergenerational interactions in collocated console gaming. *Universal Access in the Information Society*, 11(1),pp. 45-56.

Vom Lehn, D., Heath, C. & Hindmarsh, J., (2001). Exhibiting interaction: Conduct and collaboration in museums and galleries. *Symbolic interaction*, 24(2),pp. 189-216.

Waitt, G., Harada, T. & Duffy, M., (2015). 'Let's Have Some Music': Sound, Gender and Car Mobility. *Mobilities*, (ahead-of-print),pp. 1-19.

Want, R. & Hopper, A., (1992). Active badges and personal interactive computing objects. *Consumer Electronics, IEEE Transactions on*, 38(1),pp. 10-20.

Warren, C., (2013). *Spotify Is Coming to Ford Sync AppLink* [online]. Mashable. Available from:< http://mashable.com/2013/02/25/spotify-ford-sync-applink/ > [Accessed 28th February 2013].

Weiser, M., (1991). The computer for the 21st century. *Scientific american*, 265(3),pp. 94-104.

West, C. & Zimmerman, D. H., (1977). Women's place in everyday talk: Reflections on parent-child interaction. *Social problems*,pp. 521-529.

Wilfinger, D., Meschtscherjakov, A., Murer, M., Osswald, S. & Tscheligi, M., (2011). Are We There Yet ? A Probing Study to Inform Design for the Rear Seat of Family Cars.pp. 657-674.

Wilson, T. P., (1991). Social structure and the sequential organization of interaction. *In* Boden, D. & Zimmerman, D. H. (eds.) *Talk and social structure: Studies in ethnomethodology and conversation analysis.* Cambridge: Polity Press,2243

Wingard, L., (2006). Parents' inquiries about homework: The first mention. *Text & Talk-An Interdisciplinary Journal of Language, Discourse Communication Studies,* 26(4-5)**,**pp. 573-596.

Wootton, A. J., (1981a). The management of grantings and rejections by parents in request sequences. *Semiotica,* 37(1-2)**,**pp. 59-90.

Wootton, A. J., (1981b). Two request forms of four year olds. *Journal of Pragmatics,* 5(6)**,**pp. 511-523.

Zuckerman, O., Hoffman, G. & Gal-Oz, A., (2015). In-car game design for children: Promoting interactions inside and outside the car. *International Journal of Child-Computer Interaction*.

Appendix

Appendix 1: CA Transcription Notation

The transcription notation provided here represents the modified version of the system developed by Gail Jefferson (Jefferson, 1978)

Notation	Explanation
word [word [word word] word]	Opening Square brackets "["aligned across adjacent lines denote the start of overlapping talk. Closing square brackets "]" to show where the overlap stops.
>word word< <word word>	Inwards arrows show faster speech, Outward arrows show slower speech
↑word ↓word	Upward arrow indicates onset of noticeable pitch rise Downward arrow indicates onset of noticeable fall
wo(h)rd	(h) is showing that the word has "laughter" bubbling within it
wor-	A dash shows a sharp cut-off
wo::rd	Colons show that the speaker has stretched the preceding sound
(words)	Transcriber's guess at what might have been said if audio is unclear
word= =word	The equals sign shows that there is no discernible pause between two speakers' turns or, if put between two sounds within a single speaker's turn, shows that they run together
°word°	words between "degree signs" is quiet
<u>word</u>	Underlining indicates stress on word or syllable
WORD	Upper case indicates louder or shouted talk
(3.0)	Bracketed numbers indicate a period of no talk; here, a period of 3 seconds.
→	Draw reader's attention to a feature of analyst's interest in transcript.
word	Transcription of non-verbal conduct

Appendix 2: Information sheet

AutoMedia: Family life, interaction and Media use in the car

Why is this study being done?
As parents get busier and pressed by the demands of tight work schedules and multiple obligations, the car has become one of the domestic spaces where interaction involving family life can take place. The research aims to study family and home life in the car and exploring the role and use of media in this setting. The research will investigate the family car and document the varied domestic routines that take place during car journeys in order to develop insights for the future design of family-oriented, car-based media. To do this, the project researcher will join you for a number of journeys and later, if you are interested in continuing you will record your activity in the car.

What does participating in the study involve?
The study proceeds in two parts over roughly two weeks in total, spread out over up to one month at times that are convenient for you:

1. **Week 1**, Chandrika Cycil will meet your family either in the home or in a café and ask you about your journeys. If possible, she may request to travel with you during one or two of your typical weekly car journeys (once you are at your destination she will leave you and make her own way back). During these journeys, at times when it will not disrupt your travel, Chandrika will ask a few questions prompted by the journey about these journeys and what occurs during them. These will also be good opportunities for you to learn more about the project. This method of traveling with drivers has been used successfully to elicit information for studies of driver and passenger interaction both in the USA and the United Kingdom.

2. **Week 2**, Using two small video cameras secured in your vehicle, Chandrika will ask you to record your typical weekly car journeys over 2-3 weeks. She will try to avoid disrupting your everyday travel activities during filming, in fact, the hope is that you will behave as naturally as possible! Chandrika will meet up with you once a week to check on the cameras. You will have complete control over starting and stopping the recording. After the film has been edited, she will contact you, provide you with a DVD/USB copy of your footage and check that you are happy with the sections of film we would like to use for analysis and presentation. In some cases she may also ask you to help us make sense of the activity captured in the videos.

Who will look at the resulting video data?
The data will be used as a part of Chandrika's doctoral thesis. The data may also be used with members of the professional academic community that requires them to respect the views of all participants. Segments of the videos with accompanying transcriptions may be presented in the context of the project's results and final report to scholarly publications, academic symposia, university classes, professional training activities or dissemination of results to policymakers, government and industry. Other than this, the video clips will not be made publicly available without your explicit consent.

How long will the data last in this study?
The record acquired from the filming will be preserved indefinitely unless you request otherwise. Even after the interaction has been recorded, you have the right to revoke your agreement to participate in this study and to remove your data from inclusion.

What are the risks of this study?
Because of the nature of the data being gathered (i.e., video-recordings), it may not be possible to conceal your identity as a participant. There is a potential risk that people known or unknown to you will formulate negative opinions of you or your behaviour on the basis of their viewing of these data. We have three safeguards against this:
1. You can request that recording be stopped at any point during the activity, thereby preventing a record from ever being produced. In Week 2, you will be controlling the recording process.
2. You will be able to review the recordings we wish to use. If you wish the Principal Investigator will have particular segments containing your likeness deleted or erased.
3. As discussed in the section on confidentiality below, all additional data (i.e. names, addresses and any other revealing information) will be confidential.

What about confidentiality?
The nature of the data being gathered precludes completely concealing your identity as a participant. Any researcher who happens to know you personally may be able to identify you from the video clips. If this occurs, and you are unhappy about it, we will refrain from making further use of these recordings. In addition, we will keep any additional information that we have about you confidential through the use of pseudonyms. The original recordings will not be made available for any purposes outside of research activities.

Are there benefits to taking part in this study?
There are no direct benefits to you personally for participating in this study. The primary benefits from this work are for the advancement of scientific understanding of social processes and transportation problems. The availability of these data may lead to improvements in the social sciences and others areas of in car design and interactive technology development of which you or others may be a direct or indirect beneficiary. If you are interested in these scientific outcomes, and we hope you will be, arrangements can be made with the Chandrika Cycil (the contact researcher) to be sent copies of your digitized files of the interaction, along with transcripts, analyses, and articles as they become available.

Will I receive any payment or other monetary benefits?
You will receive no payment for being recorded. You will however receive goodwill tokens to the value of **£100** for a store of your choice for being willing to devote your time to the project. The ethnographic and video data will not be used by any member of the project team for commercial purposes. Therefore, you should not expect any royalties or payments from the research project in the future. The research relies on and appreciates the goodwill of participants in this project. As noted above the researcher will offer you copies of your edited recording on DVD/USB drive.

What are my rights as a participant?
Taking part in this study is voluntary. You may choose not to take part or, subsequently, cease participation at any time.

Can I learn more about the project?

If you wish to know more you are welcome to contact Chandrika Cycil (the contact researcher) at the below address.

Contact details:
Chandrika Cycil,

Dorothy Hodgkin Scholar

School of Information Systems, Computing and Mathematics
Brunel University, Uxbridge,
Middlesex
e-mail: chandrika.cycil@brunel.ac.uk
Mob: 0784XXXXXXX

Further details of the project may be found at the project website:
http://familylifecarsandmedia.com/

"If you have any concerns or complaints regarding this project please contact siscm.srec@brunel.ac.uk."

Appendix 3: Consent Form

AutoMedia: Family life, interaction and Media use in the car

Research participant name(s) :_____

To be filled in by one or both adult participants (parents) on behalf of all family members:

	Yes	*No*
Have you read the Research Participant Information Sheet?		
Have you had an opportunity to ask questions and discuss this study?		
Have you received satisfactory answers to all your questions?		
Do you understand that you and your family are free to withdraw from the study**:**		
at any time		
without having to give a reason for withdrawing?		
Do you agree to take part in this study and provide consent for family members who are minors (children)?		

As part of this project a video recording was made of you while you participated in the research. We would like you to indicate below what uses of these records you are willing to consent to. We will only use the records in ways that you agree to. In any use of these records, names will not be identified. *Please read the accompanying Information sheet before filling out this form.* [Please tick Yes/No to indicate those permissions you wish to give]

	Yes	*No*
The records can be studied by the research team for use in the research project.		
The records can be used for scientific publications.		
The records can be kept in an archive for use by other researchers.		
The records can be shown in classrooms to students		
The records can be used on the research project website.		

I have read the above description and give my consent for the study and use of the records as indicated above.

Signature: _____ Date : _____ Place: _____

Appendix 4: Ethics Form

School of Information Systems, Computing and Mathematics
David Gilbert, Head of School, Professor of Computing
Jasna Kuljis, Head of Information Systems and Computing, Professor of Computing
Tony Rawlins, Head of Mathematical Science, Professor of Mathematics

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Date: 6th September 2012

STATEMENT OF ETHICS APPROVAL

Proposer: Chandrika Cycil
Title: Automedia: Studying Family life, interaction and media use in the car

The school's research ethics committee has considered the proposal recently submitted by you. Acting under delegated authority, the committee is satisfied that there is no objection on ethical grounds to the proposed study. Approval is given on the understanding that you will adhere to the terms agreed with participants and to inform the committee of any change of plans in relations to the information provided in the application form.

Yours sincerely,

Zidong Wang

Professor Zidong Wang
Chair of the Research Ethics Committee
SISCM

Appendix 5: Family Descriptions

SNo	Family Type	Parents Age		Ethnicity		Occupation	Ages & Gender of children	Area	Recruitment
		M	D	M	D				
F1	2 parent (Married)	42	42	Mixed (other) Brazilian	British (White)	M-Researcher D- pvt company (IT)	6 (M), 8(M)	Slough	Intranet
F2	2 parent (Married)	36	44	White British	Mixed British (Caribbean)	M-PA Dad-TV Production	7 (M)	Uxbridge	Intranet
F3	2 parent (Married)	48	51	White British	White British	M-Teacher D-Trainer in Uni	16 (M), 16 (F)	Uxbridge; Uxbridge/ Devon	Intranet
F4	2 parent (Co-habiting)	38	40	White British	White New Zealand	M-Student D-Car mechanic shop business	6 (M), 9(M)	Perivale	Intranet
F5	Single Parent	36	-	White British	-	M-University Administration	7(M), 10 (F)	Uxbridge/ Marlow	Intranet
F6	2 parent (Married)	40	37	White British	Mixed White and Black African	M-Garden Leave (at home now) D-HR Manager	7 (M), 9 (F)	Nottingham	Print Ad
F7	2 parent (Married)	31	33	White British	White British	M-At Home D-Admin Uni	3½ (F), 1 ½ (M)	High Wycombe	Intranet
F8	2 parent (Co-habiting)	28	29	British Mixed (El Salvador)	White British	M-Support Services D-IT Industry	5 (F) (expecting 2nd child)	Uxbridge	Print Ad
F9	2 parent (Married)	26	30	Asian British Bangladeshi	Asian British Bangladeshi	M-At home D-Accountant	3 (M), 1 ½ (M)	West Drayton	Intranet
F10	Single Parent	36	-	White British	-	M-Receptionist at Hospital	6(F) 8(F)	Iver Heath	Netmus Website
F11	2 parent (Co-habiting)	38	37	White British	White British	M-Nurse D-Delivery Driver	11 (F) 7(F) 1 (F)	Hayes	Netmus Website
F12	2 parent (Co-habiting)	32	42	White British	British Asian: Saudi Arabian	M-at home D-private company	6 (F) 2 (M)	Ickenham	Netmus Website

Table 1 Driving Routines

Family	Car Details	Driving Responsibility	Journeys
F1	2 Cars (1 small and 1 sedan)	Mother/ shared over weekends	School, gym, swimming
F2	1 Car (SUV)	Mother	School, after school, husband's work
F3	2 cars (both large)	Mother/shared over weekends	School, work, part time job, leisure
F4	1 Car (large car)	Shared	School, rugby, shopping, visiting grandparents
F5	1 Car (SUV)	Mother	School, gym, swimming
F6	1 Car (SUV) *At the time of study were transitioning to a new car- data collected in both)	Shared. Predominantly mother.	School, work, Athletics, Long trips to peak district with bikes, nearby cities
F7	1 Car (Sedan)	Mother	School, activity centre, shopping
F8	1 Car (Ford Focus)	Mother/ Grandmother/Dad	School run; Shopping , long trips to parks, Grandparents
F9	1 Car (VW Polo)	Mother /Father (Mostly mother)	Various leisure activities, parks, work (to drop dad)
F10	1 Car (small family car)	Mother/ Grandfather	School runs, shopping, grandparents
F11	1 Car (small convertible)	Mother	Visits to grandparents, shopping, Work
F12	2 Cars	Mother/Father	School ; activity centres; family trips; grandparents

Table 2 Technology Practices

Family	Artefacts	Practices
F1	Tablets	Carried only on particular long journeys. Laptops as well. Problems with sharing.
F2	DS, Tablets-mum, dad, Taryn, Play station	DS (always in car) Tablets carried on long journeys
F3	iPods, phones	Teenage children so carried and used their own devices. They did not do amny journeys together as a family.
F4	Crossword Puzzle, Dad's Dead Phone, Mums Phone, DS	Phones and crossword carried on most non school journeys. Phones offered to the children only for long journeys
F5	iPads, phones, books	Did not use much tech for journeys. Mostly reading/ playing with toys.
F6	iPads, iPods, play station, TV at home	Carried iPods, iPhones, iPads and DS in car on most long journeys. DS and iPads taken on some shorter trips as well-frequently to listen to music.
F7	No/little tech mostly play and games that were verbal	No tech, just toys
F8	Tablet; iPhone	Listened to CD, tablet used on longer journeys
F9	Tablet; parents' phones; CDs	Phone used sometimes; Parents used phones and SatNav frequently.
F10	iPads, iPhones, iPods	Carried iPods, iPhones, iPads and DS in car on most journeys. Mum used iPhone to make calls and for navigation purposes,.
F11	iPads, iPhones, digital cameras, V-tec camera, play station, 3 TVs at home, Daughter's blackberry	Carried DS and phones into the car. DS and mum's phone was used to play games and browse internet.
F12	Ipad, iphones	Mum used the phone to connect to her handsfree, tablet used frequently. Partner's car had screens in backseat (no video footage from those journeys)

Ethnographic Description of Families

In order to contextualize these families and provide a background to understand their family structure, routines and technology practices, we provide a short background to the families.

F1: This is a family of four with one parent working and the mother was a full time research student. The family considered themselves to be highly technology oriented and they used smartphones, tablets and laptops in the car. The mother drove the family car for regular school trips and activities although both parents shared childcare responsibilities. Observation of family journeys and technology practices was observed in both cars. The mother used the smaller car to do most school drops and pick-ups. The father's larger car was used for his work commutes, on weekend family trips and all other journeys when the mother was not driving.

F2: This busy family of working parents described themselves as being "very technology savvy'. Hence many of the artifacts family members carried and used in the car ranged from tablets, smartphones and portable game consoles. In this family, the son had a DS (portable game console) that was placed permanently in the armrest of the car and was the main car associated artifact. The mother was the only member of the family who drove as the father was still trying to obtain his license at the time of data collection. The car was relatively new (3 months old) and had many new features that the mother described and showed to the researcher during the fieldwork.

F3: This family of four consisted of two working parents and were the only family with teenage children. With older children, families reported that each family member differed significantly on use and values towards technology use. Here, all family members including the children had their own phones and iPods and had greater freedom over their use as compared to our other families with primary school aged children where family or parental values determined the use of technology.

F4: This family of four while agreeing to participate in the study reported that they were not a very technology oriented family - the father was the only member of the family who owned a smart phone and the older son owned a PSP. As the study progressed, we noticed some interesting artifact use with this family. In this family, there was an expressed preference for gadgets that carried educational value and facilitated collaborative

participation of all family members such as the ‘crossword solver’ (described later). Parents’ phones were offered for play

F5: This family was undergoing several transitions at the time of the data collection. The mother, a single parent was in the process of moving into a new house with her partner and his children. The data collected with this family covered this moving period so much of the recordings included long moving journeys with boxes and multiple activities carried out in the mother’s car including incorporating reading-with physical books and toys. The family time and activities surrounding artifacts in the car were focused on how the family as a ‘triad’ did family journeys together-namely mother, daughter and son. This family liked to read an also listen to particular CDs and audiobooks in the car. Although the family owned tablets and phones (the daughter was allowed her own phone) the children were not allowed to use them in the car and thus were not observed in the data.

F6: This family like F5, was undergoing several transitions. The family had shifted to a single income family-due to the mother’s redundancy notice at the company she was working in. This changed the schedule of car trips made by the family as she no longer commuted to work. The family also was upgrading their car at the end of the study, but data collection itself happened in their earlier family car. With regards to artifacts in the car, the family integrated their portable technology including phones, tablets and with systems in the car.

F7: This family had two young children. The daughter had started school while their younger child was still a toddler. The mother was the primary caregiver to the children and carried out all driving duties. She handled most of the care duties like taking the children to various activities and managing shopping. They used almost no technology at home or in the car-the parents did not own smartphones. One reason was that with young children, they simply did not feel the need or interest to use technology. The car stereo had been broken for several months and still not fixed as they said it was simply not their priority. Their need for a car was rather vital as they lived in an area that was quite hilly and they needed to drive to access various activity centres.

F8: This family composed of three members-mum, dad and a 6 year old daughter. The mother had recently started a contractual job as a disability support worker. This entailed that she worked on specific days of the week providing support for students. She shared care responsibilities with her parents who lived nearby. Her mother assisted with the daily afterschool pick-ups that were coordinated at the start of each week depending on her work

schedule. Her partner worked in an IT firm in East London in a 9-5 job and therefore shared driving responsibilities only over weekends. The family had just transitioned to a new car with the aim of supporting a larger family. The family was quite supportive of technology use and the daughter was offered a family tablet and parents' phones on journeys. During the study, the family also found out that they were expecting their second child.

F9 : This family of four comprised of young children. The stay at home mother was the primary caregiver to the children and carried out most driving duties during the week. She handled most of the care duties like taking the children to various activities and managing shopping The mother was quite keen for the children to read and take part in more non-technology related activities. The father on the other hand liked gadgets and often was the one to encourage their use both in the home and the car. The mother on her own used her phone and GPS units heavily while driving both to coordinate and plan her journeys.

F10: This family comprised of a single mother and her two daughters. The mother worked part-time and this enabled her to handle most care responsibilities by herself. On the days that the mother worked, her parents who lived nearby supported her with managing drops and pick-ups. The family used a lot of technology in the car including the mother's iPhone, her daughter's iPod, iPad and DS. The children regularly used these devices on all types of long and short journeys. In this family, the older daughter assisted her mother on several occasions with navigational support while driving.

F11: In this family, the mother handled all driving activities. She had a relatively small car that was bought primarily for her work as a community nurse, but had now accommodated her partner and three children on journeys. The car was used for shopping trips and visits to family and friends. The family rarely travelled together in the week-most family journeys were made during the weekend, This family owned a lot of technology both in their home and also carried devices into the car. A single artefact (phone/DS) was shared between the children except the older daughter who had her own phone. A few occasions in the data collection, the daughter's phone was confiscated because she had broken the rules of use.

F12. This family consisted of two parents and two children aged 6 and 2 years. The parents each had a car. The father worked full time and the mother was handling all care and driving responsibilities. She had just bought a new car that afforded a bit more space to store children's items in the boot and accommodated carpooling. As the children were

relatively young, the mother did not encourage heavy use of technology. However, the family iPad that was shared between parents and children both at home and at times in the car. The father was an advocate of technology use and actively followed the latest technologies.

Appendix 6: Participants' Interview Checklist

Family

☐ Two parent ☐ single parent-specify M/F ☐ Grandparents Live/ Visit

Mother -a) employed: b) Home based work c) Unemployed d) other

Children

How many?

☐ 1 ☐ 2 ☐ 3 ☐ >3

Gender: Male ( ) Female ( )

Ages: Ages:

Residential Area

London borough-(U,M, C)

Outside London (specify)

Other-

Cars:

a) 1 b) 2 c) >2

Driving the Car: ☐Mother ☐ Father

Car Type: ☐ Small family car ☐ Large family car

☐ Luxury car ☐ Sports car ☐ Other (specify)

Demographic Details	F	M
White		
British		
Irish		
Any other White background		
Mixed		
White and Black Caribbean		
White and Black African		
White and Asian		
Any other Mixed background		
Asian or Asian British		
Indian		
Pakistani		
Bangladeshi		
Any other Asian background		
Black or Black British		
Caribbean		
African		
Any other Black background		
Chinese or other ethnic group		
Chinese		
Any other ethnic group		

Type of Technology	Home	Car
Television		
Music System		
Computer/ Laptop		
I Pods/MP3s		
Tablets (IPads, etc)		
Radio		
Video Games		
Other		

Range of Car Journeys:

Nature of Trips	Regularly (Daily)	Often 3-4 times)	Rarely (once)	Never
School Runs				
After school Activity				
Family visits				
Leisure				
Work				

Appendix 7: Fieldworker's Checklist

Fieldwork Guidelines and Observation Checklist:

(a) Items for Fieldwork:

- Ethnographer's Diary
- iPad for photos and audio
- Cameras (on 2nd or 3rd visit)

(b) Location of Family:

- Town /Area
- Ask family about the area
- Duration of stay in the area
- Proximity to school, activities, family members

(c) Car Details:

- Age of Car
- Car Model
- Features inside Car: (Demonstration if required)

(d) Car's Interiors:

- Items inside the car
- Car seats/who sits on them
- Arrangement of family members inside car (who sits where)
- What is kept in the car?
- Car seats and who uses them (important for camera positioning)
- Storage compartments
  -demonstration of contents

(e) Journey Details:

- Is this a regular journey/special?
- Who is driving? Why are they driving? Who else would drive?
- Which family members were present? Was anyone missing, if so why?
- How are the family members organised in the car and is this the regular organisation?
- What items were organised in the car?
- Were any stops made on the way?

(f) Device Details:

- Was any media used?
  Parents: ? Children: ?
  -Observe how it is used; where it is used: backseat/front-seat
- Was any media kept inside the car?
- Any media associated solely with car journeys?

Appendix 8: IAA Design Project Report

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RSDO Research Support & Development Office

EPSRC Engineering and Physical Sciences Research Council

EPSRC Impact Acceleration Account (IAA) – Readiness
Appendix B – Application Form

1) Project Details			
Project Name	Family Car Media – Concept Demonstrator and Market Assessment		
Key Academics	Dr. Mark Perry, Department of Information Systems and Computing Ms Chandrika Cycil, Department of Information Systems and Computing (named researcher)		
Date of Application	5/12/2013	Application Ref No	

2) Application Type	Y/N
Proof of concept project	Y
Technology evaluation	Y
Technology demonstrator	Y
Market research and evaluation	Y
Business case development	
Technology brief preparation	Y
Other	

3) Funding	£
Impact Acceleration funding requested	12,000
Industrial funding secured (cash/in-kind)	2,000
Total Funding	14,000
Current commercialisation funding	
Previous commercialisation funding	
Previous internal funding	
Previous commercial funding (e.g. funded trials/testing)	

4) Other Details	
Project Description	This funding will develop demonstrator proof-of-concept prototypes and conduct end-user market evaluations within a specific automotive context: interactive media for family car travel.
IP Position	
Timing of Funding	Start of Feb 2014 to end of April 2014

5) Why is this funding required?

This funding will support commercialisation of insights gained during an extensive EPSRC funded research project exploring the design space of in-car family media technology use in two ways: (1) Extend university-based research to foster industry partnership: key findings of our initial inquiry have already sparked corporate interest (QualComm, Intel, Microsoft); (2) facilitate and further understanding of the market environment around end-user uptake of these innovative and novel technologies. Digital interaction solutions will support family-based collaborative search, gaming and organisational capabilities during car journeys.

6) What will the funding be required for and how will this meet the criteria for readiness applications?
1) Three-month activities that enable the results of EPSRC funded research to be encapsulated in a form that can be presented to potential exploiters either for 2) take-up by the company, or3) as a precursor to further collaborative

The funding will be used sequentially in five related activities in:
1) **Workshop**: this will iterate and finalise detailed designs drawn from the EPSRC funded 'AutoMedia' project. Designers experienced in automotive design, human factors and innovation will engage to facilitate prototyping of design concepts through storyboards, mock-ups and low-fidelity prototypes (Univ of Salzburg, Doppler Lab; Univ of Nottingham, Mixed Reality Lab; Brunel; Codasign). Estd: £2000.
2) **Technology demonstrator**: build/iterate proof-of-concept prototype. Professional designers will co-develop this. We have identified potential collaborators as Triteq, Codasign, and PAIPR group, and have costed estimates from them. Est: £5000.
3) **End-user evaluation** of proof-of-concept prototype solutions to provide iterative design feedback and support market analysis of future uptake by users. Estd: £2000.
4) **Industrial visits** to present our concepts and prototypes will increase the likely impact of industrial take up. These will explore how concepts can be integrated into existing work in automotive technologies within these companies. We have already received offers of funding-in-kind investment to strengthen our research-industry impact (Intel, Microsoft). Reinforced through the end-user evaluations, we will have a strong case to present to industrial partners regarding the impact of our work. Visits are planned to Intel Automotive Infotainment Solutions (US) Microsoft Research (UK, USA); QualComm (USA). Estd Funding towards travel: £2500.
5) **Dissemination/Exploitation**: Production of a 'glossy' promotional brochure to communicate our findings for distribution, and build associated website content showing the prototypes. Est: £500 for admin, postage, printing, and web development costs.

7) How will progress be monitored and measured?

Progress will be reported via detailed weekly project website updates. An interim technical report will be released describing initial development concepts and workshop outputs in week 6, halfway through the project. The consolidated final output will be a brochure (and associated website) to aid in dissemination and exploitation of findings (see IAA proposal section 3.2) to prospective partners, and will include feedback from the industrial visits, highlighting routes to commercialisation. Dr Perry will project manage.

8) How will this funding accelerate impact?

This proposal fits within the key objectives of the 'Readiness' activities by facilitating greater collaboration and partnership with industry and end users. It extends key research within university research to reach the wider context of automotive industry developers to facilitate greater diffusion of innovative technology and commercialization of concepts.

9) What will happen next if the acceleration is successful?

Workshop planning and establishing time-lines with designers who will facilitate drawing up the proof-of-concept demonstrator.

Version 1.0 March 2013

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RSDO Research Support & Development Office

EPSRC Engineering and Physical Sciences Research Council

EPSRC Impact Acceleration Account (IAA) – Readiness

Appendix B – Readiness Funding Report

To be completed jointly with RSDO after the project has taken place. (Not all sections are applicable).

1) Contribution towards Research targets	Target	Contribution Towards Target Y/N	Brief Description
Number secondments (in and out)	12		
Number of strategic engagements/alliances	3	Y	
Increased Network memberships	25%		
Increase in collaborative bids submitted	30%		
Increased grant income (industrial and RC)	30%		
Staff and researcher personal impact plans	25 p/a		
Internal impact acceleration seminars/workshops	3 p/a	Y	Two Design Workshops were carried out. The first workshop was with Brunel design students by building an interest in the automotive design space. The second workshop was a multidisciplinary workshop with design researchers; academics and games design students to foster collaboration across these experts. The outputs of these workshops fed into the development of the digital automotive technology concepts presented with this report.
Industry seminars/group visits/mini-roadmap sessions	3 p/a	Y	Visits to Volvo in Gothenburg, Chalmers Institute of Technology, Gothenburg and Microsoft Research, Redmond. Scheduled visits Jaguar Landrover, UK (October), Conference call with Qualcomm.

2) Contribution towards Readiness targets	Target	Contribution Towards Target Y/N	Brief Description
Number business/exploitation plans prepared following EPSRC funded research	21		
Increased Number Automotive industry collaborators (UK and International)	25%	Y	Volvo Microsoft Research (Automotive Research Group, Redmond) Qualcomm JLR
No. showcased prototypes/demonstrators	6	Y	Six prototypes of design concepts were developed based on the outcomes of the workshop.
No. published one page technology briefs	5 p/a	Y	Out of six storyboard concepts developed out of design sessions, four were shortlisted for further development into detailed system prototypes.
No. feasibility/proof of concept studies	9	Y	We carried out user evaluations with eight users to evaluate the early storyboard concepts to help us narrow down on the most relevant designs. All concepts were well received and the participants' top four designs were selected for further iteration.

3) Contribution towards Realisation targets	Target	Contribution Towards Target Y/N	Brief Description
Increased % of leveraged income from industry for EPSRC funded research	20%		
Increased number of (high TRL) KTP and TSB projects submitted/awarded	6		
Number consultancy contracts awarded as result of EPSRC research	9		
Number documented inputs to Standards bodies/ Government policy	6		

Version 1.0 March 2013

No. 'success stories' documenting accelerated impact	15		
No. agreements established for exploitation of IP	3		

4) Other	Target	Contribution Towards Target Y/N	Brief Description

Other Reporting and Case Studies

IAA Success	Details
Evidence of translation of research results into forms of interest to industry	
Evidence of impact in the automotive sector	
Outline case study to demonstrate impact	
Recommendations for refinement of the IAA Secondments Process	
Other	

Date Form Completed:

Appendix 9: Design Work Report

This section describes how the ethnographic findings of the current research were able to inform the technology design. The designs presented here extend from the discussion of findings as the designs are intended to reflect how design might consider the organisation of routine work between family members. In the chapter I discuss how the data were presented to groups of designers and how the ideas for the designs were developed over this course of the research. I describe the development of three concepts that were arrived at after a series of iterations and feedback from designers and users.

As an example of how ethnographic concerns may be addressed through design, the work described here extends analytical points by considering the practical ways in which the findings can support systems design (Crabtree et al., 2012a). This is challenging because ethnographic findings are often challenging to translate into explicit design concepts (Dourish, 2006). However, this should not be a reason why ethnographers do not attempt to bridge the gap between describing the social organisation of a setting, engaging in requirements elicitation and design explorations.

In order to connect the ethnographic observations with technology design, design workshops were conducted to explore the potential in the data to inform design. Below are listed some of the key issues and concerns highlighted through the ethnographic work with families:

Step 1: Collaborative design process

Once identifying some of the key concerns from the data, the next step was to engage with designers in order to find inspiration for developing concepts. The financial support for the design work was carried out through the support of an EPSRC Impact Acceleration (IAA) Grant (Refer Appendix 8). The first step in advancing design ideas was to get the involvement and creative input from designers. Following suggestions from colleagues at the university, the researcher started to look for local resources for the initial workshops organized. The first step was to arrange an exploratory workshop with design students to connect the research findings to design insight. While the researcher carried out the selection of design problems to address, all the design work of developing of storyboards and designing prototypes discussed in this chapter was carried out with the assistance of a professional designer.

Workshop 1: In a first exploratory workshop, empirical examples from the data were presented to sensitise designers to the family issues and concerns in the car. In this data-led session comprised of design students who looked through the empirical examples from the family car video material (Fig. 3) and identify problems and opportunities based on the family activities situated in the car. Participants looked at perspicuous examples of family work being conducted in the car and were then asked to brainstorm in groups to identify focal points as opportunities for design (Fig. 4). These observations were then mapped on posters and through a process of affinity mapping, the key themes and concerns of families were identified.

Figure 3 Data-led Design Workshop

Figure 4 Working through Design Issues

Following discussion and affinity mapping of various observations in the data, the participants arrived at some key areas where design could intervene.

Integrating Technology into the Car Environment: In observing the family data, ICTs such as mobile phones are an important part of planning and organising journeys. However, their use is challenged by the ways in which they interact with demands on driving and attention. The participants explored how design could intervene in creating a seamless environment by which technology can become part of the car environment. Design ideas included gesture based recognition of specific actions of mobile phone use; sensor-based systems within car spaces that would recognise and use information from devices intelligently. For example, recognising that a mobile phone place on the seat or dashboard means that the driver is 'unavailable' or 'currently driving'.

Supporting Backseat Interactions: In the data, there were several instances where children in the back were engaged in collaborative play. However, a number of challenges surfaced while trying to engage in play in the backseat including disagreement leading to disruptions to the driver and front seat passenger. Design opportunities in this regard may look into how games can encourage collaboration and

increase engagement with the outside environment. Future implications could also consider reconfiguring the layout of the backseat to facilitate interactions across both spaces.

Workshop 2: In a full-day design workshop, I involved 14 participants including industrial designers, experienced design researchers and games design students to participate and work through material developed from the first, brainstorming workshop. The purpose of this second workshop was to bridge the gaps in the exploration of ideas to start experimenting with prototype ideas of what how the design ideas would materialise in the car.

The group worked through several family issues including organising and planning for journeys, routine family activities, and navigation in the family car as well as dealing with children and activities in the backseat. As the workshop progressed, participants articulated their ideas through posters and design briefs to work through potential design ideas drawing on what was inherent in the empirical material. While working through this material, several issues were identified where technology design could intervene to support the needs of families. The workshop ran in two interest threads: one was targeted at design solutions that focused on organizational aspects of family journeys and supporting the needs of parents while the second strand focused on ideas for entertainment concepts for the family car-targeted mostly at child passengers.

Step 2: Developing storyboard designs

Once the outputs of the workshop were obtained, together with the designer, I set out to develop and describe how the design solutions would fit into the family car. This involved scrutinizing the outputs of the ethnographic findings and the workshop to prioritise ideas that could further be developed into feasible design concepts for the family car. The development of these early concepts was situated against the examples of real problems of families in cars. One of the ways in which interactional concerns can be highlighted is through the construction of visual, animated accounts in the form of storyboards (Boyarski and Buchanan, 1994). With this in mind, the designer set out to develop storyboard concepts (Refer Appendix 9) of the various design ideas. These were continually iterated based on discussions between the researcher and the designer. Storyboards effectively capture the interactional features

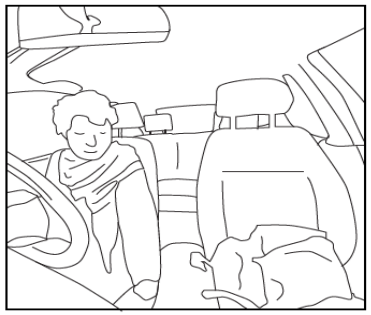
of settings, re-create scenarios as well as explicate the concerns with technology that arose during the course of car journeys.

The purpose of developing these storyboards was to:

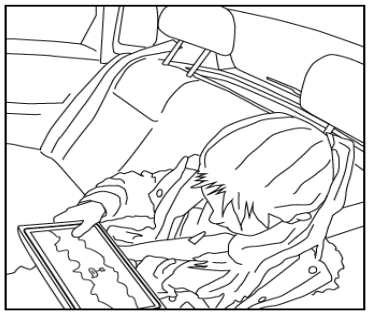
1. Articulate how concepts may address the concerns and issues within the family car against what was observed to be pivotal concerns to this setting.
2. Observe and describe how the intended design intervention or concepts would have an effect on what was being done in a setting and how this would shape the interactions that took place.

1

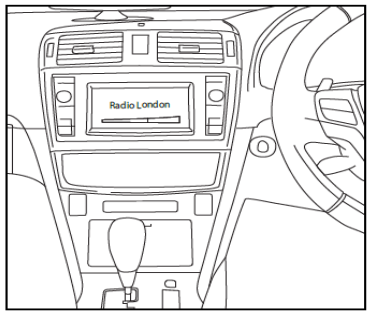
Appendix 9a Storyboard: Remote-Control System:



Its the morning school run and Mum is driving her daughter to school whilst listening to her favourite morning radio station.

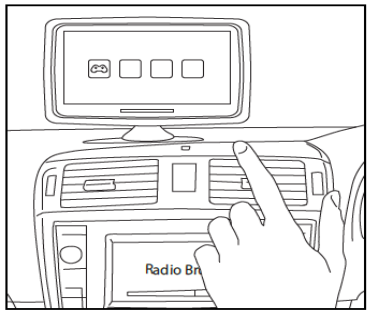


The daughter is sitting in the back of the car playing her new favourite game on the in-car family system. She likes having the sound on as it makes the game more enjoyable.

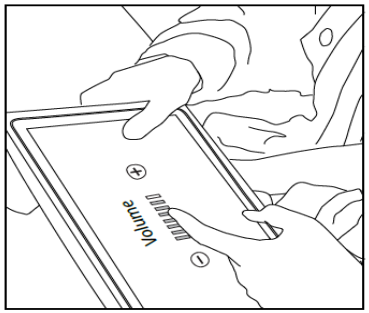


The news comes on and starts discussing a local community centre that may be shut down. Unfortunately the mum is having difficulty hearing what is being said due to her daughter's game being played in the back of the car with the sound turned up.

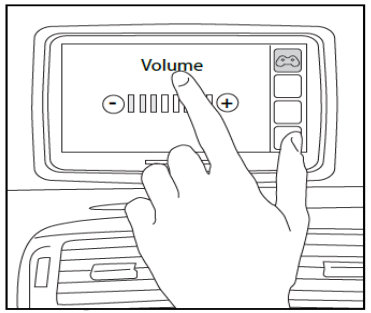
The mum turns to the daughter and asks her to turn down the sound so that she can hear the radio better. The daughter, however, just ignors the mum and continues to play the game.



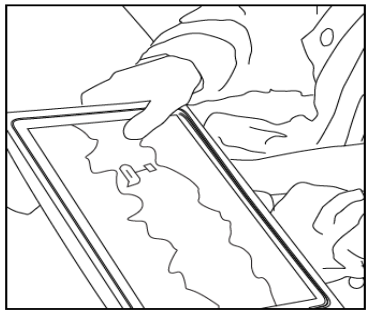
Being ignored the mum askes the daughter again to turn the sound down. Asking a third time, the mum threatens to pause the game from the parent control unit if she does not.



Reluctantly the daughter reduces the sound by the smallest amount and carries on playing her game.



Wanting the sound of the game to be lower the mum gives up and uses the parent control unit to reduce the game sound.



The daughter carries on playing, with no visual clue that the mum has turned down the volume. The daughter is not able to override this change.

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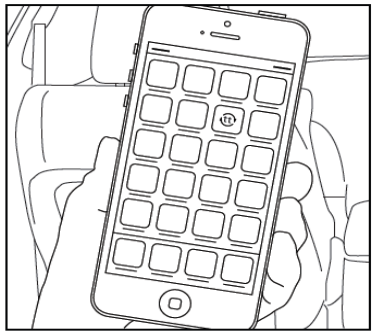
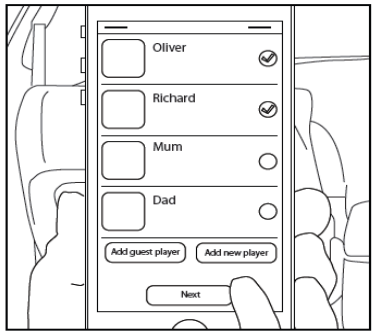
Appendix 9b Storyboard: Turn-Taking System

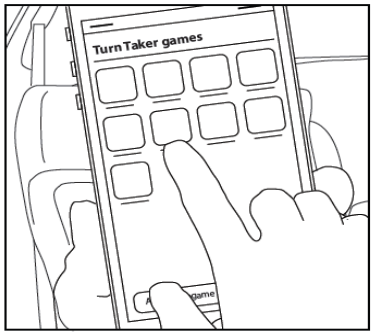
Richard and Oliver are in the back of the car with nothing to do. They ask their mum if they can play games on her iphone.



Handing the iphone over, the mum states that they need to use the 'game share' application so that there will be no arguments.

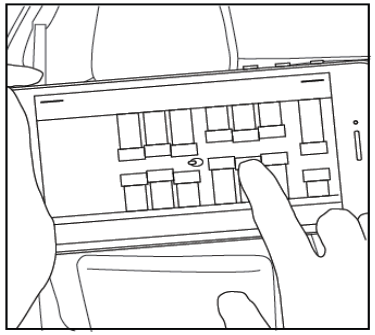


Selecting the requested application, Oliver selects the family members who will be playing.

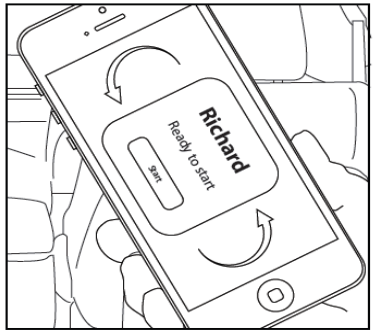


Once the players have been selected, Oliver gets to choose the game he and his brother will play first.

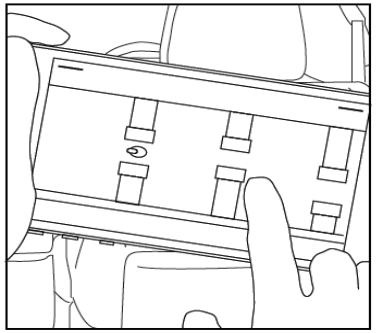
At the start of the game the application randomly selects who goes first - and it has picked Oliver.



Oliver's history in the game shows that he has a higher skill than his brother. Because of this the level he gets to play is a high one.



Oliver has died in the game and to carry on he needs to physically turn the phone over and hand it to his brother Richard. Turning the iphone over gives a visual clue that Oliver's game has finished so no cheating.



Richard the younger is less skilled and the game level is setup so that he, the current user, gets to play at a lower level than his brother. This allows for each game to be a similar time.

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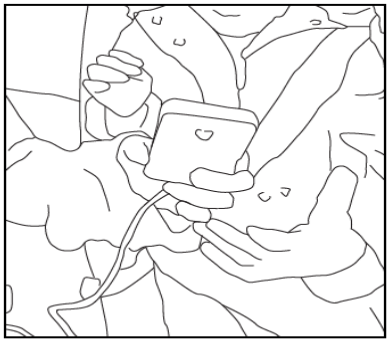
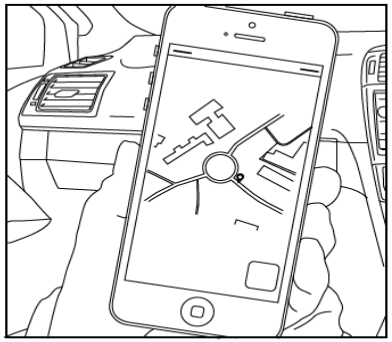
Appendix 9c Storyboard: Child-Friendly GPS System

A mum has just picked up her son from school and drives him to an away football match. The mum uses her phone to navigate while on the highway and balances doing this whilst driving.

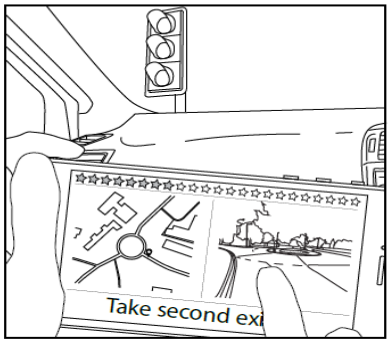


They start approaching the town where she must now locate the venue of the match. The traffic builds up and she must fully focus on driving. She passes the phone to her son to assist her with navigation - instructing him that he needs to guide her.

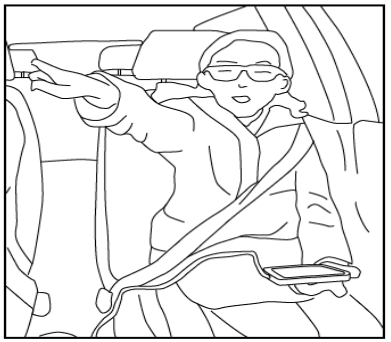


As the navigation app is already open, the son switches it to the kid friendly version. This synchronises the address they must reach.

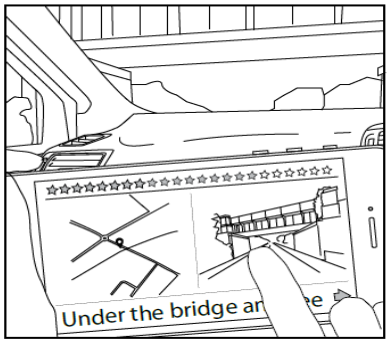
Clicking the confirmation button the application starts to navigate towards the destination. As the journey continues, and the car is sitting in traffic, the son holds the phone in his lap and goes back to the conversation with his mum.



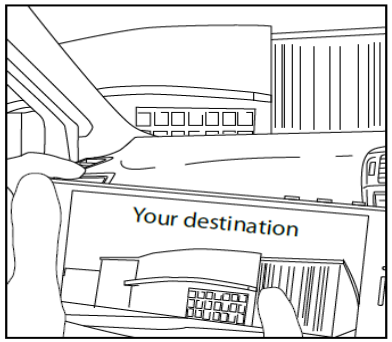
Approaching traffic lights, the son looks down to the phone. On the screen the son sees a moving map and also a google map image of the next turning. At the bottom of the screen the son sees instruction for this next turning. Stars at the top of the application present the overall progress of the journey.



Continuing on their journey the mobile phone signals that they need to look out for the next turning, the son is told to look out for a bridge.



Spotting the bridge the child reads the next intruction which is to go "Under the bridge and keep left".



Closing in on their destination, an image appears on the screen so the child knows what to look out for.

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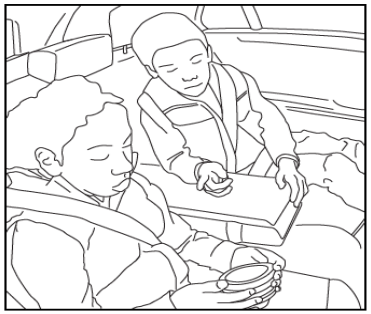
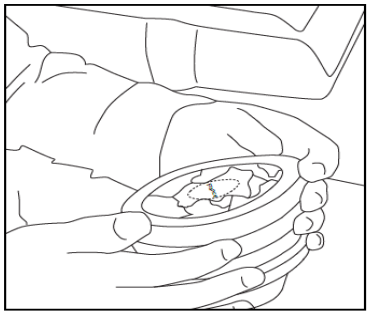
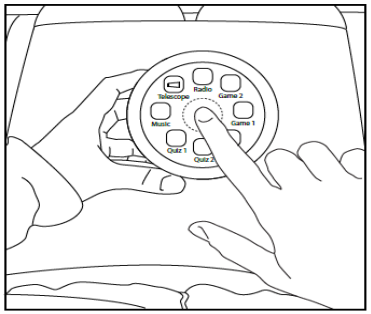
Appendix 9d Storyboard: World-Tripper



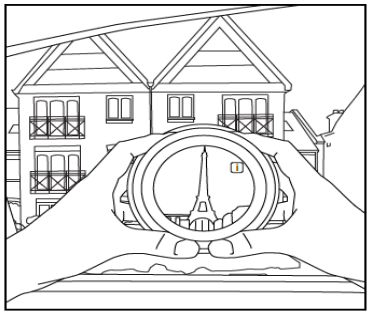
At the beginning of the journey the World Tripper is switched on. The family have been using the World Tripper for a few months now and in that time they have driven and collected over 500 miles. The more miles they have the more cities the family can virtually travel to.



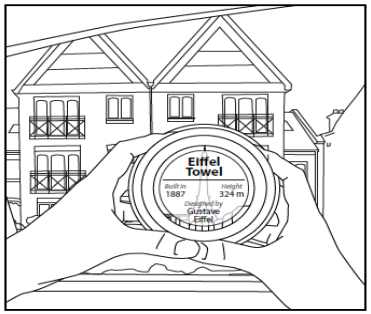
Its the daughters turn to choose the city (or let one be randomly selected). She tilts the device so that France is centred on the screen and selects by clicking the screen. Going through the same process she selects her favourite city, Paris.



Each city selected has different activities. In Paris the family can choose between listening to the radio, selection of music through time, take a quiz, play games or take a virtual tour. The daughter selects the telescope icon by simply rotating the device and tapping the screen.

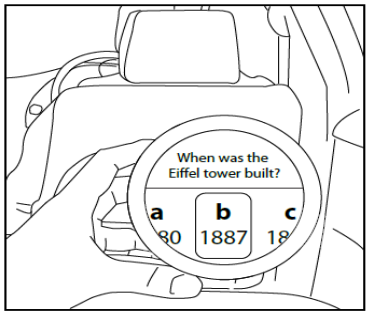


With the telescope game selected she holds the Tripper to her eye. The daughter sees a virtual representation of the selected city. The view changes as the car moves, turning right or left. The same movements mirroring the virtual view.

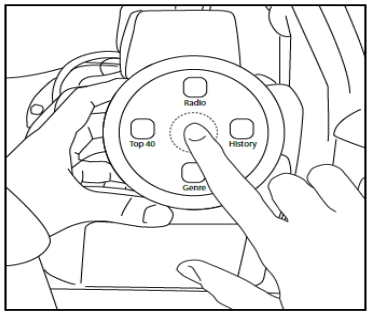


On specific landmarks, there is an icon and when the Tripper is twisted (as in focused) general information of that landmark is presented.

Other activities let The family work together, such as a quiz, based on the selected location. Here the Mum checks the next question, later handing it back to the children so that they can select the answer.



To answer a quiz question, simply twist the Tripper until the correct answer is displayed in the middle and tap. Once the quiz is completed the family will be given a team score that they can try to beat next time.



The family can choose to listen to music based around the Paris area, listening to radio stations, historic music, or the top 40 over the ages.

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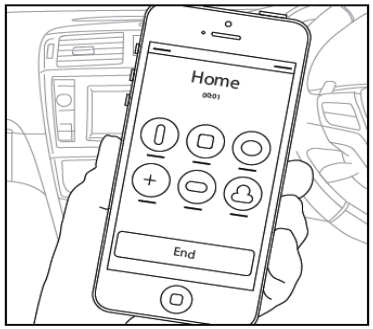
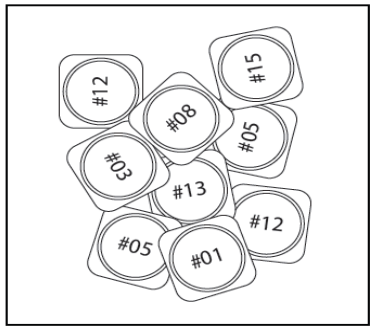
Appendix 9e Storyboard: HomeCar Organiser

Mum is taking her two young toddlers for an outdoor activity trip to a local park. A short while after setting off, she starts to look around the car, worrying that she may have left their jackets behind. While she calls out to her young son in the rear seat, but he doesn't seem to respond.

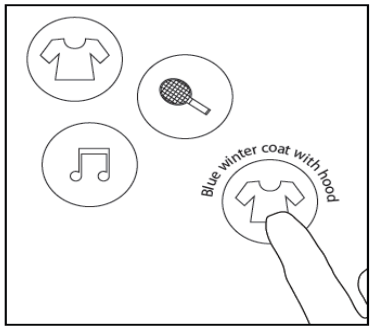


Automatically, she reaches out towards the dashboard to retrieve her phone and proceeds to call her husband (who had packed the car) to check with him .

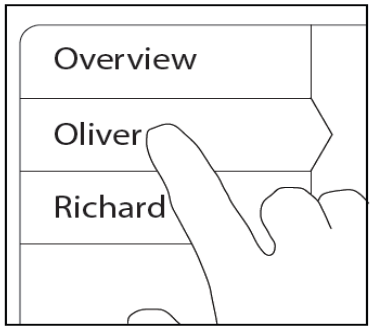


Luckily they have an inventory system where each object considered important is tagged with a chip (This includes the coat).

At home the inventory system is connected to a notice board that helps organise the family weekly tasks reminding them what they need to take each day to school or work. Alternatively the family could use a web application to do this instead of the digital board.

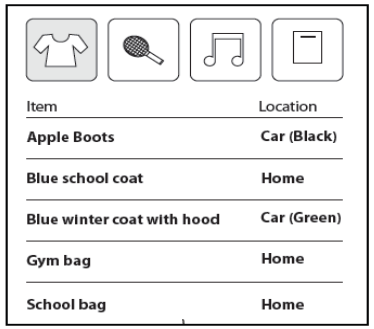


Each tagged article is represented on the board with a categorised magnet, that when tapped gives a brief description (if one has been entered).



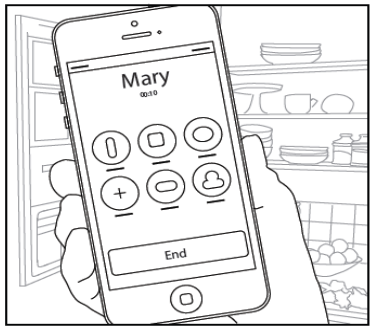
The board also has a search functionality, allowing the parent to look for the location of a specific item.

Using the touchscreen interaction the dad selects the oldest son's name. This displays the list of tagged objects for his son.



Item	Location
Apple Boots	Car (Black)
Blue school coat	Home
Blue winter coat with hood	Car (Green)
Gym bag	Home
School bag	Home

Selecting the category of clothes the father soon spots the missing coat and notices that its last known location was in the car his wife is currently driving.



Letting his wife know over the phone, the father asks if there is anything else. The mum replies by saying no and ends the call to continue on the journey.

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Step 3: Role of user evaluations in storyboard development

In this stage, I invited the participation of four families from the ethnographic study as well as invited four external families to share their views on the storyboard designs. The participants were presented paper prototypes of the concept storyboards. Parents were interviewed individually either at home or in a café. The features of the concepts were presented to the families and then families were asked to explain their understanding of how the concept would work. The purpose of this user evaluation was to address the following concerns.

1. To observe if families identified with the designs and if they targeted and solved 'real' problems in the family car
2. To identify if any components of the designs required further clarification.
3. To narrow down on what designs were most useful to be developed and transferred into more fully elaborated proof-of-concepts for use in presentations to potential industrial partners.

This discussion with users helped me discuss if families could identify with the concerns addressed in the storyboards. A further significant purpose for reaching out to users was to involve them in participating in the design process. Based on the end-user evaluations with families, I was able to narrow down four candidate concepts for further development. The selection of these concepts was based on which designs families found most useful and relevant to the family's current needs. None of the families expressed negative opinions of any designs barring a few which they considered either too technologically advanced or not fitting their current use of technology. For example, two designs the HomeCar Organiser and the Note-Taking System were ruled out by families in the user feedback stage. The former was reported to be more specific to families with very young children (to track and tag items in the car) as well perceived as being cumbersome to set up. Whereas the latter was considered redundant as existing systems targeted the features. Therefore, after discussion with families the following designs were chosen:

1. Remote Control System
2. Turn-taking System
3. Child Friendly Navigation System

4. World Tripper (This design is excluded from discussion in the thesis as the concept was developed out of an interest to develop a gaming application that involved the environment rather than from observations made from empirical findings.)

Iterative development of the designs was then carried out together by the researcher and the designer. During the iterations, user feedback on the storyboard concepts were used to develop features further as well as incorporate aspects that were overlooked in the earlier design phase. Feedback from automotive research designers were obtained from presentations made by the researcher to User Research Groups in industry. The collaborative process enabled to stretch the insights from the data to involve the participation of users, designers and industry experts to provide valuable input into design.

Appendix 9f: Remote control system

Description of Problem: In observing that families carry a growing number of mobile devices carried into the car, there is a need for integrated controls over what is being used and how the devices contribute to the overall noise levels in family cars.

Requirements for the system:

- Set up front-seat controls for volume and power of devices being used in the car.
- Volume adjustments based on parallel devices being used.

Description of System: The concept was designed this around the early idea of the multi-functional GPS unit (See Appendix 9a for Storyboard). The idea of the multi-functional GPS was to introduce the sense of family context to in-car infotainment consoles. The design discussed here has a particular focus here on the 'Devices' section of this unit. This is presented as a dashboard for all the devices in the car. The design assumes that families would have up to six devices in this case. But a "scroll down" functionality to accommodate more devices would be a feature that could be incorporated in the future. From the user feedback, it is understood that the 'ease of use' for this concept was important without making it demanding on the driver's attention. Consequently, the design has enabled the driver to within 'two clicks' mute

or turn off all the devices connected in the car and within ‘three clicks’ (Clicking the individually named sections) change the sound on individual devices.

Figure 5 All Device View

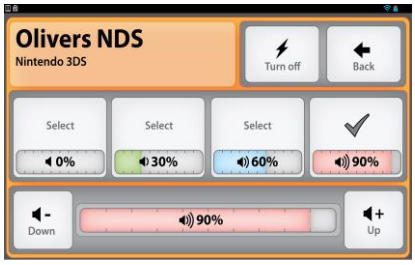

Figure 6 Individual Device view

All devices (Mixed): This is a viewing screen (Fig 7) where you can change the volume for all devices at once. This feature would only work on devices connected and not turned off.

Individual device: This screen takes the user to a page where one can change the volume for the individual device (Fig 8).

Figure 7 Mute All view

Figure 8 Turn-off All view

A brief description of the essential features of the system are listed in the table below.

Remote Control System Key Features	
Feature	***Explanation***
Mute All:	This option eliminates the volume on all the devices connected within the car. This is in order to cut all noise disturbance caused by noisy game consoles.
Turn all Off / On:	This feature turns off all the devices connected within the car. This feature was additionally emphasised by parents in the user interviews and accommodated in the final design concept. While parents found that this may have a negative effect on the children’s mood, in terms of concentrating on driving, parents felt it necessary to be able to have control over the device use.

Appendix 9g: Turn-taking system

Description of Problem: One of the concerns that arose from having a number of mobile technologies carried into the car is how they are managed effectively between passengers. Often parents do not have the means or may choose not to carry many devices. Instead children are encouraged to share and divide the available resources between them. But this meant that managing turn-taking was to done in such a way that a fair and equitable solution was available for children.

Requirements for the system:

- Fair allocation of turns between children
- Incorporation of time and level-based turn-taking
- Minimal involvement of parents in the facilitation of turn-taking

Description of System: The design solution was to design an application that would function on parents' phones and tablets that would devise an automatic turn-taking system to switch turns between children.

Main Menu: This landing page (Fig 9) takes the players straight into choosing who should play (Fig 10). Pressing Exit or rewards will require and admins (Mum/Dad) to confirm identification to access.

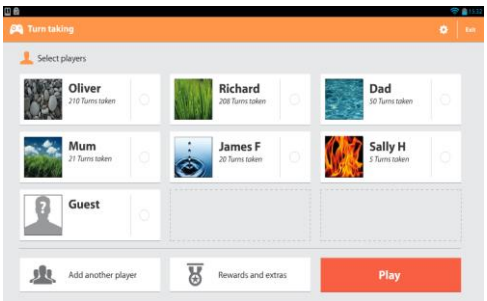

Figure 9 Main Menu

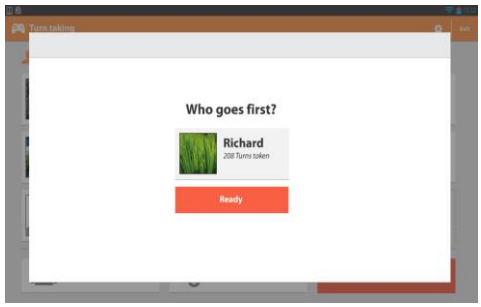

Figure 10 "Play" Screen

Identification: This is an automated process to recognise if the child presenting him/herself for the turn is the one whose turn it is (Fig 11). The purpose of using face recognition here as a feature was based on integrating a feature that placed emphasis on fairness maintained within play. Once identified, the player is taken to the 'game selection' screen (Fig 12).

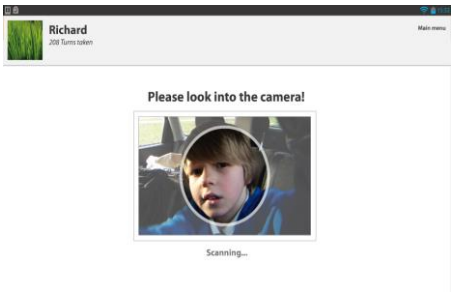

Figure 11 Player identification

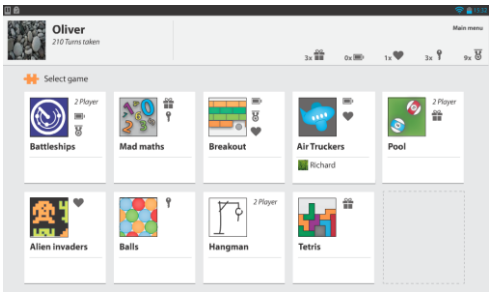

Figure 12 Game Selection

Time: This game is just not level related but also time related as the player needs to reach the end before the time runs out. The feedback we received from families was that this sort of turn taking would be easier if the game was controlled by time. In order for it to accommodate level-based games, the option should be allow one child at least a few levels before it is handed over to the other child. The players picked three games on the first turn, on the next turn they get a number of options. This includes changing the game, adding another player and potentially skipping a turn.

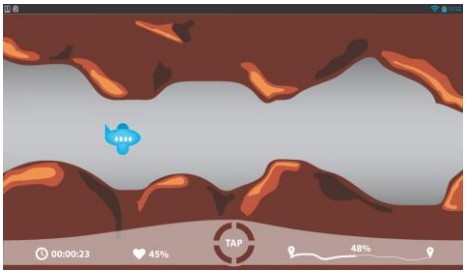

Figure 13 Game Progress

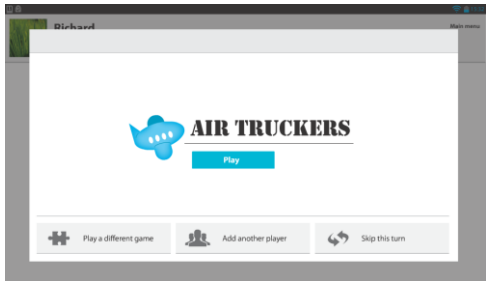

Figure 14 Game End

A brief description of the essential features of the system are listed in the table below.

Turn-taking System Key Features	
Feature	***Explanation***
Selecting Game	To choose a game the player has to click on the game tile. The icons on the left of the game tile represent the bonuses that can be used for that specific game. The icons on the top right are the bonuses that they player has available.
Play:	This feature allows the player to continue with the current game.

Play a different game:	This feature allows Goes back to the select a game screen and then once chosen the player can continue with the newly selected game.
Add a player:	This enables the parent to add another child into the gaming turns. For example, if children are picked up during the journey.
Bonus / extras	These features are given to registered players (with setup security measures). New play joins after every one has taken that turn.
Skip a turn:	This was an idea that there may be times when the child can not play (helping mum). However they still need to sign in and once ready the child can take two turns back to back.

Appendix 9h: Child friendly navigation system

Description of problem: As seen in the section on navigational assistance, the analysis demonstrates the ways in which children can get involved in the driving by providing navigational assistance during journeys. However, children are often hindered by the difficulty in reading electronic maps, or ability to interact meaningfully with the interface of navigational devices. At the same time, children wanted to help and be useful in the car, while parents also wanted children to pick up such skills. Further in evaluating the storyboards with parents were also interested in work with their children to understand and engage with the surroundings that the vehicle was passing through, and to teach them about the places that they lived in.

Requirements for the system:

- An interface that would benefit a child user
- Use of landmarks to support text-based instructions in order that children recognise and view the navigational progress
- Pacing of instructions such that directions are provided in a timely manner.
- Incorporating game-based features in the application such that it transforms the activity as enjoyable for children.

Description of System: The concept was to design the interface of an application that would allow children to collaborate with the driver around a shared mobile device that would allow them to co-navigate the vehicle. The interface had to address the difficulties faced by children in pacing instructions, orienting to the outside environment.

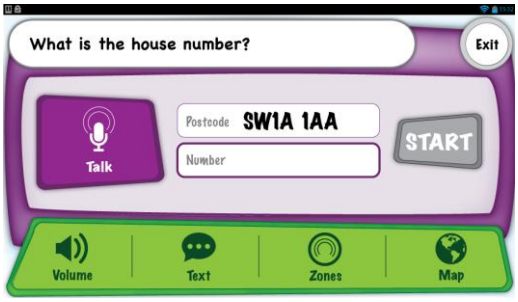

Figure 15: Entering destination

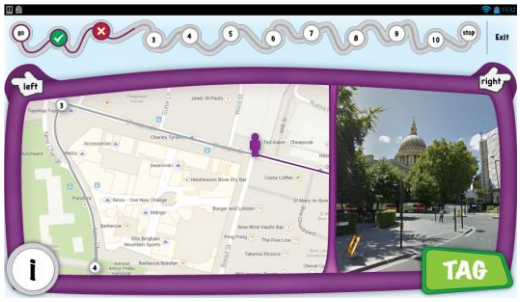

Figure 16: Navigation between points

Entering Destination: To add a destination, users would need to simply click on the microphone icon and speak the postcode and house number. This will then populate the address for the co-navigator and parent to check and confirm. If the user does not know the postcode or house number, then they may also find a destination through map browsing.

Navigation between points: This screen is designed for children and acts as a navigation device as well as an interactive game for the child. As child and car progress to their destination, the child passes a number of markers. These digital markers represent for example a junction, landmark or turning within the real world. This is shown in two ways, firstly by the progression bar at the top and secondly by the moving map on the left side of the main area. The image on the right of the main area shows a Google image of the real world junction, landmark or turning that the child needs to be on the look out for.

Playful Element: To engage the child more with this journey we have included a game where the child collects the markers during the journey. Clicking tag at the right time (A few feet away from the real world location) will gain a green tick. Clicking Tag to far away gains a red cross. The number of green ticks you collect can be used as bonuses for other games.

Directions: This screen displays the next instruction that needs to be read out (see Fig). This is provided in text along with an indicator hand that shows which side that the driver must turn. Children expressed difficulty in spatial orientation of left and right

direction which the hand symbol is intended to simplify. Further, another consideration may be directions such as north, south, east and west.

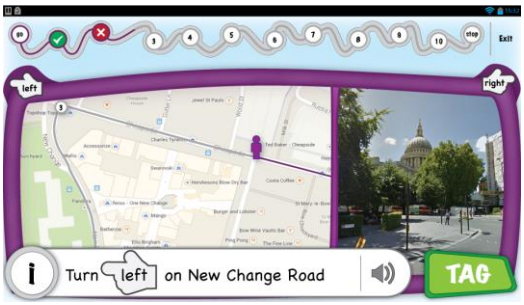

Figure 17: Directions

Figure 18: Location Description

Location Description: Once the child is on the correct street to the final destination, the screen changes to show an image of their location with the final directions (Fig). This is intended to indicate the arrival point and help the child orient to the outside environment.

A brief description of the essential features of the system are listed in the table below.

Child Friendly Navigation System Key Features	
Feature	***Explanation***
Text:	This enables to set the reading level of the text used in the application by increasing the level. Have a 6yr old child or a 12yr old child – then adjust the text to their reading level.
Map:	Change the map settings and show a satellite view of the area
Volume:	Clicking volume will allow the user to access setting that controls the volume level of the text to be read out.
i:	Clicking the (i) icon opens up more information. The screen that displays what happens if the child or distance to the location opens up the (i) section.
Tag:	Clicking 'TAG' at the right time, tags the car into that checkpoints. This will either give the child a green tick or red cross in the top time line. This denotes if the tag was close enough to the real location and if the checkpoint was marked.

Exit:	This returns the device back to the initial page, where the user can select the destination.
Speaker:	Clicking on the speaker icon allows for the text to be read out aloud.