Storing, Caring and Sharing: Examining Organisational Practices around Material Stuff in the Home

A thesis submitted for the degree of Doctor of Philosophy

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ABSTRACT

Homes are a much discussed, but little empirically examined resource for action. Material stuff at home offer resources for social, organisational and individual activities that we routinely encounter and use on an everyday basis. Yet their purposes, storing and sharing practices of use and roles in social and organisational actions are hardly touched upon within Human Computer Interaction (HCI) and Computer Supported Cooperative Work (CSCW) academic literature. As a consequence of this, there are critical gaps in understanding home organisation and management methods as a means of informing the design of novel technologies. This thesis is an examination of everyday routines in home, paying particular attention to tidying, storing, retrieving and sharing practices.

To examine these practices at home, this thesis presents a combination of two qualitative studies using ethnographically oriented methods. Study one (Home's Tidying up, Storing and Retrieving) concerns the topic of home storage in practice; investigating how householders create and use domestic storage practices and the methods used to manage their storage at home. Study two (Social Interaction around Shared Resources) concerns social interaction around shared resources, and the methods used to manage sharing practices at home. Semi-structured interviews, fieldwork observation, tour around a home, and a photo diary were undertaken to produce a 'rich' description of how householders collaborate in storing and sharing set of practices to manage their everyday routines.

Several key finding emerged from the research, that are used to identify important implications for design of home organisational technologies, for example to support effective lightweight interactions, providing user controlled mechanism to make different levels of privacy protection for family members, offering effective awareness of family communications and notifications of the activities of other people around these organisation systems, and making available a range of flexible options for family members to access a shared resource. The thesis make the case that flexible systems should be designed allowing people to categorise things in different ways, and have the values of home asserted in technologies, considering factors such as emotion around the use of space in home organisation to make homes become the unique places that they are understood to be.

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Chapter 1- INTRODUCTION

1.1 Overview

Awareness of the challenges of household organisational work in Human Computer Interaction (HCI) is limited, and as a consequence of this, despite number of years of HCI research on home life, there are critical gaps in understanding how the activities at home are done. To help bridge such gaps in understanding, the research presented in this thesis set out to investigate the broader context of home activities in understanding home organisation and management methods as a means of informing the design of novel technology to support family needs. This thesis specifically addresses the organisation of home life through the lens of the ways that material objects are managed and shared. A variety of households engaged in two empirical studies, and the family members' communication activities and organisation methods were examined. This thesis is therefore formed of two qualitative studies of twenty households. Study 1 looked at the ways people tidy up and store different objects, such as letters, photos, clothes, magazines, children toys, etc.; family members' intentions for storing and the methods they use to manage their storage practices were examined in detail. In the course of conducting fieldwork and asking families how they stored, accessed and re-accessed things at home, participants pointed to their management of their storage which involved constant usage of shared resources, such as dining table, television, laptop, kitchen surfaces, etc. around the house and that led to the second study to get a deeper knowledge of home routines considering collaboration and sharing. In this respect, study 2 looked at the ways families shared different materials at home and the sorts of social interactions taking place in order to organise a family and managing a household. The knowledge gained from the resulting rich understanding of home organisation extends the thinking around the design by drawing out some broader implications. Finally, the thesis provides implications for the design of interactive technologies for the home which suggests that any technical program wishing to develop information

technology for household organisation should consider the attributes of storage, shared resources and social interactions involved around them.

1.2 Background

Previous studies of the relevant literature fall into a number of areas, and these are interlinked and considered in the following sections. Primarily this section covers ethnographic studies of home life and practices. However a separate section examines workplace studies of information and object management and organisations and the third section overviews the design and use of domestic technologies.

The introduction of digital new home technologies, from home appliances to personal computers was a process that was rapidly growing in the 1990s. It was realised that home was an important site for new information technologies; technologies that are unsuitable to be migrated from office environment to the domestic (Venkatesh, 1996). Venkatesh argued that many technology providers have a sound knowledge of the technology they produce, but not of the social context of the use of that technology. He outlined that the apparent failure of 'home computing' happens as a consequence of its lack of compatibility with the kinds of practices and activities that are to be found within the home environment. The purpose of the research presented in this thesis is to continue the study of home life by better understanding the households' activities through field research, specifically by documenting family members' communications and social interactions around their home organisation systems. Mateas et al.'s work in 1996 had taken up a number of themes identified in Venkatesh's work, and focused on aspects of interaction of technology and home life. Mateas et al.'s "Engineering Ethnography in the home" in 1996 was notable for being one of the first ethnographic studies of the home. They argued that in order to define future domestic technologies, we need a more complete model of daily home life. Mateas and his colleagues revealed detailed understanding through their "Day Walkthrough" in the home, and argued that unlike office, family activity with a

PC is distributed through various spaces, and these activities can be characterised as a communication with other household members inside or outside of the home with family and friends. This thesis continues this tradition applying ethnographically- oriented methods to gain a rich insight to daily home life.

1.2.1 Studies of home life

The introduction of technological devices in many aspects of everyday life, from holiday activities to leisure and hobbies brought new issues for designers, involved in Human Computer Interaction (HCI). As a result, a variety of theories and techniques have been incorporated into the field of HCI. In an early home study, O'Brien and Rodden (1997) argued that uncovering the detailed nature of home life is essential to the developers of future interactive systems. They suggested that studies based on the ethnographic tradition offer some contributions to greater understanding of the home.

Previous studies have examined the adaption and use of Information Technology (IT) in the home and investigated how prepared family members were to accept "Smart Home" technologies (Venkatesh, 2001). Venkatesh's study presented findings from ethnographic fieldwork on computer use in the home and 'the home of the future'. The research revealed that computers are being integrated into the home but that the integration is not complete, due to the existence of three overlapping spaces: physical space, social space and technological space. He argued that in designing the home of the future, product developers need to pay attention to requirements of everyday living in the home. Venkatesh et al. also investigated how life in the home was being impacted by these information technologies, and the attitudes that householders had about "Smart Homes" appliances that were going to be on the market in the next few years. These studies revealed that many technologies and specifically the PC and the solo nature of the desktop in general were inadequate for typical family use. They also suggested that future research should be sensitive to concerns for everyday living in the home and that researches explore these requirements in greater detail. More recently, Tolmie et al.'s study "Unremarkable Computing" in

2002 explained that as family life requires a routine for coordination to manage the everyday activities, it is vital to understand the relationship between "technology and home". As Tolmie et al. (2002) put it:

> "There is little empirical understanding of the fundamental nature of domestic routines to date….. [and] while some tentative suggestions for the design of domestic technologies, no means have yet been found for an understanding of domestic routines to impact the design of domestic technologies in a way that is comparable to the impact that the study of routines in office environment has had on fields such as CSCW." (P.400)

If designers are to create appropriate home technologies, research needs to go deeper and understand the daily activities that householders are involved in. Tolmie et al.'s work was notable for articulating some of the organisational aspects of daily life. The paper revealed how important it is to understand domestic routines, and explained how routines help provide the grounds whereby the business of home life gets done:

> "Routines mean that people can get out of the door, feed themselves, put the children to bed, and so on, without eternally having to take pause and invent sequences of action anew or open up their every facet for inspection or challenges or to constantly have to account for what they are doing with explanations or rationales." (P. 400)

This thesis therefore continues the term of Tolmie et al.'s work to explore the nature of home organisation and householders routines, using ethnographic fieldwork that details families' social interactions and the communications required to manage home activities. Using the fieldwork findings, the research extends the thinking around design by drawing out some broader implications, each of which can be used to help inform the development of future home organisations technologies.

Another notable work done by Crabtree et al.'s paper "Finding a Place for UbiComp in the home" (2003) presented new concepts from ethnographic studies of routine activities and technology uses, concerning the social character of home. These concepts made visible the socially organised production of home activities as well as consumption of communication in the domestic environment. They described the places where communication is accomplished and the routines where communication is articulated. They discussed three properties of places at home and the relationship to production, management and consumption of communication. These included: "(i) Ecological Habitats: places where communication media live and where residents go in order to locate particular resources. (ii) Activity Centres: places where media are actively produced and consumed and where information is transformed. (iiii) Coordinate Displays: places where media are displayed and made available to residents to coordinate their activities." (p.215) In 2004, Crabtree et al.'s research "Domestic Routines and Design for the Home" used ethnographic studies of the routine nature of communication in home, to reveal a discrete organisation of coordination whereby members of a family manage communication. The notion of coordination was used to refer to the cooperative or socially organised character of domestic routines. This study provided an example of the routine work of home communication. Handling mail is one such routine activity central to the coordination of home life. Crabtree et al.'s ethnographic findings showed that mail handling relied on the construction of a series of organisational sites where the mail is displayed to promote awareness and coordination. Mail may be collected by any family member. Having collected the mail, it must be sorted (even one piece of mail requires sorting), categorised, organised and placed for further actions. They describe how mail organisation consists of an ecological network of displays constructed by household members to make visible what point a job to do has reached. This thesis continues their work to examine the ways that material objects are managed and shared by different family members for different purposes to meet their needs in everyday life. In opting to study home organisations, this research has chosen to study a specific set of organisational activities, composed of tidying up, storing and retrieving activities

at home, that provide an entry focus to help document home organisation and management in detail as well as the identification of critical points to help inform the design of home organisational technologies.

1.2.2 Physical objects and information organisation

As the amount of information users confront on their computer increases, tools to organise and manipulate this information become increasingly important. Many studies highlighted general issues concerning information management and organisation. Notable early research on information organisation was carried out by Malone (1983). He used the term 'desk organisation' to include not only the desks, but also the tables, shelves, file cabinets, and other information storage in people's offices, and identified two basic strategies for desk organisations: filing and piling. 'Filers' have clean desktops and do not allow papers to pile up. On the other hand, 'pilers' have messy desktops cluttered with piles of papers, making less attempts to organise papers. One of the most important insights from this study was that, in addition to this *finding* function, an equally important function of most desk organisation is *reminding.* Thus piles on top of a desk remind their owners of *things to do*, without the owners having intentionally to look for what needs to be done. Malone's work also suggested that computer systems can make simplifications in three processes required for finding information (creating classifications, classifying information, and retrieving information) by providing "intelligent" aids for categorising and retrieving information and for reminding about things to be done. He has also argued that these systems should continue to provide two of the functions of conventional desks: easy storage of loosely classified information and convenient use of visible reminders. The purpose of the research presented in this thesis is to continue the study programme of physical objects in home life by examining material stuff, looking into socially organised production and consumption of physical things in the home. The aim of study 1 in this thesis is therefore to explore storing practices at home; what happens to a new piece of information or a thing coming into a

house, and how activities such as tidying up, storing and retrieving happen around these things and new pieces of information.

Of particular interest to the research in this thesis are investigations undertaken on storage in the home. Whittaker and Hirschberg (2001) explored the reasons people collect paper, types of data they collect, problems encountered in handling papers and strategies used for processing it. They examined three hypothesis about the character, value of personal paper and handling information. These concerned obsolescence, uniqueness and filing behaviour. Considering their obsolescence hypothesis, they observed that archived documents became less valuable as the archiver's interests, job responsibilities and company strategies changed with time. For their uniqueness hypothesis, they found that people are rational about storage: they only keep unique data. Finally, the filing hypothesis concerned strategies for handling paper data, and they found that filers ended up with greater amount of information than pilers, and that pilers benefited from greater availability of information (recent information).

Using ethnographically oriented methods, study 1 further explores householders' attitude to storage, reasons for keeping and disposing information or things at home, and their strategies and practices for storing and retrieving. More recently, Kaye and his colleagues (2006) "To Have and to Hold: Exploring the Personal Archive" described a study of forty eight academics and the techniques and tools they used to manage their digital and physical documents and artefacts, and presented two sets of results. First, they discussed the participants' rationales behind personal archiving, and second, implications for development of digital tools that allow for personal archiving were explored. Their paper also examined the goals and structures of archiving. Kaye et al.'s work explored two key concepts to be considered in designing successful systems for personal archives:

> "First, as values of legacy, sharing, anxiety and identity construction drive each archive's physical structure, they also set the criteria for judging the

archive's success. That is, subjects judged the adequacy of their archives not only based on efficiency of retrieval, but also on how well or how poorly the archive helped them to identify and keep what they had decided what they needed to display.....

Second, there is no identifiable 'best practice' for archiving: rather, tools built to support the activity of archiving must accommodate many types of goals, methods, and styles. Flexibility and the user's own ability to tailor or fine-tune a system will be the key to the success of any digital archive tool." (P.283)

With an existing interest in personal archival, my research was inspired to apply such a detailed investigation in home storage practices. This thesis explores people's intentions for storing materials, re-use and categorizing them. It also discusses problems of storing and retrieving. Study 2 continues to investigate family members' social interaction around shared materials at home in sharing practices and problems with sharing.

1.2.3 Domestic technologies

In the last two decades, there has been an increased interest in both academic and industry in designing technologies for homes. However, the methodological and technical challenges in realising IT systems for the home are still significant. Homes are a much discussed, but little empirically examined resource for action to build a richer picture of domestic life at a detail level and as a consequence, an understanding of the nature of the home is of interest to the developers of future information technology (e.g. Guglielmelli et al., 1996; O'Brien and Rodden, 1997). With little attention to the practical and social organisation and management of physical things in everyday activities, it is important to continue to explore this further to gain insight to family member's routine activities around material stuff with an eye towards informing design of technology to support social interaction of people we care about. Previous studies (Hughes et al. 1998; O'Brien and Rodden, 1997) have drawn attention to

home activities associated with the social organisation of household routines, and considered the ways in which an understanding of the nature of the home was of interest to the developers of future interactive technology. More recently, O'Brien et al. (2000) discussed an important feature in all households was "daily routines" of things "being as they should be", with the majority of such routines being driven by the concerns of work and /or children. Technology must not only fit within routines but may be used as a means of constructing the very routines of home life. They also showed that spaces were seen as "belonging" to family members at certain points in time when they used certain pieces of technology. The purpose of this thesis is to continue this work by understanding "storing" and "sharing" routines at home, and to document the nature of home practices and the constraints that family members face with their methods.

Other work done by Nassla and Carr's "Investigating Intra-Family Communications Using Photo Diaries", (2003) Plomp and Tealdi's "Technologies for Well Being at Home", (2004) Blythe et al.'s "Tele-Biographies: Data Collection Techniques to Capture the Ways People Interact with Digital TV", (2004) Taylor et al.'s "Home that make us smart", (2006) Vetere et al.'s "Mediating intimacy: Designing Technologies to support strong-tie relationships", (2005) O'Hara et al.'s "txtBoard: from text-to-person to text-to-home", (2005) Perry and Rachovides' "Entertaining situated messaging at home" (2007) were interested in human centred and participatory design practices, and much of this work took place in the home. The need for such research into home appears even more relevant at this time, and it is all the more vital to examine households' organisational routines so that home technologies can fit well into the pattern of home activities. This study continues the investigation of home life, using ethnographically-oriented techniques to expose the methods to uncover family members' storing and sharing routine activities that enable families to shape the technologies that are developed, leading to potential designs that will address families' actual needs.

1.3 Motivation of Research

In the light of the background to this thesis, the academic motivation that drives this research is to extend the existing CSCW and HCI understanding of how and why home storage and sharing take place by family members, accessing and re-accessing stored as well as shared materials at home. Furthermore, it develops this to better understand householders' needs and support that can be provided for managing their storage and sharing activities in practice. This thesis will provide a resource for future research by academics, as well as offering some potential insights for home technology designers. Data synthesis, reflections on design will be discussed in chapter six, giving implications for home technology design.

1.4 Aims and objectives

The aims of this research are to uncover information practices in the home, and get a sound knowledge of home routines considering collaboration in tidying, storing, retrieving and sharing practices. The following studies will address these in details.

> *Study 1 (Home's Tidying up, Storing, Retrieving)* concerns the topic of home storage in practice; looking at how householders create and use domestic storage practices and the methods used to manage their storage at home.

In the course of conducting fieldworks and asking families how they stored, accessed and re-accessed things at home, participants pointed to their management of their storage which involved constant usage of shared resources around the house.

> *Study 2 (Social interaction around shared resources)* concerns with another feature of household; that is, the social interaction around shared resources, such as dining table, coffee table, kitchen worktop, television,

games, laptop, etc., looking into just what it was about these resources that made them so popular for sharing and the methods used to manage sharing practices at home.

The achievement of the following objectives is influential to the realisation of the research aims above:

1- Adapt appropriate research method from the HCI literature to investigate the home and its associated practices with regard to the thesis topic.
2- Undertake studies in the home to explore these practices.
3- Examine home life, home storage and sharing set of practices as a whole, rather than focusing just on the medium, synthesising the data from all sources.
4- Extend the thinking around design by discussing some broad implications to help inform the development of future home organisation technologies.
5- Identify critical points to design concerning how domestic technology design might be made sensitive to the distinctive qualities that make up home life.

This thesis will use the data gathered to establish a 'rich' description of how households' members collaborate in tidying, storing, retrieving and sharing activities to manage their everyday routines.

1.5 Scope

The qualitative research undertaken for this thesis involves investigating and documenting the nature and demands of home organisation to help inform the future development of home technologies that seeks effectively to support home life. Thus, a technology implementation was not considered necessary to explore the issues at the centre of this thesis. The scope of this thesis seeks to support the HCI and CSCW research communities by providing an extension to current understanding of home storage and sharing activities and to highlight the sorts of interactions between family members. More generally, the research also seeks to

offer some rich insights that could be gainfully applied to the development of home organisation technologies.

1.6 The thesis outline

This thesis is divided into seven chapters. The content of the following six chapters is briefly outlined below:

Chapter 2 is a review of several critical areas of interest relevant to this research as they appear in the literature. The initial section considers literature of Gender studies and technology, as these can be relevant topics of household organisation, but as Gender study is an interdisciplinary field, I decided to continue my literature on home studies within HCI and CSCW, explaining how the popularity of the home as a topic of study was an important concept, which this research benefited from. The section presents an extensive literature on homes, families and domestic technologies and Smart Homes. Following on from this, ethnography within social science, the role of material culture in ethnography as well as ethnographic studies within HCI and CSCW, which has been an important and motivating inspiration of this research, are discussed. This chapter identifies areas of concern to be explored in the rest of this thesis.

Chapter 3 discusses and justifies the methods chosen for this research. The first section discusses the choice of ethnography to pursue this research. In the second section practical details of taking ethnography are reviewed. The third section describes hypothesis, generalisation and access to the field in detail. Following on from this, data collection techniques and analytical framework are discussed. Finally, the chapter introduces the two studies undertaken in this thesis.

Chapter 4 covers tidying up, storing and retrieving materials at home, looking at various family members' intentions and practices applied to their home storage practices. Related to this, members' intentions for re-use and the problems that they face in re-accessing the materials are discussed. It examines

the material properties of storage objects, storage materials and storage media. Following on from this, we illustrate informants' reasoning for choosing particular storage materials and media and discuss how the properties of items to be stored have impacts on choosing storage media. Detailed discussions around the members' perceived effectiveness of storing and retrieving materials, is explored. The chapter also discusses storage management, illustrating how families manage and discard items from their storage at home. Finally, this chapter looks at social interaction such as verbal and non-verbal communications around storage materials to show different ways in which family members interact with each other in relation to their storage practices.

Chapter 5 focuses on some of shared resources and their material properties which makes resources sharable and used by household members at all times. The chapter details some of social interactions happening around these resources with regards to families' routines and practices, which go beyond simply representing functional information, and become a part of the interactions and communications of a family social life. Another part of the chapter highlights issues, which have impacts on effectiveness of social interactions around share things and examines the problems around shared resources and social interaction problems around these materials. For example, to examine what happens if two people intend to share a laptop at the same time, and what sorts of communication take place to resolve this problem. Finally management of shared resources and participants practices around these devices are explored in detail.

Chapter 6 examines and synthesises data from the two studies. Both studies aim to extend the thinking around design by discussing some broad implications. This chapter includes Design 'Method' concerning how domestic technology design might be made sensitive to the distinctive qualities that make up home life rather than identifying a series of set tasks and identification of explicit design implications. Design relevant materials from data recounts the most important findings of the thesis. Following on from this, existing storage systems, such as warehouse technologies are reviewed, including their common functionalities

with the home, but do highlights the problems with these existing technologies. Finally, critical points for designing domestic information technologies are presented.

Chapter 7 is the conclusion, which ties together various strands of this thesis and discusses the contributions. It also explains how this research might be developed, and considers the areas not addressed in this research.

Chapter 2- Literature Review

2.1 Introduction

This chapter discusses the backdrop to the thesis within HCI and CSCW. The intention is to examine several critical areas of interest relevant to the research as they appear in the literature. The initial section considers literature from several disciplines, but is focused on literature related to Gender studies, with a brief discussion of relevant materials from the Gender and technology corpus. Section 2.3 describes the evolution of home studies within HCI and CSCW, explaining the popularity of the home as a topic of study, and as an important concept, that this research benefited from. Section 2.4 presents an existent literature on homes, families and domestic technologies. This section is divided into 'movement from Offices to Homes in CSCW and HCI', 'Computing and Communication in the Home', 'Studies of Home Technologies' and 'Smart Homes'. Section 2.5 provided an overview of ethnomethodology and ethnography within social science, the role of material culture in ethnography as well as ethnographic studies, within HCI and CSCW, which has been an important and motivating inspiration of this research. Based on the discussions presented in this chapter, the concluding section identifies areas of concern to be explored in the rest of this thesis.

2.2 Background studies of home

Home life has been a topic of enquiry in many disciplines; anthropological literature (e.g. Wallman, 1984; Miller, 2001), cultural studies (e.g. Lavenda and Schultz, 2007), sociological (e.g. Silverstone and Hirsh, 1992; Pink, 2004) and social psychological (e.g. Csikszentmihalyi and Rochberg-Halton, 1981) and provided rich background information about home life. Much of this literature has focused on issues such as, gender, childhood, religion, language and culture, class, race, ethnicity, sexual preferences and other issues related to politics and

economics. As I was interested to study home life and in particular family members' routine activities, I decided to examine the literature about gendered housework and information technology. Following section is an overview of work on housework that is drawn on in gender studies.

2.2.1 Gendered housework

The experience of home life is mediated by gender, especially with regard to the division of housework between couples in families. A common-sense view is that women are associated with domestic environment, and thus with everyday life more generally (Scott, 2009). Lefebvre (1947) argued that because they were most likely to be housewives and caught up in domestic routines, women experienced the repetitive nature of everyday life more negatively than men. However, Felski (1999) has argued that the repetitive routines of domestic life can be interpreted more positively. Homemakers can decide when, how and in which order to do the domestic tasks they set themselves, and can get happiness from some of these. Planning, shopping for, cooking a family meal, for instance, can be experienced as an act of love and nurturance (Miller et al.1998), which affords opportunities for creativity and self -expression. Felski has argued that those engaged with domestic labour do not miss out on the excitement of life outside the home, but rather create meaningful worlds within it.

There are several works focused on the evolution of housework provided accounts of the changing nature of housework which include Oakley (1974), Willmott and Young (1973), Gershuny (1992), Sullivan (1996), Devine (1992), Ferri and Smith (1996). Oakley (1974) has argued that key characteristics associated with housework are monotony and lacking in value. It is also unpaid and automatically associated with women; it is perceived to be women's responsibility.

Willmott and Young (1973) claimed that family life gradually improved for its members, becoming increasingly more equal. Thus, it was believed that the

domestic division of housework based on gender was breaking down. To support this argument, Gershuny (1992) argued that men were doing more in the home, especially when women were involved in paid employment. Sullivan (1996) also supported the argument, stating men only spent slightly more time on leisure than women and that gap was continuing to narrow.

Willmott and Young's research has received significant criticism from feminist researchers, who have pointed to a number of key problems. Oakley (1974) argues inadequate methodology, when she explains washing up a breakfast bowl once a week is not sharing tasks. She has also argued that to help in the house is not truly evidence of male domestication. Oakley's (1974) own research indicated women still saw housework as their responsibility. This is supported by Devine (1992), who argued that even when women had paid employment they remained responsible for housework, although husbands helped. Ferri and Smith (1996) argued that in all types of paid employment relations it was most common for women to have the main responsibility for housework and children.

With more women in paid employment outside the home and technological advances helping to reduce the intensity of domestic labour, Stockman et al. (1995) have suggested that, while they may help out more with housework, men do not take an equal share, and so women find themselves working a 'dual burden' of paid and unpaid housework. Wajcman (1995) for example, has discussed that the amount of time spent on housework over the twentieth century has remained constant. Modern devices, such as washing machine, electric iron and dishwasher may have made each task less physically easier but have had little effect on the amount of work to be done. He argued that we have invented more tasks and expect them to be done more frequently, for instance instead of one weekly wash, we divided clothes into piles by colour and fabric, and do several washes per week. The expectations of what homemakers should achieve have risen, and so the work has become even more time consuming. Wajcman argued that these 'labour-saving' devices are in fact 'labour-enslaving'. A related argument comes from Elizabeth Shove (2003), who

has suggested that the twentieth century saw a change in the meanings associated with housework, centring on a shift away from comfort to cleanliness. She argued that our standards of hygiene are rising, as we try to keep our home more spotless, and the sense of competitiveness between homemakers may be no less than it was in the 1950s.

The history of the technological transformation of household work is also an important topic within Gendered Studies, both on a theoretical and a functional level. Hardyment (1988), has detailed the changing nature of housework in Britain against the backdrop of changes in British society overall during the industrial revolution, examining the parallel increase of industrialisation in both mercantile and domestic settings. Other works by Wright (1960) and Rothschild (1983) also have explored the topic of technological transformation of domestic work.

Data from the Office of National Statistics (ONS) demonstrated the time different groups of people use to carry out their domestic tasks. Despite a massive shift in terms of women's employment outside the home, women in all economic categories spend longer on domestic work than men. For example, women who work full time spent 151 minutes on domestic work compared with 113 minutes spent by men who work full time. According to the Time Use Survey in 2005, men were more likely than women to spend time in paid employment and on the computer and conversely women were more likely than men to spend time on housework activities and caring for children and spending time with friends and family at home. ONS data reveals that people spend 31 minutes a day on cleaning and tidying. Entertainment technologies have seemed to be a greater priority than housework technologies, such as tidy up and storage. This thesis examines people tidy up, storing and sharing practices and reveals the problems that people face with these routine practices. Therefore, a deeper understanding of their methods and practices is crucial to new domestic product development and technological solutions for them.

2.2.2 Gender and technology

The concept of domestication originates from anthropology and consumption studies and has been developed particularly by cultural media researchers interested in the role of information and communication technologies (ICTs) in the household (e.g. Silverstone and Hirsch 1992). Silverstone and Hirsch's framework (1992) discusses that domestication involves more than simply bringing new product or software home. Rather, in this process not only the technology is being evaluated and negotiated but also the users and social practises are being challenged and shaped by the technology. There is a considerable body of work on the larger theme of relations between gender and technology. For example, Cockburn and Ormrod (1993) have highlighted the organisation of gender relationships implicit in the design, development, marketing and the use of microwave.

In 2002, Trauth's research presented two theoretical viewpoints of literature about gender and IT: essentialism and social construction. The essentialist theory focuses on the existence of relevant *inherent differences* between women and men with respect to information technology. He discussed the observed differences in the participation of women and men in the IT field as evidence of this viewpoint. Therefore, the causes of gender representation in IT were attributed to biology (Venkatesh & Morris, 2000). One conclusion that could be drawn from an essentialist approach to gender and IT research was that women and men should be treated differently. Trauth's research (2002) suggested that one logical view would be the creation of two different workplaces: a "women in IT" workplace and a "men in IT" workplace. Thus, the gender imbalance would focus on addressing "differences between women and men" and the equality factor would focus on "separate but equal," something that was rejected in the arena of racial equality more than decades ago (Trauth, 2002; Trauth et al., 2004, 2005).

The other dominant theoretical viewpoint focused on the *social construction* of IT as a male domain. This explanation for women's relationship to information technology looked at sociological factors rather than biological forces. The literatures of gender and technology in general (e.g., Wajcman, 1991; Cockburn et al., 1993) and gender and information technology, in particular (e.g., Spender, 1995; Star, 1995; Webster, 1996; Slyke et al., 2002) considered social construction theory rather than biological and psychological theories. According to this view, the social shaping of information technology as "men's work" places IT careers outside the women's domain. There are different suggestions for addressing this situation. One study revealed the development of strategies to help women fit in to the male domain based on a multi-year investigation of female in both academe and the workplace in Australia (e.g., Nielsen et al., 1998; von Hellens et al., 2001). Another study considered the need to reconstruct the world of computing to become more of a "female domain." For example, Webster's study "Shaping women's work: Gender, employment and information technology" (1996) focused on the social shaping of female gender identity and the implication for women's relationship to workplace technologies. Based on analysis of women as a social group in cyberspace, Spender's work "Nattering on the net: Women, power and cybespace" (1995) predicted an increase of "female values" into the virtual world that would come with female presence. Wajcman's study "Feminism confronts technology" (1991) also revealed several issues. For example, he discussed that there was not a universal definition of masculine or feminine behaviour; what was considered masculine in one society was considered feminine or gender-neutral in another. He argued that while gender differences exist they appeared differently in various societies.

Blythe and Monk "Notes Towards an Ethnography of Domestic Technology" (2002) was a thoughtful analysis. They have discussed that despite a massive shift in terms of women's employment outside the home, there has not been a change in the division of housework. They also argued that entertainment technologies appeared to be a greater priority than task based technologies; while there are not many available technologies to help with routine tasks, such as

tidying, a wide range of tools are available to support DIY and male works, such as gardening. Blythe and Monk have discussed that most home technologies are generated through design. As number of female employment outside of the home increases, housework appliances should be re-coded and aimed at men. For example, colour of appliances is a key into cultural associations, and product designers must consider this and changing patterns of housework.

Similarly, Lie (2003) has argued that men and women were changing their practices and entering new relationships with each other and their environments, and the understanding of the notions of masculine and feminine were just as unstable as men's and women's looks, activities and practices. Whilst fascinating, a comprehensive description of the breadth of research is beyond the scope of this PhD; HCI, CSCW, Computer science and technology studies in general might be seen not so much interested in gender, as these disciplines are focusing on improving technological difficulties or optimising user performance.

2.2.3 Time, Leisure and Domestic Daily Routine

The perception of not having enough time may be unique to modern societies. In pre-industrial times, with more tiring manual house works, less designated leisure time, no television or other entertainment media, days would have passed more slowly. New information technologies, faster methods of transport, new sophisticated mass media and the rise of the 'digital age' have all changed the way people experience time in life. People have more things to do, and less time to do each of them. Robinson and Godbey (1997) noted that, although Americans actually had more leisure time in 1985 than in 1965, they felt more rushed and tired. Southerton (2003) agrees that the pressures of consumer society have created a 'time squeeze', whereby the demand to spend more time on some activities, particularly work, reduces the time available for others. He suggested that 'feeling harried' is a common experience of time in contemporary Western society.

Clock time had come to rule everyday life, as people rushed from one appointment to another, scheduling every moment and worrying about 'getting things done' in time. There is a constant feeling of being rushed and of not having enough time to do all that we want to do (Robinson and Godbey, 1997). For example, Robinson and Godbey (1997) presented empirical evidence that people who use their own washing machine spend as much if not more time on their laundry than those who do not own one. They argued that a common response to the experience of feeling rushed was to engage in 'time deepening': increasing the density of a given period of time by doing more within it. They identified four ways of deepening time: doing a given task more quickly, replacing a slow activity with an equivalent, or faster one, doing more than one activity at once, and being more aware of time when performing a task. Robinson and Godbey (1997) have also argued that product designers must consider changing patterns of housework. Southern (2003) suggested that the extent to which we feel rushed, tired and temporally squeezed depends on the extent to which we are able to schedule, allocate and coordinate our activities with others in our particular social network.

Widerberg (2006) also has identified a sense of life being 'speeded up' that is quite exhausting to experience day after day. Her study in Norway combined a large-scale survey of living and working conditions with 100 qualitative interviews with employees in four different workplaces (a company, two schools, a restaurant and a community services bureau). Her study showed how much feelings of being rushed, tired and 'sped up' can become so embedded (and embodied) as to become normal and taken for granted.

This thesis therefore continues the term of the recent sociological works on time to explore the nature of householders' time managing their daily routines, using ethnographic fieldwork that details how families use time to organise their day to day activities, such as tidying up.

2.3 HCI and CSCW and Home

Within HCI and CSCW, studies of human activities and communication have started to consider the home as a place to study domestic life to build richer picture of home practices that can provide technology designers with an insight into the potential for domestic computing. The following section describes HCI and CSCW terms and highlights the rise of the growing body of research into the home in HCI and CSCW.

2.3.1 What are HCI and CSCW?

HCI is the acronym for *human computer Interaction,* a discipline concerned with the study, design, construction and implementation of human-centric interactive computer systems. A user interface, is a method by which human interacts with a computer, but HCI goes beyond designing screens and menus that are easier to use and studies the reasoning behind building specific functionality into computers and the long-term effects that systems will have on humans. HCI is generally considered to be a very broad discipline that includes different specialties with different concerns regarding computer development: computer science is concerned with the application design and engineering of the human interfaces; sociology and anthropology are concerned with the interactions between technology, work and organization and the way that human systems and technical systems mutually adapt to each other; ergonomics is concerned with the safety of computer systems and the safe limits of human cognition and sensation; psychology is concerned with the cognitive processes of humans and the behaviour of users; linguistics is concerned with the development of human and machine languages and the relationship between the two (e.g. Myers, 1998). The means by which humans interact with computers continues to evolve rapidly. While computers become more and persistent in culture, designers are increasingly looking for ways to make interfacing with devices easier, safer and more efficient.

CSCW is acronym for *computer supported co-operative work.* CSCW is the term used to describe any technology system that relies on combinations of

hardware and software resources to enable groups of people to collaborate and share technology. Suchman (1987) has defined CSCW as the design of computer technologies with explicit concern for the socially organised practices of users. This theory has focused on work settings and interactions within communities of practice. Therefore, the developers needed to learn more about how people work in groups and organizations and how the technology affects that. In addition, some in the Management Information Systems field have promoted this as a way to improve success rates in large system development. But this area had been largely absent from discussion among designers and developers in the vendor company settings engaged in early efforts to develop group support applications. CSCW started as an effort by technologists to learn from economists, social psychologists, anthropologists, organizational theorists, educators, and anyone else who could shed light on group activity (Grudin, 1988). These tools to support group work are usually labelled 'groupware', which involve software, hardware, services and/or group process support (Johhansen, 1988). In the past, most groupware were designed for small groups of workers, such as air traffic control, but with an increasing use of computing technologies in domestic environments, this has begun to change. The design of computing technologies for these groups of users is different to traditional approaches in HCI, which emphasis was on understanding the individual user's model of task and individual user's relationship with the computer to undertake well-defined tasks. By observing groups in field studies, CSCW researchers have often sought to support groups' productivity, considering their underlying communicative needs (Kraut, 2003).

2.3.2 Research into home in HCI and CSCW

In late 1990s and early 2000s, studies of home were just beginning to be seen in HCI and CSCW as a locale with its own concerns, practices and routines. A few numbers of early studies of home life have begun to produce a rich picture of domestic life in HCI and CSCW (e.g. Venkatesh, 2001; O'Brien, 2000; Hindus et al., 2001; Harper et al., 2001; Edwards et al., 2001; Tolmie et al., 2002; Blythe et al., 2002). Since then, studies of technologies in domestic activity have ranged

across a diverse set of activities, from paper mail organisations (e.g. Harper et al., 2003; Crabtree et al., 2003b) and calendar use (e.g. Crabtree et al., 2003a) to mediating intimacy (e.g. Vetere et al., 2005) to lists in mothers' work (Swan and Taylor, 2004), notes on fridge's door (Swan and Taylor, 2005) ,making place for clutter (Swan et al., 2008), and materialising energy (Pierce and Paulos, 2010). The organisation of home life has now become an important topic of investigation and studies have been influential in the design of organisational systems. Bell, Blythe and Senger (2005) provided an ethnographic study of variety of home, and explored what home actually means to family members and provided a set of design criteria that go beyond the functional. In a revealing ethnographic study, Taylor and Swan (2005) have also provided a description of use of artefacts in the home, and the 'artful' ways that these organising technologies are used between family members. Studies concerning the home and families are now a common feature in many journals and conferences, such as EPIC, Intelligent User Interfaces, Multimedia, Mobility, Creativity and Cognition as well as traditionally more technical agenda, such as Ubicomp and Human Robotic Interaction.

2.4 Studies of home in HCI and CSCW

A number of studies of the development of information technology for the home with an orientation towards HCI and CSCW have begun to build a rich picture of domestic life with an insight into the potential for domestic computing. I have decided to divide and detail the literature into four development areas of 'From Offices to Homes in CSCW and HCI', 'Computing and Communication in the Home', 'Studies of home technologies' and 'Smart homes'. These sections provide a sense of how uncommon the early studies of home were and suffered from a lack of interest in the past within HCI and CSCW. A thread of interest that has begun to points towards the communication and technologies in the home are also included in the following sections, where they complemented this thesis in specific ways.

2.4.1 From Offices to Homes in CSCW and HCI

Early studies in HCI and CSCW concerning information technologies in the home were limited, as Personal Computers (PCs) were relatively uncommon in homes and the meaning of computer systems were shaping in offices. This was due to combination of factors. In an article from 1980, Ruchinskas et al. revealed several potential barriers relating to the slow rate of adaption of home computers within the home. These included general public difficulty seeing the relative advantage of computer assisted, a great deal of resistance to the notion of "computerised living", limited software availabilities; which meant the consumer dissatisfaction with a few pre-programmed functions, or develop their own programs, which meant learning new skills in many cases, home computers and computer assisted services were rather expensive, the computer function was not readily visible aspect of the product offering; therefore the consumers did not observe the value of home computing innovations.

In 1985, Venkatesh et al.'s early work covered several papers attempting to consider information technology within the home, and pointed out more barriers relating to lack of information technologies within the home. These included lack of links to other technologies in the home, gender bias, and lack of defined physical or social space within the home. He outlined the failure of "home computing" to take root within the domestic environment as a consequence of its lack of compatibility with the kinds of practices that are to be found within that environment. Venkatesh highlighted two key spaces within the home (Social space and technological space), which interact in complex and unpredictable ways which in the nature of this interaction the domestic technologies find their character.

As the majority of research in HCI concerning Personal Computers had been gathered in an office environment, early studies framed home in relation to the office. Oslen's study "Remote office work: changing work patterns in space

and time" (1983) examined some behavioural, organisational, and social issues surrounding remote work, particularly using computers to work from home and identified important characteristics of jobs that can be performed at home; these types of jobs seemed to require minimum physical requirements, individual control over work pace, and a relatively low need for communication. This work was continued by a few papers such as "Toward the perfect workplace?" (Bailyn, 1989) where the author has considered the challenges of using computers to work from home by comparing home-based workers with office-based employees and used the results to suggest that home-based workers seemed to find more intrinsic values in their job, compared to office-based employees.

Since then, further research studies have examined home as a work place to office. Junestrand and Tollmar's study (1998) was one of the influential ones, and has argued that computer architectural design and communication technologies should be treated in parallel. Similarly Mynatt et al. (1998) have pointed out that designing systems for home environment can be used effectively, by focusing on the knowledge of the user's intention and situation. Other studies have provided the situational boundaries between home and office, and focused on home-based workers' communication and interaction with family members (e.g. Frissen, 1999; Schmidt, 2000; Salazar, 2001). Frissen's study (1999) analysed the patterns of acceptance and use of Information and Communication Technologies (ICTs) in the context of everyday life of households. His research was rooted in a user-oriented perspective towards novel technologies which understood the incorporation of ICTs in everyday life of households as a "domestication process". Salazar's paper (2001) has also revealed that working at home was not as simple as placing a computer somewhere in the home and beginning to work. He argued the interaction with family members needed to be taken into consideration. His research looked at the process of negotiating the time and space needed to do work in the home and provided a variety of relational and situational boundaries. These studies suggested that computers were seen primarily as tools for work productivity, and whose presence in the home was in order to further those aims.

Other studies revealed that in order for computing to become a fixture in household, it had to first and foremost offer the consumer clear benefits, either in terms of access to new services, convenience in fulfilling familiar tasks, or efficiency in managing one's daily life. Since any form of home computing represented a major capital investment for most consumers, researchers believed it was unreasonable to expect widespread adoption, unless the perceived needs of consumers were served (e.g. Zinn, 1981; Frenkel, 1989; Gray, 1990).

2.4.2 Computing and Communication in the Home

Research concerning technology and awareness of computing and its potential in the home increased in mid to late 1990s. Within HCI and CSCW, studies of human communication have focused on improving the communication and social interaction to support home activities. In a paper in 1996, Mateas et al. built on some of Venkatesh's research into home life and Kraut's HomeNet project. Venkatesh research in 1996 provided valuable analysis of home computing trends and Kraut's HomeNet project (1996) provided important quantitative data regarding Internet use in the home. However, Mateas et al. argued that in order to define future domestic technologies, we need a more complete understanding of daily home life. Their work was notable for being one of the first ethnographic studies of the home, and "Day Walkthrough" in home that first gathered an overview of repeating weekly and monthly activities such as sport practices and music lessons, etc. and then gained detailed understanding of a typical day in their home, particularly in comparison to most technology studies at that time. Apart from their method, another innovative aspect of their study was the "flannel board" which was a device with a large number of felt pieces representing rooms, participants, objects and activities, a technique for participants to manipulate the pieces as they walked through their day. The visual engagement of the board facilitated recall and kept the conversation grounded. In June 1997, Kraut et al.'s HomeNet Overview, was the first large scale study, starting in 1995 with 50 families and increased to 100 families in 1997 which

provided families with hardware and connections and were carefully documenting how members of family used on-line services such as electronic mail, computerised bulletin boards, on-line chat groups, and the World Wide Web. They used their results to suggest guidelines for the design of new online tools. One of their main findings was that age, gender, and race predicted Internet use, but family income did not. They showed that teenagers were much heavier users of the Internet than their parents. A major findings were interesting to consider, e-mail use was more popular than use of the Web, more stable, and drove continued use of the Internet overall. Kraut and his colleague discussed the main reason was that Email sustained on-going dialogues and relationships, where in contrast, the Web had more bounded properties, in which information gathering, for example, for school assignments, purchase decisions, or paid employment was satisfied with one or a few visits. Their argument was that the Internet was a *social and emotional technology*, and that it sustained social networks.

A growing research interest in HCI and CSCW, has begun to point to communication within the home and the role that different surfaces play in the home (e.g. Crabtree et al., 2003; Harper and Shatwell, 2003; Taylor and Swan, 2005). One project that has moved the technology into the home is the Appliance Studio txtboard, which is a self-contained display device that displays text messages sent to a phone number. O'Hara et al.'s "txtBoard: from text-to-person to text-to-home" (2004), use of txtboard in a home environment discussed a range of important issues about its use, and in particular the lived practices of the participants were revealed, by focusing on its use in communication within the home. Messaging was used to demonstrate awareness through reaching out to promote a social touch as reminders to others, and as information store for later use. Such studies by O'Hara et al., provided valuable detail of family life around a situated display, and are limited to a single electronic display, and so cannot provide wider picture of communication display types and their use within the home.

Despite these various studies of communication in the home, there has been little theoretical discussion of the nature that display surfaces play in communication. Crabtree and various co-authors have addressed this, and produced studies using an ethnomethodological approach to investigating the communication within the home. Crabtree and Rodden's study "Domestic routines and Design for the Home" (2004) examined the routine work of communication at home. Their study showed that communication relies on a discrete organisation of coordination, which consisted of ecological networks of displays carried out by householders to coordinate their actions. They also revealed key properties of ecological organisation of communication in the home. Ecological organisation of communication examines the environment in which organizations compete and a process like communication occurs. They informed design to the importance of the ecology of the domestic space and distributed arrangements of collaboration to communication. Crabtree and Rodden have identified the visible relations of place to the social organisation; these relations consisted of Ecological Habitats (places where users return to find resources needed to deal with communication), Activity Centres (places where media are manipulated, consumed and transformed) and Coordinate Displays (Places where communication media are made available to others in the domestic setting in order to support the coordination of activities). Crabtree and his various authors work was notable for its comprehensive examination and its attention to domestic arrangement and behaviours in detail, often focusing on interesting examples, yet their description often lack the sense of what makes the home a distinct setting. Therefore, the absence of some sense of home life and in particular home routines gave me further challenge to follow this research to examine the home, that might have some impact, if only indirectly, on the design of the real-world things.

Other projects such as ASTRA (Markopoulos et al., 2004) and Casablanca (Hindus et al., 2001) have provided valuable indication of the utility, but unlike txtboard study, their focus was more on the design of the devices, with less attention to communication and the incorporation of the display into the everyday of the home life. A few of other studies have attempted to go beyond the

functional roles that these displays have on communication (e.g. Huchinson et al., 2003). They have suggested that computers and Internet can play a positive role in keeping people connected, by emphasising on understanding the needs and desire of users in real world setting. Huchinson et al.'s study presented two technology probes (messageProbe and videoProbe) to support family playfulness, but this was not clearly explored in their analysis; this requires a good deal more research to provide better understanding of home and family members' activities and routines.

2.4.3 Studies of Home Technologies

The movement towards studying the home has started to focus on the introduction of new computer technologies in the late 1990s and early 2000. Several studies from this period that were significant for the research presented in this thesis. Chappells and Shove (1999) have focused on household waste practices and considered the range of actions and behaviours which different bin technologies prohibit or permit. Recent recycling trends reflect the changing character of the 1990s waste "problem". New environmental "problems" have emerged as household rubbish increases pressure on landfill site capacities, and potentially hazardous mixtures of waste elements decompose to create chemical substances, with unknown local and global risks. Strategies are required to link the consumption, collection and disposal activities across a new hierarchy of management options, and mark a shift from approaches which focus on final disposal to those which emphasise a "minimise, reuse and recycle" waste ethic (Chappells and Shove, 1999). Many studies have assessed recycling potential for the material recovery from waste home appliances and provided useful data for product designers (e.g. Kim et al., 2004, de Kruyff et al., 2011). The electrical home appliance industry has also continued its efforts to develop easy-to-recycle products. Therefore, various work such as studies on TV recyclability have assessed the effect of these improvements to identify subjects for future Design For Recycling (DFR) by analysing disassembly time and recyclability of TV sets (e.g. Nishi et al., 1999). Nishi et al.'s study (1999) has revealed that disassembly

time was reduced by 6- 20%, while recyclability improved by 20-25% for medium size and larger TV sets. Their result showed the desirability of conducting DFR for TV sets, and highlights its effectiveness for preserving the environment. Considering the importance of disposal and recycling, this thesis examines the ways households tidy up, store and retrieve objects such as papers, photos, CDs, books, clothes, toys, laptops, etc. By examining these practices, we can reveal various ways in which family members decide to recycle or dispose and bin their unwanted materials at different stages of time.

Other studies also focused on the introduction of new computer technologies (e.g. Edward and Grinter, 2001). Edward and Grinter's "At home with Ubiquitous Computing: seven challenges" (2001) examined a number of challenges form technical and social and ethical domains that they believed should be overcome before new technologies and in particular the smart home concept could begin to move daily. They discussed the idea of "accidentally" Smart Home, where they argued that households should understand when their houses make the transition from dumb to smart and manage that transformation and "Piecemeal adaption", where households gradually build up bits of technology which may then need to work accordingly. Edward and Grinter have also discussed how users adapt technology in unpredictable ways, as most of these have focused on office technologies, which are notably different than technologies for the home.

> "We believe that the chief challenge that will be faced by designers of the smart home is balancing the desire for innovative technological capabilities with the desire for a domestic lifestyle that is easy, calming, and –at least in terms of technology – predictable." (Edward and Grinter, p.270)

They believed that social impact of new technologies is hard to predict and relationship within the home make it a more unstable setting than the office or other public spaces. As mentioned earlier, one approach HCI and CSCW researchers found fruitful for uncovering cultural and social values embedded in technologies, was ethnography (e.g. O'Brien et al., 1999; Tolmie et al., 2002;

Taylor and Harper, 2002); Blythe and Monk, for example have uncovered gender assumptions in technology design through domestic ethnographies.

The characteristics of these researches were an improvement of home life studies as well as a growing range of technological solutions created for the home (Hindus et al., 2001; Crabtree et al, 2002, 2003, 2004; Bell and Dourish, 2006; Kirk and Sellen, 2010; Dourish et al., 2010).

Recently within HCI there has also been a specific focus on designing energy particularly electricity to be more visible (Froehlich et al., 2010), even tangible (Backlund et al., 2006; Pierce and Paulos, 2010) with a primary goal of promoting more sustainable consumption. Pierce and Paulos (2011) have developed a perspective on energy as materiality and employed a design approach of materialising energy. They have discussed several design explorations around the theme of emotional attachment to energy. Their design strategy focused beyond energy awareness toward promoting more involved and meaningful material engagement *with* energy with the aim of redirecting everyday interactions and practices towards sustainability. They have proposed a framework for designing interactions with energy-as-materiality: (i) collecting energy (generating/producing), (ii) keeping energy (storing/maintaining), (iii) sharing energy (transmitting/distributing), and (iv) activating energy (using/consuming). Their intention of the proposed framework was to expand on the ways in which interactions with and around energy can be designed.

Similar to collecting, storing and sharing energy as materiality, with the importance of storing and sharing a variety of materials at home, such as letters, clothes, photographs, books, children toys, etc. this thesis examines how these objects can get tidied up, stored, re-accessed and shared by different family members to expand the understanding of social interactions involved around these resources.

Also, a number of social scientists alongside HCI researchers were working on home and reflecting on the practices of householders. Their researches on home as a place raised unique challenges for HCI and CSCW. In parallel to this work, various studies revealed specific objects to be augmented in home, as well as visions of broad technologies facilitating the homes (e.g. Taylor and Swan, 2004; Kim et al, 2004; Taylor et al, 2006; O'Hara et al, 2005; Sellen et al., 2005; Taylor et al., 2006, 2007; Perry and Rachovides, 2006; Neustaedter and Brush, 2007), which I wish to give further attention to in my thesis.

Moreover, researchers in human-computer interaction have been exploring interactive table tops for use by individuals (e.g. Wellner, 1993) and groups (e.g. Morris et al., 2006), as part of multi-display environments (e.g. Forlines et al., 2006), and for fun and entertainment (e.g.Wilson, 2005). A key challenge of surface computing is that traditional input using the keyboard, mouse, and mouse-based widgets is no longer preferable; instead, interactive surfaces are typically controlled via multi-touch freehand gestures (e.g. Izadi et al., 2008). Many Microsoft surface computing prototypes have employed gestures created by system designers. Surface gestures are highly varied and almost anything one can do with one's hands could be a potential gesture. Most surface gestures have been defined by system designers, who personally teach them to user testers (e.g. Malik et al., 2005; Rekimoto, 2002; Tse, 2006). Although this principle is important for early prototypes, it is not useful for determining which gestures match those that would be chosen by users. It is therefore timely to consider the types of surface gestures people make without regard for recognition or technical concerns. Although designers may organise their gestures in a logical fashion, user behaviour is rarely so systematic (Wobbrock et al., 2009). As McNeill (1992) writes in his laborious study of human discursive gesture, "Indeed, the important thing about gestures is that they are *not* fixed. They are free and reveal the idiosyncratic imagery of thought" (p. 1). This is also a topic of concern in my thesis to gather a natural detailed picture of family member's routine activities and preferences around the use of surfaces when practicing storing and sharing at home to help designers create better surface computing.

2.4.4 Smart Homes

In the past decade smart homes have become increasingly popular and various incarnations of smart homes have been commercially available. Smart home association states the definition of smart home as “the integration of technology and services through home networking for a better quality of living.” (http://www.tiresias.org/research/guidelines/smart_home.htm) Several organisations and universities, such as Georgia Tech, MIT, University of Colorado, Samsung, Orange and Microsoft, have or have had smart homes.

A smart environment is "a physical world that is richly and invisibly interwoven with sensors, actuators, displays, and computational elements, embedded seamlessly in the everyday objects of our lives, and connected through a continuous network" (http://www.smarthome.com) Meyer and Rakotonirainy (2003) described potential applications for smart homes to the following categories:

- Welfare - Health monitoring, personal trainer, remote diagnosis.
- Entertainment - Music, television, video, games.
- Environment - Remote control of lighting and heating and air conditioning. Energy usage and cost. House automation.
- Safety - Alerting of gas leaks and air quality.
- Communication - Video phone, home calendar, reminders and communication inside and outside the house.
- Appliances – Assistance in appliance operation and diagnosing of problems. Automatic food ordering etc.

The smart home has been a regular topic within HCI and to a lesser extent CSCW research. There has also been considerable research into smart home technology. The majority of these studies tended to cover a fairly narrow range of topics. Examples of some of these studies were concerned with, ambient lighting, temperature regulation, plant watering (Spinellis, 2003), the use and interaction of sensors (Jiang et al., 2004), the security of those sensors (Covington et al., 2001),

and networking amongst household appliances (Chung et al., 2003). One group whose stated aim was to "digitally engineer domestic life" had developed prototypes of a range of unusual objects specific to the home, such as a smart pillow that reads bedtime stories (Park et al., 2003).

Berg et al.'s study argued that the focus on very specific forms of technology, has tended to make the inhabitants of a household less visible, and the work and effort those inhabitants do practically invisible (Berg et al., 1999). Björkskog (2007) discussed that "although home automation has become popular, ubiquitous computing intended for smart home has not yet had a similar breakthrough." (p.1) He argued that the goal is to bring computation into the real world setting and to expect users to interact with them in a natural way. As research in ubiquitous computing has been more focused on supporting people at work rather than at home, the resulting technologies aim to support the need in a home environment may be completely different. A smart home system should be able to make the lives of the inhabitants safer, more supportive, convenient, pleasant, enjoyable, entertaining and relaxing and capture so many essential aspects such as sentiment, negotiation, cooperation which give home life its unique quality. In many ways, the smart home was an inspiration for this research, in the hope of exposing other aspects of the home than the technologists' current vision of home life.

2.5 Fieldwork and social scientific research

The use of ethnographic methods in studying working practices came to play an important role in the adaption of sociological approaches in HCI and CSCW. Sociologist introduced a set of techniques to examine the setting and uncover the methods, like ethnography, that can be used to gain detailed understanding of a particular setting (e.g. Dourish, 2004). The following sections provide an overview of ethnography within social science. After that the role of material culture in ethnography is discussed, as well as ethnographic studies within HCI and CSCW.

2.5.1 Ethnography

Perhaps the most obvious way of understanding somebody else's everyday life is to go to their setting and experience it directly. This technique of immersing oneself in the field is rooted in anthropology where, researchers are required to interpret the significance of the rules, rituals and routines found in other cultures (Malinowski, 1984 [1922]). Ethnography was developed through the work of the Chicago School of the 1920s and 1930s. The Symbolic Interactionists who worked there were interested in meanings people gave to their action, and advocated doing empirical research in the field. As Rock (1979) discussed in "Handbook of ethnography", the social world is taken to be a place not of statics but of processes, where acts, objects and people have evolving and intertwined local identities that may not be revealed to an outsider. In a pertinent passage, Park and Burgess (1921) argued:

> "It has been the dream of philosophers that theoretical and abstract sciences could and someday perhaps would succeed in putting into formulae and into general terms all that was significant in the concrete facts of life. It has been the tragic mistake of the so-called intellectuals, who have gained their knowledge from text-books rather than from observation and research, to assume that science has already realised its dream." (p.15)

The city of Chicago formed the perfect setting for ethnographic research, because it was undergoing a process of rapid ethnographic move, which is a collection of field methods intended to provide a reasonable understanding of users and their activities given significant time pressures and limited time in the field and revealed high levels of migration, poverty and crime. Thrasher's (1927) ethnography of a criminal gang and Thomas and Znaniecki's (1958) study of Polish immigrants to Chicago are notable studies in that period. Ethnography is not a method in itself, but rather an approach or strategy. It is aim to reach an in-depth, interpretive understanding of the way of life found in a particular culture or

subculture from the perspective of the people within it (Hammersley and Atkinson, 1995). The ethnographers have studied Moonies (Becker, 1984) and scientologists, environmental health officers (Hutter, 1988) and traffic wardens, civil servants (Rock, 1990) and homicide survivors (Rock, 1998), crack cocaine dealers (Bourgois, 1995) and bartenders, gigolos and mistresses (Salamon, 1984), taxi dancers and cab drivers (Davis, 1959) and these studies involved artful character of social life (Atkinson et al., 2001)

The Ethnographer immerses themselves in the field of a relatively long period of time (typically several weeks or months) or perhaps to live as if they were a member of a group. This may mean researching undercover, but always involves the researcher living with people they are studying and more or less participating in their daily activities. This enables them to develop an insider's view of what is going on in that setting; in terms of the meanings people give to their actions and interactions. Consequently, the ethnographer may claim to be a stronger position to write about the group than other types of researcher. (Scott, 2009)

As a methodological approach, ethnography can involve several different research methods, and the combination of them is designed to give a more in-depth understanding of the field. The most commonly used methods are participant observation, in-depth interviewing and documentary analysis. Participant observation, means participating in the activities of a group while observing them. Gold (1968) argued that there are two aspects of the process; some researchers present themselves as group members and observe only as a secondary activity (participant as observer), while others present themselves as observer and remain quite detached from the group (observer as participant). Often, the researcher will not participate in the activities of the group, but rather interact with them while they are doing so (Delamont, 2004). Thus, the ethnographer aims to observe everything they can and to provide a thick description of the people in question (Greetz, 1975). In-depth interviews provide the researcher with detailed, personal accounts by the participants of how they see

the social world. Such rich, qualitative data are regarded as source of knowledge. The interview questions tend to be open-ended and semi or unstructured, following a topic guide, rather than a rigid script (Fielding, 1993). This gives the interviewee both more of an opportunity to elaborate on the answers and greater power to direct the course of the discussion. Semi and unstructured interviews help to reveal how participants make sense of the everyday world. It is important to consider not only the manifest content of these, but also the motivations behind their concepts and categories (Scott, 2009).

Of particular relevance to the research in this thesis are semi-structured interviews undertaken in the everyday setting. Qualitative interviews are used to examine participants' routines and activities around storage and sharing practices at home, revealing their motivations behind them. The choice of this method is further discussed in chapter 3.

2.5.2 Ethnomethodology

Ethnomethodology is a branch of sociology dating from 1954. The name is originated in the work of Harold Garfinkel. Ethnomethodology's research interest is the study of the everyday methods people use for the production of social order (Garfinkel, 2002). Garfinkel's approach is based on his reconsideration of one of the fundamental problems of the sociology, "the problem of social order", including the work of Parsons, Durkheim, and Weber, phenomenological theories of Husserl and Schutz, amongst others. The problem of social order deals with the question of how orderly social facts are and relations can arise out of the independent individual. On the other hand, ethnomethodology contends that individuals construct a sense of order based on the behaviour and pattern they perceive in a given situation.

Garfinkel was not attempting to work out the theoretical problems that sociologists had left unaddressed. Instead he wanted to question the foundations on which these theories were built. Durkheim, one of the founding fathers of

sociology had famously recommended: "...our basic principle, that of the objectivity of social facts" (Durkheim, 1895- as cited in Garfinkel, 2002). This is usually taken to mean that we should assume the objectivity of social facts as a principle of study (thus providing the basis of sociology as a science). Garfinkel's alternative reading of Durkheim is that we should treat the objectivity of social facts as an achievement of society's members, and make the achievement process itself the focus of study. For Garfinkel, Durkheim's "objective reality of social facts" was not a principle at all, but a phenomenon. It was not to be assumed, formulated, and refined, but to be studied. In Garfinkel's view, the objective of sociology was not to develop abstract theories of social reality, but rather to understand how social reality was achieved, and how people made it work. Thus, ethnomethodology strives to represent people's practices and methods by which they manage and organise their everyday behaviour in particular settings, in the same way that people themselves describe them.

Two of the key features of ethnomethodology are the ideas of ethnomethodological indifference and reflexivity. In general, ethnomethodology indifference is based around the idea that there can be no absolute correctness, appropriateness or adequacy in articulating the practices because the meaning is derived by its relationship to both the context and the other words being used in the context. Reflexivity refers to simultaneously embedded character of actions, talk and understanding; to how what actors 'know about' or create their sense of social order through their talk.

In HCI and CSCW, ethnomethodology has been taken to examine and describe the organisation of action as being a moment-to-moment, naturally occurring, and improvisational responses to practical problems (Suchman, 1987; Dourish and Button, 1998). Sociological approaches can be used to help us understand how work is conducted in real setting, and how interactive technologies can be designed to fit for the ways in which people work. At the same time they do not go very far in addressing the kind of critiques that Suchman was making. Her target was to use a conceptual model to support a whole range

of technologies. Ethnomethodologically informed ethnographies of HCI and CSCW studies have set out to examine a deeper connection between sociological understanding and the design of interactive technologies. Their approach deals not so much with this technology or that form of work, but rather more generally with interactive technology and social processes that support any sociological account of behaviour (Bentley et al., 1992; Harper et al., 1991; Randell et al., 2007; Taylor et al., 2007). Button and Dourish (1996) have argued that ethnomethodology can be used to inform design through:

> "1. Fieldwork investigations that develop an understanding of work and organisations from the "inside", providing innovative insights into the organisational situatedness of work and the methods and practices through which work activities and the interactions are assembled and which may be used in the design of technology to support work; and
> 2. Developing an understanding of the temporal organisation of activities and interactions, revealing them to be a moment-by-moment organisation, and in so doing furnishing new concepts around which to generally consider the design of technology." (p.19)

This thesis was inspired by ethnomethodology informed ethnography, as it offered a starting point to examine what I was observing and hearing; for example, when observing and interviewing family members about the storing methods, the orientation helped me to find out the family members' account of what they were doing and how they made sense of it.

2.5.3 The Role of Material Culture in Ethnographic research

Material culture's origins lie in the archaeological practice of collecting and cataloguing ancient artefacts (Buchli, 2002). Collection of vessels, instruments, armoury remains and brought back from a region would be examined to piece together how a society lived, fought and died. Langer (1953) refers to objects as presentational form. There is no starting point to reading a pot or an

axe. He discussed that objects relate to much wider perceptual functions than words, they have multidimensional qualities relating to sight, sound, smell, taste and touch enabling detailed distinctions to be made. One of the most influential studies informing material culture, has been an emphasis on objectification; that through making things, people make themselves in the process (e.g. Miller, 1997).

A great deal of ethnographic studies of material culture the issues of space, place, landscape and the manner in which they encode, produce and reproduce, change and transform patterns of sociability (e.g. Tilley, 1994; Feld, 1996) The house is a primary setting for the production and reproduction of social relations. What makes a house a home is that it is far more than a physical structure providing a shelter. Houses are material forms with very special characteristics; complex objects that are arranged and organised into a whole and people can collect them together and organise themselves through them (Tilley, 1999).

Age and durability may be the significant factor in material culture. The length of time and complexity in making a thing may add to its value. Things may be important in their uniqueness and inability to replace them (Munn, 1986). When Hoskins (1998) was interested in recording personal life histories in Sumba, Indonesia, she found that the only way that it was possible to obtain this information was to get people to talk about things. Personal identities were embedded in objects such as a drum, or a spindle. Talking about 'things' was a way of constructing, materialising and objectifying the self, and things contain and preserve memories and represent personal experiences.

Ethnographic studies of material culture have been concerned with the ways in which artefacts are made, the types of materials used and the way they become combined through technological processes, emphasising on time and effort and the social relations of production. These approaches have suggested that technology and methods can be better understood as social productions linked to systems of knowledge and value (e.g. Latour, 1993b; Sigaut, 1994; Sillar, 1996). This change has moved researchers away from viewing technologies as

mechanical actions to think about the way actions on material world are embedded in a social system (Tilley, 1999).

Of particular relevance to the research are investigations undertaken in the everyday domestic realm that considers the concept of 'home' (e.g. Silvia, 2000; Miller, 2001; Morley, 2003; Cohen, 2005). Material culture specific focus on objects and social system was helpful in providing a grounding in conducting my research, to examine household organisations in terms of tidying up objects, storing, accessing and re-accessing them, as well as sharing objects and limited shared resources at home, focusing on the social interactions involved around these objects.

2.5.4 Ethnographic studies in HCI and CSCW

As mentioned in previous sections, the Chicago School's ethnographic focus on everyday life provided the foundations for studies of work within HCI and CSCW. Currently, the use of ethnographic material is most common in HCI and CSCW, as part of the processes of requirements gathering ethnographic approaches can be used to uncover requirements for a system design through the detailed observation of the setting (e.g. Hughes et al., 1992, 1997, 2000; Button and Dourish, 1996; Dourish, 2004). The following section includes two early examples of ethnographic field investigations, from the domain of air traffic control and factory production printing.

One of the best known ethnographic field investigations of CSCW research that took place was the work into air traffic control carried out by a team of sociologists and computer scientist at Lancaster University (Hughes et al., 1997). As an ethnographic study, the topic for the investigation was not about the rules and procedures as they might be found in the manual. Instead, it focused at the actual practices of air traffic control as it occurred moment by moment as it was experienced by the controllers themselves. This study investigated the management of air traffic not as an abstract, but as everyday work practices of air traffic controllers. The study uncovered the way which this work was organised

around the features of the setting. The flight strips, for example, did not just record information, but were part of the way in which the work was done, both for an individual controller and others whose activities must be coordinated with that of the controllers (Dourish, 2004).

Bower, Button and Sharrock (1995) have presented an ethnographic investigation of an industrial print shop. In particular, they were interested in the relationship between the practices through which the print workers organise their daily activities, as well as their use of computer system that embodies the production of printing process. The outcome of the ethnographic work was to see the management of the activity on the print shop floor as 'situated' activity; the actual moment by moment organisation of the work was contingent on the physical environment, the time of the day, the materials available at hand, and so forth. Bower et al. used detailed observation of working activities to draw attention to the ways that people accomplish their work. They have argued that the work did not just 'happen', it had to be made to happen by the people who do it.

Since then, ethnography has become an accepted practice within HCI and CSCW. An approach to using ethnography and fieldwork has also emerged recently, sometimes referred to ethnographically informed design, as an alternate ethnographic method for information science research to describe how the results of such research can be understood and applied by designers of information systems (Crabtree et al., 2000). A number of well-known studies were presented in HCI and CSCW, notably by Bentley et al., 1992; Button and Dourish, 1996; Dourish, 2001, 2003, 2006, 2007; O'Brien, 2000; Crabtree et al., 2000, 2003; Venkatesh, 2001; Taylor and Harper, 2002; Tolmie et al., 2002; Gaver et al., 2003; Crabtree and Rodden, 2004; Taylor and Swan, 2004, 2005; Taylor et la., 2005; Perry and Rachovides, 2007; Swan et al., 2008; Dourish et al., 2010. These ethnographic studies have focused on specific activities, with an eye towards informing technology design.

2.6 Conclusion

This chapter has discussed the literature relating to background studies of home, the rise of home in HCI and CSCW, studies of home in HCI and CSCW, ethnography and ethnographic studies in HCI and CSCW. The review has presented materials from a wide range of sources that were the most significant for me in undertaking this research. Several issues have come to light that seem worthy of exploring in the rest of this thesis. These broad general points acted as broad motivations for the research in this thesis, which gave me initial direction when starting this PhD. I realise there are many other trajectories that could have been followed which would have led to different outcomes.

- Both the literature from ethnographic studies within HCI and CSCW and the role of material culture in ethnographic research directed my investigation toward the influence of social practice through material interaction. These bodies of work gave a means to examine a household's everyday practices in detail. An ethnographic study by Joseph Kaye et al., "To Have and to Hold: Exploring the Personal Archive" (2006), which was working on personal storage of forty-eight academics was inspiring to explore it further in home setting. By examining home's storage and sharing practices, the use of mundane material things can be explored in detail.

- One of my main goals in undertaking this research is to improve our understanding of home life, in particular social interactions around various shared resources, as well as social interactions and managements of home organisation systems, such as storing and sharing. If the technologies are to be designed to be useful and meaningful to people in home setting, home activities demand more detailed investigation. The efforts that family members put into managing home, and keeping it a safe place for householders need to be articulated in order to be taken into account.

- HCI and CSCW home studies provided a promising area to study home organisation, in spite of the fact that few research had been done on the

topic when I embarked on this PhD. Therefore, I decided to develop study of home life further by some small but new contribution to the research.

Chapter 3- Research Methods

3.1 Introduction

This chapter is a description of how the research in this thesis was undertaken. Chapter 2 has discussed ethnography and its origins and history, both within social science and HCI & CSCW. The first section discusses the choice of ethnography to pursue this research, and ethnographic methods used to conduct the work presented in this thesis. This chapter considers ethnography procedures in practice, from planning to doing ethnographic oriented methods in the fieldwork. In the following, a few of the more practical details of undertaking ethnography are reviewed and three general topics are discussed. Section 3.3 describes the scope and plan for the fieldwork; hypothesis, generalisation and access to homes are described in detail. In section 3.4 the prospect of going into the field to interview householders, observe a home, and take on data collection technique are explored. The issues concerning the data collection; objectivity and reflexivity are also discussed in this section. Section 3.5 considers the analytical framework; from field-notes to finished texts. Section 3.6 concludes the chapter and introduces the two studies undertaken in this thesis.

3.2 Ethnography in Practice/ Choice of methods

Chapter 2 has detailed some of characteristics of ethnography and how it has been taken up in HCI and CSCW. A variety of methods have been used in traditional HCI research to collect primary data on user's needs (for example, controlled experiments, questionnaires and surveys). However, it has been widely accepted that these methods do not provide sufficient data with respect to the 'real life' of the users because these traditional methods are unable to accommodate the fact that the human activity is highly 'flexible', 'nuanced', and 'contextualised' (Suchman, 1987). The nature of these methods becomes even more problematic when we look at a domestic setting. Controlled experiments to investigate everyday household activities seemed to be problematic as for example a participant whom the experiment hadn't been designed for, but were often part of

a family, such as a child or pet. Another approach might have been to design a survey or questionnaire to collect the data. As also mentioned in Swan's thesis (2011), most of the participants made apologetic comments about the way they did things in their household. Therefore, having a general part of unease on the part of the participants as to whether their routines were 'normal' suggested that these methods were unsuitable for the domestic setting. With regard to the participant's sort of idealised response, the use of questionnaires or surveys seemed to be an unsuitable approach to be carried out in this thesis. To address such a problem, qualitative methods might be better suited to access participants' knowledge and meanings, and investigate family member's routines and activities.

As mentioned in the previous chapter, one of my goals in pursuing this research was to find a sense of home that was missing from HCI and CSCW literature, something that more closely examined home and its associated practices with regard to storing and sharing activities that goes into organising the daily routines of families. Therefore, the descriptive aspects of ethnographic fieldwork seemed to offer the best opportunity for that. There are growing corpus of ethnographic fieldwork studies within HCI and CSCW (e.g. Suchman, 1987; Heath and Luff, 1991; O'Brien and Rodden, 1997; Venkatesh 2001; Taylor and Harper 2002; Huchinson et al., 2003; Taylor and Swan, 2004; 2005; Perry and Rachovides, 2007; Kirk and Sellen, 2007; Swan et al., 2008; Dourish et al., 2010). Therefore, this approach seemed to be well suited to explore domestic setting.

There are also many studies about the use and suitability of ethnography methods in HCI and CSCW as a means of informing design (e.g. Button and Dourish, 1996; Hughes et al., 1997; Crabtree et al., 2000; Blythe et al., 2004; Bell and Blythe, 2005; Wright et al., 2006; Dourish, 2006; 2007), and the debate concerning their efficacy in HCI and CSCW is far from resolved.

3.3 Planning

One of the first thing to do when embarking on an ethnography is to scope and plan for the field research. In HCI and CSCW, the scope of ethnography is focused on a technology or the group of people one is interested in. As I was interested in examining the daily routines of households, my planning started by considering a set of questions to find out the details of family members' practices around home organisations; the work that goes into storing and sharing routines that make up home life. I started the planning by taking into account some broad questions: What kinds of people live in these settings? How can the different kinds of interactions be recorded (methods): observation, interview, video or audio recording? Soon after, a series of detailed questions were prepared to examine home tidying up, storing and retrieving activities: What do participants do with a new piece of information or a thing that comes in to their house? How do they decide to keep things or throw them away? How do they keep a unique item? How do participants experience problems accessing a shared object at home? How do householders clear their storage and when do they decide to do that? How do their storing practices change in response to the growing amount of information and objects available and to cope with ever-increasing accumulation of stuff (e.g. Kaye et al., 2006)? How often do they access different types of storage at home? What are the problems they experience in organising and maintaining their personal storage? Prompt responses were associated with *activities, routines* and *practices* and not just location. The questions also included some '*last time'* questions focusing on routines that participants remembered from their past: When was the last time they accessed any sort of storage at home and why? When was the last time they had problems re-accessing a stored item at home?

In planning this ethnographic field study there were several methodological issues to keep in mind. Three of these are considered in some detail below: the role of hypotheses and research scope, generalisation, and access to fieldwork sites.

3.3.1 Hypotheses and research scope

As mentioned earlier the purpose of using ethnography is to openly investigate a topic. For example, the first study is concerned to examine home tidy up, storage and retrieval, applying ethnographically-oriented methods. Therefore, the research should be framed in an open way, with a broad question first, such as "What do they do with a new piece of information or a thing going to their house?" The critical point here is that ethnography should not be seen as a method to prove or disprove hypotheses, but instead as a way in opening up new possibilities (e.g. Weilenmann, 2003; Taylor, 2005; Ito, 2005). Weilenmann (2003), for example, used a study of mobile phone talk between teenagers to show how questions like "Where are you?" prompt answers associated with activity and availability, and not just the location. Thus, an answer like "I'm in the fitting room" says a great deal about all the three. However, the nature of ethnographic research does not exclude the need for scoping or planning the fieldwork. The planning and scoping should be done considering the openness of unexpected empirical themes to arise and some room must be left for them. This nature of ethnographic fieldwork makes it hard to apply any strict schedule when planning ethnography, especially if it is going to last over several months. In the first study, home storage and their practices for instance, evolved over time as the fieldwork revealed that other important issue was different kinds of social interactions around these practices, which led us to carry out our second study; social interaction around shared resources at home.

It is also important not to take on topics that are far too broad in ethnography field study as effort and time is spent managing the quantity in figuring out what to focus on, and how to justify attending to one thing over another. By limiting the scope at the beginning, the research may still be given space to expand. In many ways, ethnography should be treated as a continuous scoping exercise, where decisions on methods, analysis and interpretation need to be made on an on-going basis. The scope of the first study was limited to examining home storage practices, and this was further developed by following

the second study which looked into social interaction around shared resources at home.

3.3.2 Generalisation

Planning the number of participants to study and how long to spend in the field is a difficult issue in ethnographic research. As ethnographic study includes a small number of participants claims have been made that ethnography offers no means for generalisation (e.g. Sharrock and Randell, 2004). The issue of generalisation in ethnography is not entirely resolved, but rather can be seen in a different light. As Howard Becker (1993), an early leading character of ethnography in sociology discussed:

> "If we haven't settled [these epistemological issues] definitely in two thousand years, more or less, we probably aren't ever going to settle them. These are simply the commonplaces, in the rhetorical sense, of scientific talk in the social sciences, the framework in which the debates go on".((p.219)

Therefore, in ethnographic research, the far more important issue is how participants will make their social patterns and behaviours visible. By using ethnographically-oriented methods we are not trying to explain social behaviour in terms of whether an entire population does or does not do something. Instead, we are interested in the *how*. How is it, for instance, that family members manage their storage at home? From this perspective, the issue is not so much with the representativeness of the study's participants, as it is with the ways that we might start to see the broader patterns of storage routines in home organisations.

Similarly, the number of participants in the study and the field study's length is not driven by issues of generalisability. It is the need to see how things are socially arranged and done in routine ways that help guide the number of participants involved, and the time spent in the field. Ethnographies in HCI often limit their participant numbers roughly 5 to 15 and may have studies that run for

weeks or, at most a few months. Yet, it is also wrong to assume an exact number of participants in advance. A common rule for both the number of participants and length of the time in the field is whether we start seeing the same patterns or themes reoccurring in observations and interviews. Once this happens, it is time to either develop another line of investigation or put more time into analysis and writing (e.g. Scott, 2009; Taylor, 2009).

In terms of participation, this study began with somewhat formal criteria for participant inclusion. At the beginning of the fieldwork, I had decided to recruit only families who met particular requirements. The main criterion for participants to be in the study was to be adults and preferably be living amongst other adults (partners) and children. After interviewing a few families, I decided to include couples and singles to also examine their storing practices. For example, in home 5 a couple with no child, in home 8 a single mother with a child and a single person in home 9 also took part in the first study. Since, study two concerns social interaction around shared resources, I decided to only interview families with children to examine their sharing practices and the problems they may encounter sharing different objects such as a laptop, a TV, a game or a table at home. The details of participants are included in Tables 3.1 and 3.2, and the time spent in the field is discussed in section 3.4.1.

3.3.3 Access to the field

Getting access to participants is another practical issue to consider when planning an ethnographic study. Considering the time needed to plan, I started to arrange access by making telephone calls to my friends, who were willing to give up their time, to have their routines and sometimes private lives (in their eyes) examined in detail. Initially, I decide to arrange a time for a coffee morning with them. The next step was to explain my motivation to them, and finally just to *ask* for help and also asking them to convince their partners to participate in the study. It worked well to find a few friends and their partners willing to participate in the study and then asked whether they were able to introduce friends to take part in the study. This has been referred to as the '*snow balling'* method, as it involves

having participants on a rolling basis (e.g. Millen, 2000; Rachovides and Perry, 2006; Kolko et al., 2011). It was also helpful to explain my motivation of the investigation to new participants alongside with personal introductions which seemed to ease unfamiliar participant's discomfort. My overall aim was to help people feel at ease with the research and emphasise that it was *me* who was newcomer to their homes.

3.4 In the Field

The process of going into the field to interview someone, observe a scene, and collect data can be hard. Unfortunately, things do not get any easier once in the field. The best that I could do to deal with the uneasiness was to recognise that this was an ordinary effect of being somewhere new with new people. Although I knew some of the participants, in some cases I hardly knew their partners. Indeed, a very real aspect of doing fieldwork was learning to deal with the sense of unease. Thus, a practical approach to starting off in the field was to simply start trying different ways to engage with a setting. As mentioned earlier, I had to make several phone calls and emails to arrange an appropriate time which suit the family and deal with the pressure of cancellations. The family members were mostly rather nervous about the whole procedure. First, they were concerned if their routines were normal and usually made apologetic explanations about the state of their households. Second, as some of the questions involved discussing the storage of their unique documents and sentimental valued objects, there was a sense of unease on their part to discuss these issues and take photographs of them, when necessary. Therefore, a broad explanation of the research seemed to help in comforting them to build the trust in discussing their practices with me, and I was very lucky to take an opportunity to spend time and share dinner, and watch TV programmes with them, or in some cases spend the whole evening with the families. The following section includes the description of the households and the functional aspects of the collection methods in detail, as well as addressing the issues of objectivity and reflexivity that are concerned in the data collections.

3.4.1 Participants

Fifteen families in the two studies came from a range of social, ethnicity and nationality backgrounds (See table 3.1 and 3.2). Fourteen families were two parent families, one home was a single parent, one was a single parent living with two adult sons, and the other was a single person living alone. Two families lived in London and the rest lived in Surrey. In the first study I interviewed ten households and included eighteen participants, but due to a very difficult and time-consuming task of arranging time with the male partners, I decided to carry out the second study, interviewing the adult female partners only. The second study involved ten households and included ten participants, where five households were the same as the previous study. This choice was made mostly based on participants' interests and their previous contributions to study one as well as their time availabilities.

Participants also came from different range of economic background. The fathers in three interviews were managing/technical directors. In one household, the father worked as a taxi driver. Two fathers owned fast food restaurants, and two worked as a senior consultant and a financial advisor. In two households, the male partners were a student and a researcher. One father worked as a car dealer from home. Four mothers were stay-at-home carers; none of the fathers were, although some had adopted flexible working hours to increase their contributions to home-care. One female partner was a computer programmer. Two mothers were sales advisors, and another one was working as a product specialist. One mother worked at a nursery and three were full-time students. Apart from two households (see table 3.1; home 5 and home 9), all of the families had either one or two children living with them. The ages of the children ranged from one year old to twenty six years old. The families took part in both studies were middle class, mostly well-educated and from mixed cultural, nationalities and ethnic backgrounds. Importantly, these families were not selected upon this basis; they were not chosen for being in some sense extraordinary families or as a

representative of a particular sample, other than being typical families taking part in family like activities of tidying, storing, retrieving and sharing activities.

3.4.2 Collection Methods

The ethnographic data presented in this thesis took place over approximately two years, from the middle of 2007 to the beginning of 2010. A study also examined another topic, the use of surfaces at homes and offices (Salovaara, Perry, Zarabi, 2008), but the work is not included in this thesis due to consideration of length. I visited these families' home on a semi-regular basis in a combination of activities; observing, talking, semi-structured interviewing, audio recording and taking notes. The families' involvement varied in length, depending on the topic under investigation and the participants' time availabilities in continuing to be part of the study. With the agenda of studying home life, a range of topics emerged from this period in the field, including household organisation around tidying up, storage and retrieval. While I was carrying out the first study, I realised that in almost all families, social interaction played a major part in managing their storage practices at home, and this inspired me to investigate families' social interaction around these shared resources, such as a TV, a desk, a laptop, a game, kitchen surface, dining table, etc. in detail in the second study.

All the interviews were recorded using audio equipment; initially a tape recorder was used, but due to many problems, (i.e. constant change of battery which interrupted the interview and distracted me from taking notes) I changed to a memory stick voice recorder to improve voice quality and ease the process of transcription. Field notes were also made during observations, which alongside the audio records made more sense when analysing data. As well as taking notes and voice recording, *photographs* were taken of the materials involved in storage and shared practices by participants. Technology tour is also beneficial to get an idea of how these families store and share their digital stuff. But due to the existence of various reasons this was not done. As well as not being the point of focus of this thesis, the time spent in with the families were rather long and to do a

technology tour meant spending more time and probably more difficulties arranging the time for technology tours and interviews. Also a much broader set of data had to be analysed which would have required more time.

Originally photographs were used in history of sociology to make a social issue more compelling. Discussion of photography in *visual ethnography* has been concerned with the use of photographs as a methodological tool and has been addressed by a number of scholars (e.g. Becker, 1974; Wagner, 1979; Schwartz, 1989). Specifically, visual sociologists have made great ways by developing new collaborative or participatory approaches (e.g. Harper, 1986; Pink, 2001; Parker, 2005). Wang, Cash, and Powers (2000), have argued that in homeless individuals using visual methods to define the research agenda through the discussion of the photographs. They have discovered that the practical benefits of having participants taking photographs were undeniable and generated information that the researchers might never have considered. As they pointed out, nobody knows the situation of the research participants better than the research participants themselves. Rather than asking direct and predefined questions, the points of research inquiry came from the issues brought up in the photographs and the interviews that followed (e.g. Perry et al, 2001; Packard, 2008; Moore et al, 2008; Woodley-Baker, 2009). Considering the significant attention to photo diaries in recent years, I decided to apply this method to gather more data as a way to gain an insight into the nature of the home as a setting and examine family members' routines and activities.

Developing an understanding of home routines such as tidying up, storing, retrieving and sharing in private and personal places is not easy. Probes are a new approach to gaining information in order to inform and inspire the design of new technology (Gaver et al., 1999). Similar to Gaver's Cultural Probe kits, all of the participants used digital cameras (for one to two weeks) to photograph items or processes of tidying up, storing, retrieving, sharing as well as any problems with these practices that they found interesting to include. I had to arrange a time to go back to families to discuss the photographs and examine householders' routines around their storage and shared practices. Sometimes, they e-mailed me the

pictures with their descriptions, more telephone calls were made in case of any uncertainty. A set of guidance for photo diarists was also given to partners to take photos of things that were important to them to provide a focus of interest for subsequent discussions and further interviews (Appendix C and D). They were also advised how to use the cameras. For example, in the guidance for study 1, participants were asked to think of a list of questions and take photos. These questions were designed to uncover their practices of storage from "how do you experience problems with information overload in your home?" to "How do you decide to keep incoming information available in your immediate shared space?" and "When is the time to decide what to keep and what to throw away?" After a week or two they were ready to discuss their photos regarding these questions in detail. My aim was to gain insights into how people live their lives, tidying, storing, retrieving and sharing different materials in their everyday circumstances, their routines, practical concerns, and so on. These probe materials were resources that required as Harrison (2002) puts it, the collaboration of the participant to 'translate' their meaning. Probes have encouraged participants to reflect on important personal, social and technological features of their everyday lives. These pictures are included in appendix A and B in this thesis. Chapter four and five presents and examines these pictures in detail to show the participants' practices and concerns regarding storage and sharing materials at home.

Cultural probes were initially developed in the Presence Project (Gaver et al., 1999b), which was used to exploring the design space for the elderly. Cultural probes are an appealing first step in a technology design process. Used as an instrument to "discover the unknown" (Gaver et al., 2004), it is envisaged that probes may be used to discover and examine interactions within family groups (Horst et al., 2004). For Gaver and the other members of the Presence Project, Cultural Probes inspired design by providing "a rich and varied set of materials" that let them ground their design in the detailed textures of the local cultures.

These materials were products of the probe packs, each consisting of a variety of artefacts including postcards with various questions concerning participants' attitudes to their lives, maps asking participants to highlight important areas in their cultural environment, cameras with instructions asking participants to photograph things of interest to them and things that bored them, photo albums asking participants to assemble a small montage telling a story about their lives, and media diaries asking participants to record the various media they use, when, where and in whose company. These artefacts provide a range of materials reflecting important aspects of the participant's local cultures and on being returned to the investigators, these reflections inspire design. Where Gaver's probes were intended to reflect participant's local cultures in material detail to inspire design, my concern was to provide information to inform and shape design of home technologies.

Another point worth noting here is that the collection of data and its analyses go hand in hand. While the fieldwork provided the raw materials, the analysis helped to discover a way of seeing to revisit the field with the new topic to investigate in the second study. The following sections provide some explanation of two important concepts (reflexivity and objectivity) of ethnographic research that should be kept in mind when embarking on an ethnographic research.

3.4.3 Reflexivity

In the 1980s, the ethnographers increasingly recognised the centrality of writing activities for participants' observation techniques and began to give close attention to ethnographic writing. Textual practices emerged as the object of intense debate mainly in American anthropology (e.g. Clifford and Marcus, 1986; Marcus and Fischer, 1986). Cultural critique in anthropology has been associated with an American school of ethnographers led by George Marcus. With James Clifford he published *Writing Culture: the Poetics and Politics of Ethnography* (Clifford and Marcus eds 1986), a book which has come to be seen

as marking the postmodern shift in anthropology. The critique launched by *Writing Culture* had as its focus three aspects of the ethnographic enterprise: poetics, politics and epistemology. By 'poetics', attention is drawn to the fact that ethnographers make up what they write. Language, in such a perspective is never simply descriptive, but also persuasive. If ethnography is literature, the assertion by positivists of its factual (non-fictional) basis must be questioned. The 'politics' of ethnography refers to the relationship between anthropologists, their subjects and their readers. The political economy of global inequality must be foregrounded in ethnographic descriptions and author/reader relations are more problematic than the original formula allows for. Finally, the status of ethnography as a source of knowledge (epistemology), its methodology and configuration of knowledge as power, are called into question. Cultural critique in these terms examines the very intellectual foundations of modern anthropology.
This required developing experimental methods, summed up as 'reflexivity', the need for the ethnographer to be continuously self-monitoring in the light of feedback from society.

When embarking on an ethnographic oriented research, an important concept of *reflexivity* should be considered. Reflexivity concept has its origins in anthropology, and as Atkinson et al. (2001), discussed in "Handbook of ethnography" current discussions of reflexivity cover a variety of topics. For example, as a research strategy in fieldwork and interviewing, reflexive practice is proposed as a way to bridge differences between researcher and participants (Wasserfall, 1997). This help researchers to avoid making unexamined assumptions (Karp and Hendall, 1982), to promote the reshaping of theories (Burawoy, 1998), and to create a protected space within, which the participants can tell their life stories as well as to increase the interviewer's understanding of those stories (Broudieu, 1996). This reflexivity has come to be a fundamental feature of modern ethnography, where the ethnographer builds a reflective attitude into the on-going fieldwork to include multiple voices from the homes, analysis and recognising the inevitable subjectivity on the account he or she produces.

Nevertheless, ethnographic research should be seen as lacking without at least some reflection on the ethnographer's part (e.g. Taylor, 2009).

Because of the nature of ethnography, it is important to be reflective when the research findings are being written up. Even though I used several methods of recording the findings, it was usually unlikely to capture all of the relevant aspects of the social processes, as there were too much going on at one time to focus on everything. Therefore, it was important for me to try to the best of my ability to note as many different practices as possible. Being aware of the importance of reflexivity, I continually had to consider whether or not my own expectations of surroundings were influencing my results, findings and interpretations. Thus, I tried to shape and reshape the fieldwork and analysis to make sure that multiple 'voices' from the homes were presented in this thesis. However, "there needs to be a public account of the self which explores the role of the researcher's self" (Denscombe, 2007, 69). This means that there needed to be information about my personal interests in relation to the topic, and I have tried to apply this in chapters four and five. Having said this, Calvey (2000) reinforces this idea when noting that there is the potential to be overly reflexive:

> "…which may result in the researcher conveying more about themselves than the knowledge created through the research" (cited in Davies, 2008:3.1).

> I particularly took this point into consideration, and have explicitly tried not to view situations through my own perspective and overly influenced by them. It has been argued that reflexivity makes for better work, in that nothing is left hidden as everything is stated, such as the researcher's personal beliefs and interests (Gilbert, 2008:477). This means that when using the findings to draw a conclusion, we are aware of any potential biases and can take this into consideration. It also has been suggested that reflexivity can 'create a useful humbleness in researchers' (Gilbert, 2008:478) which means they are open to other interpretations of the study.

For the purpose of understanding where the author stands it will be useful for me to make this clear. In this particular instance it may be useful on my status. I am a parent and of a similar age to many of my adult participants and experience a married life and moved houses couple of times and have gone through many of the same problems and faced many of the same issues that are reported by participants in the study. My background in Iranian British and I have lived in the UK for seventeen years and consider myself Iranian British. In terms of the data that I am collecting and the analysis that I am doing, these are obviously oriented towards my research aims in that they foreground features of home life that lend themselves to be supported by some form of computer system. There may be other aspects of home life that have received less consideration, where they fall outside of this topic.

Finally, it could be argued that, in ethnographic research, being reflexive means the researcher is adding structure or rigour to what could otherwise be a very relaxed and informal approach. This is because the research process and findings are regularly reviewed to check that nothing is left out; in simplistic terms, it can help prevent the researcher 'losing their way'. Such reflection can help to understand what kinds of things were being collected from the research and indeed, what sorts of implications the results can have for design, a somewhat unique perspective that ethnographers working in the areas of HCI and CSCW need to deal with.

3.4.4 Objectivity

Typically, being objective can be defined as "not influenced by personal feelings or opinions in considering and representing facts" or "not dependent on the mind for existence" (Soanes & Stevenson, 2003). The first step in an ethnographic investigation is the definition of the object of study. Bourdieu (1991) has stressed the general importance of this: "The fundamental scientific act is the construction of the object; you don't move to the real without a hypothesis, without instruments of constructions" (Bourdieu, Chamboredon, & Passeron,

1991, p. 248). Because of the threat of creating and using constructions unconsciously, awareness of the process is of highest importance. As Hegelund (2005), has discussed a natural question to arise for an ethnographer was to what extent his or her findings can be said to be objective. One option that was found to be more harmonised with the characteristic of ethnography was a redefinition of objectivity by Stewart (1998), who attempted new suggestions "related to values of alertness, openness to the views of others, empathy, and open-mindedness" (p. 16). Similarly, Strauss and Corbin (1998) have argued that the golden mean is to be open minded enough, that new discoveries will not be ignored and focused enough that the researcher avoids drowning in a data flood. Agar (1980) has talked about a funnel approach, in which the researcher starts out broadly and becomes increasingly focused as the research progresses, a view shared by Strauss and Corbin (1998).

Alongside the use of certain ideas around objectivity, I had plans of what sort of participants should take part in my study. As I was interested in home organisations practices that involved family members' activities to manage their everyday routines at home, I had decided all participants should be part of a family with at least one child. My first point of contact was two parents whose children were in the same school as my daughter, but I didn't know any of them beyond passing acquaintance. At the time, I had made a decision for not using families that I knew well, as I was worried that any knowledge of their home lives could bias my research and the consideration of using families who I did not know well seemed a valuable point to start my interviews. At first, a copy of information sheet regarding the study was presented to these two families, but one parent changed her mind just before the interview and the other one cancelled the day and time of the interview couple of times after arrangements were done, and I found myself in an awkward position to make further arrangements.

My interview questions were ready, but there was a lack of access to participants. As I was inspired by Swan's thesis (2011), in a similar way I decided to ask friends to participate in my study, and this change of participants

was extremely helpful in the initial phase to start getting into the field. Because I knew these women, and they were aware of the importance of their contributions, there was not a problem on their parts towards maintaining an idealised image of good home organisation systems. They were not uncomfortable with my presence in their living spaces, asking questions about how they managed their daily routines and I did not feel awkward spending long hours in their homes, which was extremely helpful in asking questions and gaining as much information as I could. At the end of the first interview, I realised that the battery light of the tape recorder was off! It was late in the evening, and I managed to ask my friend's partner to repeat aspects of the interview, which certainly could not be done with an unfamiliar participant. The fieldwork was therefore relatively naturalistic; other family members were doing all sorts of activities while the parents were being interviewed separately. I was also able to continue accessing these families for extensive periods of fieldwork, and they introduced me to other families who were interested in taking part in my study.

An additional benefit of using families I knew was that because I was comfortable, I could experiment with different observational and interview techniques, applying particular skills that I did not even have at the beginning of my data collection. I was relaxed doing the tour around the house and they were very helpful by giving detailed information of their activities to manage their storage and shared practices at home which I am greatly indebted to them. The value of long term observation and interviewing provided the fieldwork with richer data. I discovered familiarity was extremely helpful to make sense of participants' behaviour, during the fieldwork.

3.5 Analysis (From Fieldnotes to Finished Texts)

"Ethnographic research has largely resisted formal approaches to analysis. There is long-standing debate over generalisation from ethnographic studies and the reliability and validity of ethnographic data. Some believe that ethnography's scope is not exhausted by occupying a niche as the premier 'method of discovery',

a source of interesting ideas but proof of none" (Fielding 1991, cited in Atkinson et al., 200l: 459). Fielding has argued that there is renewed interest in analytic induction, when data are held in form of words not numbers. The classical image of ethnography portrays the ethnographer writing up field notes after a day's observations and interviews with people. The writing then happens when back at the office. Within HCI and CSCW, the type of data collected has an impact on the kinds of analysis that can be conducted. Interview transcripts, for instance, are essentially the accounts participants produce of some past occurrence or possibly thoughts they express on a particular matter. The analysis of interviews can thus focus on the forms of talks used by the participants or how they verbally account for their actions. Therefore, analysis that treats interviews as accurate descriptions of occurrences is common (e.g. Atkinson, 1992; Hammersly, 1995; Lofland and Lofland, 1995; Button and Dourish, 1996; Taylor, 2009).

Ethnography is created through what Atkinson (1992: 5) characterises as a 'double process of textual production and reproduction'. Fieldnotes are a form of *representation*, by reducing just-observed events, persons and places in to written accounts. Fieldnotes are intended to provide *descriptive* accounts of people, scenes and dialogues, and are not written in accord with some tightly pre-specified plan. Rather, they are composed day-by-day, open-endedly, with changing and new directions, emerging sensitivities and evolving concerns and theoretical insights. Fieldnotes have therefore the 'loose', shifting quality of working, preliminary and transitory, rather than final, or fixed texts (Marcus, 1994, cited in Atkinson et al, 2001: 355). Although the initial purpose of writing fieldnotes is to describe situations and activities, as well as people's understanding of these matters, fieldnotes also provide a critical, first opportunity to write down and develop initial interpretations and analyses. Writing activity includes the researcher's observations, seeing previously unappreciated meanings in particular happening, making new linkage to previously observed and written about. When incorporating fieldnotes into finished texts, ethnographers routinely edit them to eliminate irrelevant materials and to provide anonymity to the people studied in a variety of ways.

There are many ways to analyse informants' talk about their experiences such as grounded theory, content analysis and thematic analysis. This section discusses these techniques and justifies the chosen technique in detail. **Grounded theory** is a research method that seeks to develop theory that is grounded in data systematically gathered and analysed. According to Martin and Turner (1986), grounded theory is "an inductive, theory discovery methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or data." Rather than beginning with a hypothesis, the first step is data collection, through a variety of methods. From the data collected, the key points are marked with a series of *codes*, which are extracted from the text. The codes are grouped into similar *concepts* in order to make them more workable. From these concepts, *categories* are formed, which are the basis for the creation of a *theory*. Important concepts of grounded theory method are categories, codes and coding. While grounded theory is based around developing a theory that explains the findings within the data, my goal was to seek to summarise/encapsulate the data, but not necessarily with the aim of developing a theory to explain it in the same sense. Therefore, I decided to look into my next option which was Content analysis.

Content analysis or **textual analysis** is a methodology for studying the content of communication. Investigation of communication messages by categorizing message content into classifications in order to measure certain variables. Harold Lasswell formulated the core questions of content analysis: "Who says what, to whom, why, to what extent and with what effect?" Quantitative content analysis is used widely in mass communication as a way to count manifest textual elements, an aspect of this method that is often criticised for missing syntactical and semantic information embedded in the text (Weber, 1990). The method of *content analysis* enables the researcher to include large amounts of textual information and systematically identify its properties, e.g. the frequencies of most used keywords. Hsieh and Shannon (2005) discussed three

approaches to qualitative content analysis: The first is conventional qualitative content analysis, in which coding categories are derived directly and inductively from the raw data. This is the approach used in grounded theory to develop a theory from the data. The second approach is directed content analysis, in which initial coding starts with a theory or relevant research findings. Then, during data analysis, the researchers immerse themselves in the data and allow themes to emerge from the data. The purpose of this approach usually is to validate or extend a conceptual framework or theory. The third approach is summative content analysis, which starts with the counting of words or manifest content, then extends the analysis to include latent meanings and themes. Through careful data preparation, coding, and interpretation, the results of qualitative content analysis can support the development of new theories and models, as well as validating existing theories and providing thick descriptions of particular settings or phenomena. Content analysis involves counting instances of particular occurrences and the interpretation may be based on the frequency of occurrences. Therefore, it can be useful for three types of research: 1) Problems involving a large volume of test, 2) Research from afar or in the past, 3) Revealing themes difficult to see with casual observation. Since I was looking for a method to categorise the data into meaningful themes, examining the frequency of occurrences of the data was not my goal. Therefore, I decided to look into Thematic analysis as it was one of my options. **Thematic analysis** is also one of the most commonly used methods of qualitative analysis. In thematic analysis the task of the researcher is to identify a limited number of themes which adequately reflect their textual data (Benner, 1985; Leininger, 1985). As with all qualitative analysis, it is vitally important that the researcher is extremely familiar with their data if the analysis is to be expedited and insightful. Thus, data familiarisation is a key to thematic analysis as it is for other qualitative methods. Following data familiarisation, the researcher will either code their data or identify themes from repeated patterns in the data and then needs to identify examples of each theme to illustrate what the analysis has achieved. In practice, themes serve to identify, label and interpret features of the data. As in all report writing, the process of writing up the analysis and the results of the analysis is part of the analysis

process and a good researcher may re-think and re-do parts of their analysis in the course of the write-up (Constas, 1992). Given the advantages of the flexibility of thematic analysis, it is important that we are clear about not trying to limit this flexibility. Instead by ensuring flexibility in relation to how it is used, so that it does not become limited and constrained to lose one of its key advantages. Indeed, a clear use of this method will be useful to ensure that those who use thematic analysis can make active choices about the particular form of analysis they are engaged in. Therefore, I decided to apply thematic analysis to identify themes and patterns of storing and sharing practices from my data.

From the conversation that take place in an interview session, ideas emerge that can be better understood under the control of a thematic analysis. From the transcribed conversations, patterns of experiences can be listed. This list can come from the direct quotes or paraphrasing the common ideas. For example, family one was interviewed to get a better understanding of their storing practices. The first pattern of experience listed, was the intentions for storing. The second pattern of experience listed was their efforts to store different things in their home. The next step to a thematic analysis is to identify all data that relate to the already classified patterns. To continue the above example, the identified patterns are then expounded on. All of the talk that fits under the specific pattern is identified and placed with the corresponding pattern.

The next step to a thematic analysis is to combine and catalogue related patterns into sub-themes. Themes are defined as units come from patterns such as "conversation topics, vocabulary, recurring activities, meanings, feelings, or folk sayings and proverbs" (Taylor and Bogdan, 1989, p.131). Themes are identified by "bringing together components or fragments of ideas or experiences, which often are meaningless when viewed alone" (Leininger, 1985, p.60). Themes that emerge from the participants' stories are pieced together to form a comprehensive picture of their collective experience. The "coherence of ideas rests with the analyst who has rigorously studied how different ideas or components fit together in a meaningful way when linked together" (Leininger, 1985, p.60). Constas

(1992) also states that the "interpretative approach should be considered as distinct point of organisation". (p.258)

When gathering sub-themes to obtain a comprehensive view of the information, it is easy to see a pattern emerging. When patterns emerge it is best to get feedback from the participants about them. This can be done as the interview is taking place. The interviewer uses the informants' feedback to establish the next questions in the interview. For example, in the first study, the first question in the interview was to ask the participants what they do with a new piece of information or a thing that went to their homes. Their answers to this question usually lead to the second question of how they decide to whether keep that thing or to throw it away.

The next step is to build a valid argument for choosing the themes. This is done by reading the related literature. By referring back to the literature, the interviewer gains information that allows him or her to make inferences from the interview sessions. When the literature is interwoven with the findings, the story that the interviewer constructs is one that stands with merit. A developed story line helps the reader to comprehend the process, understanding, and motivation of the interviewer (Aronson, 1994). This is how the themes and sub-themes in this thesis were identified, and these coding structures are directly reflected in the headings and sub-headings in chapters four and five.

Once the themes and sub-themes were identified, it is possible to employ one or two *textual strategies* for presenting field-notes; an integrative strategy or an *excerpt strategy*: "(1) the integrative strategy weaved together interpretation and excerpt; and (2) the excerpt strategy visually marks off extracts from accompanying commentary and interpretation" (Emerson, Ferts and Shaw, 1995, p.179). The data of two studies in this thesis also consists of photo-diaries, which make it possible to repeatedly go back to the housholders' routine activities. The excerpt strategy is therefore congenial with the present analytical focus that we

can simultaneously inspect both interviews scripts and photographs taken by the participants.

This excerpt strategy provides a particularly effective device for highlighting dialogues between the voice of ethnographer and the social actors in the setting. Therefore, the voice of people can be heard in the excerpt. In the analytic text, the ethnographer can engage those members' voices in various ways, for example, by augmenting them with additional information, or by highlighting the implicit contradictions in what they say. In addition to these dialogues, the ethnographer can also stage a conversation between multiple voices of participants who express different views on the topic or practice an activity differently (Emerson et al., 1995, cited in Atkinson et al., 2001; 363, 364).

In chapters four and five, I have preferred to use the excerpt strategy more because it more clearly distinguishes, by setting aside from the main text, the voices of the participants. For example, having identified a theme such as "Intention for storing" and a sub-theme such as "Neatness and storing", I decided to go back to my data (interview scripts and photos) from different families to inspect this theme and express different participants' voices with the use of excerpt strategy. By applying this strategy, I could examine the difference and similarity of storage practices (from home 1 and home 3, in neatness and storing sub-theme) and represent the data and interpretation in a clear and distinguishable way, highlighting the differences and similarities between different families.

In spite of the fact that much of fieldwork undertaken for this thesis drew upon ethnography in a similar way, my analytical position is not wholly committed to ethnography. I consider this lack of commitment to a strict ethnographical data collection and interpretation to reflect the on-going debate within HCI and CSCW as to what extent ethnographic methods should be adhered to. My concern with strict ethnographic methods (i.e living with participants or spending number of days with them) is that its rigid practice and approach are used in other disciplines such as sociology, which I am not convinced as to how

useful a strict interpretation of ethnography to HCI and CSCW is in general, and in particular to design.

3.6 Conclusion

Data was collected, using different techniques, such as observation, semi-structured interviews and audio recording, homes tours and taking photos by participants. The analysis of the empirical materials, draw upon a combination of analytical approaches outlined in this chapter. The next two chapters represent the empirical basis of this thesis, outlining fieldwork done with fifteen families over the period of two years. As I was interested to see how the everyday routines that make up home life is done, I began the study by looking into what people do with a new thing that comes in to their homes, how they practice tidying up and storage routines at home, considering re-accessing issues and problems. Chapter four is therefore called "home storage: from tidy up to storage and retrieval". During study one, while taken for granted, and doings of home were being studied, social interactions between family members appeared to be an important factor in managing home organisation systems. Therefore, the second study was carried out, looking into social interaction around different shared objects at home.

Table 3.1

Home & Total no of rooms	Father Job title	Father ethnicity	Father nationality	Mother Job title	Mother ethnicity	Mother nationality	No of child	Child 1 Age	Child 2 Age
1 (F-Sh) 4 rooms	Manager Consultant	British	British	Housewife	Asian British	Iranian/ British who lived in the UK for more than 20 years.	2	4	6
2 (A-M) 6 rooms	Director	British	British	Product Specialist	Asian British	Iranian/ British who lived in the UK for more than 30 years.	2	9	11
3 (M-N) 5 rooms	Cab Driver	Asian British	Iranian/ British who lived in the UK for 15 years.	Nursery Worker	Asian British	Iranian/ British who lived in the UK for 15 years.	1	7	-
4 (A-J) 5 rooms	Financial Advisor	British	British	Housewife	North African/ British	Moroccan/ British who lived in the UK for 20 years.	2	4	6
5 (D-M) 3 rooms	Researcher	Asian	Iranian	Programmer	Asian	Iranian	-	-	-
6 (Y-L) 6 rooms	Technical Director	Asian British	Pakistani/ British who lived in the UK since childhood.	Housewife	Asian British	Iranian/ British who lived in the UK for more than 20 years.	2	9	12
7 (S-P)	Subway Owner	Asian British	Iranian/ British who lived	P/T Admin Helper	Asian British	Iranian/ British who lived	2	9	12

6 rooms			in the UK for more than 30 years.			in the UK for more than 20 years.			
8 (M) 4 rooms	-			Student	Asian British	Iranian/ British who lived in the UK for more than 20 years.	1	12	-
9 (Y) 3 rooms	-			Office Manager	Asian British	Iranian/ British who lived in the UK for 15 years.	-	-	-
10 (M-R) 5 rooms	Student	British	British	Student	Asian British	Iranian/ British who lived in the UK for 18 years.	1	7	-

Table 3.2

Home	**Father Job title**	**Father ethnicity**	**Father nationality**	**Mother Job title**	**Mother ethnicity**	**Mother nationality**	**No of child**	**Child 1 Age**	**Child 2 Age**
1 (M-N) 5 rooms	Cab Driver	Asian British	Iranian/ British who lived in the UK for 15 years.	Nursery Worker	Asian British	Iranian/ British who lived in the UK for 15 years.	1	7	-
2 (F-Sh) 4 rooms	Manager Consultant	British	British	Housewife	Asian British	Iranian/ British who lived in the UK for more than 20 years.	2	4	6
3 (A-M) 6 rooms	Director	British	British	Product Specialist	Asian British	Iranian/ British who lived in the UK for more than 30 years.	2	9	11
4	Managing	British	British	Teacher	Asian	Iranian/	2	10	12

(F-N) 6 rooms	Director				British	British who lived in the UK for more than 20 years.			
5 (Y-L) 6 rooms	Technical Director	Asian British	Pakistani British who lived in the UK since childhood	Housewife	Asian British	Iranian/ British who lived in the UK for more than 20 years.	2	9	12
6 (V-P) 5 rooms	Subway owner	British	British	Housewife	Asian British	Iranian/ British who lived in the UK for more than 30 years.	2	17	20
7 (K-R) 5 rooms	Senior consultant	African British	South African/ British who lived in the UK for more than 30 years.	Skin Advisor	Asian British	Iranian/ British who lived in the UK since childhood.	2	12	18
8 (P-S) 3 rooms	Car Dealer	British	British	Student	Asian British	Iranian/ British who lived here for 17 years.	2	1.5	5
9 (R) 3 rooms	-			Account manager	Asian British	Iranian/ British who lived in the UK for more than 20 years.	2	24	26
10 (M-R) 5 rooms	Student	British	British	Student	Asian British	Iranian/ British who lived in the UK for 18 years.	1	7	-

Chapter 4 - Home storage: From tidying up to storing and retrieving

4.1 Introduction

The first chapter of my analysis concerns the topic of home storage in practice. Starting with a brief explanation concerning the choice of topic, five main sections will be discussed. The following sections will suggest that storage does more than simply tidying away a variety of household objects; rather, by the act of tidying up, other functions are called into play around storage practices in different homes. We will then argue that tidying up and storing are a particularly interesting instantiation of household organisation because they are so simple and on-going and yet multifunctional. There are multiple ways in which household members practice storing items with various intentions behind their routines. The fieldwork also illustrates that participants have to constantly deal with tidying up and storing things away while encountering problems re-accessing the stored materials.

The chapter is composed of five sections. The first section covers tidying up and storage at home, looking at various family members' intentions and practices for storage at home. Related to this, we address members' intentions for re-use and the problems that they face in re-accessing the materials. The second section of this chapter is an overview of the material properties of storage objects, storage materials and storage media. Using examples drawn from the fieldwork, we illustrate informants' reasoning for choosing particular storage materials and media and discuss how the properties of items to be stored have an impact on the choice of storage media selected. The third section involves detailed discussions around the members' perceived effectiveness of storing and retrieving materials, giving detailed examples of how factors such as time, space and emotion influence the effectiveness of their storage practices at home, from clearance practices to storage methods. The fourth section discusses storage management,

illustrating how families manage and discard items from their storage at home. The fifth section of this chapter looks at social interaction around storage materials to show different ways in which family members interact with each other in relation to their storage practices.

Finally we will argue that home storage practices, such as storing and retrieving activities is a major part of household organisation, due to its ubiquity and multi-functionality, therefore to design for home storage householders' requirements have to be considered in order to satisfy their needs regarding storing and retrieving.

4.2 Studying home storage in practice

Following a tradition within ethnographical fieldwork, I had embarked on this research not exactly sure what I was looking for. I knew that I was interested in finding out how families manage information and physical things around the house, organising family routines and running a household. Figuring out problems like how to cope with the constant feeling of pressure to keep surfaces clear, how to tidy up, when to clear their storage, what they do with a new piece of information or object that came to their house. As my interests developed, I extended these topics further to examine how partners decide amongst themselves to keep things, what makes something valuable at home and what sorts of effort participants put into storing items in categories, how they decide what storage media to keep things in, how their tidy up, storing and re-accessing get affected by factors such as time, space and sentiment, how they organise their storage practices, and how and in what ways social interaction around the stored materials occurs in households. In the process of observing families, I noticed that many appeared to have similar routines for tidying up and keeping things. These similarities and differences were discussed during fieldwork interviews and are presented and explored in the following sections.

In the process of spending time and observing families, I noticed that storing practices are often managed by cohabiting adult partners, who use

different methods to tidy up and store physical objects around the house. It was the range and variety of these methods that seemed specifically interesting for investigation. I gradually realised their practices were influenced by their intentions for storing and intentions of re-use which initially caused me to overlook them as a research focus. Another feature that recommended home storage as a topic of interest was that these practices were so ubiquitous; all of the families that I studied had to deal with them in some ways. The fact that all families I interviewed were using age-old techniques to organise information and physical objects around the house was also intriguing. Because my intention to study household organisation and storage routines was conducted with an eye towards informing the design of technology, trying to figure out the appeal of storing and retrieving mixed objects and information seemed a good place to start.

4.3 Intention for storing

All families that I studied practiced tidying and storing information and physical objects using different methods. This section will focus on partners' intentions for tidying up and storage, in particular their motivations for tidying and storing *physical* things around the house. In much of the research surrounding the home, there are on-going Smart Home Programme and associated research into ubiquitous computing; both give attention to things at home, such as home automation (Spinellis, 2003), network appliances (Chung et al, 2003) and the health of a home's inhabitants (Mynatt et al, 2000), to list just a few examples. While these are all notable works for many reasons, much of their work is vulnerable to criticism that holds that the effort is required to get the "work" routinely undertaken in places like home into consideration when it comes to the design of computer systems (Suchman, 1994; Taylor and Swan, 2005). Having said this, the research on physical things required to keep the home in order and detailed investigations of home have given careful attention to the aspects of dealing with physical things, ranging from unnoticed elements of TV watching (Taylor and Harper, 2003) to dealing with paper mail (Crabtree et al, 2002). Related to this research, the role of physical things have been taken into consideration as an important component of designing technology for home

setting, and the stuff in the question includes address books, calendars, books, fridge doors, clutter in bowls and drawers, etc. (Taylor and Swan, 2005; Swan et al, 2008). As Rodden et al. (2004) explained, ethnographic studies inform us that the physical things at home are dynamic and move around various locations at times for the different practical purposes of activities. Here, we are concerned with physical things that participants are routinely engaged with to tidy up, store and retrieve them in the home.

4.3.1 Storing mixed objects in general storage

The first household in the study was composed of a mother, a father and two young children. During one of the fieldwork sessions in home 1, the mother discussed her everyday routines, dealing with the daily post, children's toys and clothes, books and magazines (see fig 4.1):

> "We receive majority of our new things through post; magazines, catalogues, bills and letters and as for dealing with them, as I spend most of my time in the kitchen, when I receive the letters, I put them on the worktop in the kitchen and the ones that are for me, I go through them, I open them and put them on top of the microwave, and I leave my husband's letters on a pile on kitchen worktop for his attention and mostly my information as housewife, are vouchers, catalogue, coupons and I keep telling myself, Ok, I'm going to use this one day, so I put them on top of the microwave, the coupons with dates go on the notice-board, which is right by my phone, so I remember, when I'm on the phone that next time I can take the ones which is close to be expired. With letters, catalogues, magazines, food recipes, CDs and books I put them on top of the microwave, and I think one day if I get a chance I go through them and they sometimes sit there for 3 weeks."

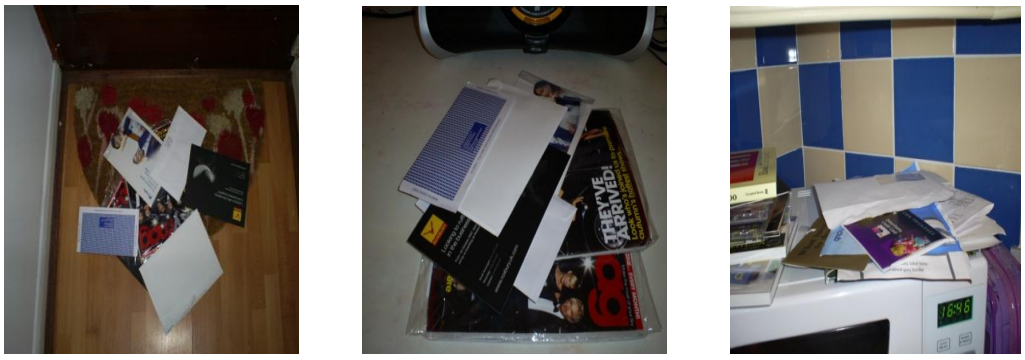


Figure 4.1 (a) pick up mail (b) separates her husband's letters(c) storing mix objects

In the excerpt above, the mother reveals how she stores different objects in a general storage space. Her explanation shows that her intention for storing is based on an object's informational use. She keeps all the letters, vouchers, catalogue, etc. on top of her microwave, even though she knows she may never re-access them again in future, but, if she thinks that even if there is a small likelihood that objects will be re-accessed, then she would keep them. Thus, the microwave lends itself to her storing routine because it is something that is easily accessible and, its' flat surface is appropriate to physically support objects with different properties. Her storage solution here allows her to place mixed objects in a variety of material forms to suit her needs and activities relating to household organisation.

Similarly from family 6 photo diaries, the male partner discussed how the photos can demonstrate the ways he keeps mixed objects such as his hat, mobile phone, deodorant spray, letters, car keys and other small gadgets together (see fig 4.2):

Figure 4.2 (a,b) Keeping mixed objects together

There are a few things that the participant described about these photos. First, he explained that when he comes home every day, he goes to his bedroom first. Therefore, where ever he finds a space on the desks, he leaves all his everyday stuff on them to go back to when needed. Second, he discussed that as well as everyday objects such as car key, mobile phone, hat, etc. even new things (non-food) such as a CD, deodorant spray or a game that come to their house get stored in the same way. Once the desk surface becomes full, these things in different

shapes and sizes, such as a mobile phone charger, a door lock, CDs, envelopes usually get piled up on top of each other and this does not bother him as long as he can re-access them in a short period of time. He explained that sometimes he knows that he may not use a piece of paper or a finished deodorant spray, but he still leaves them to come to a point that he finds re-accessing a thing difficult. Then, he decides to go through them for clearance to see whether they need to be disposed of or recycled. Here, we can see how this participant is delaying the disposal of the unwanted things on his desk.

Similar to the previous family (home 1) where the mother used the microwave surface to store different objects, such as CDs, books, letters on a temporary basis to re-access when she needs them or dispose if she cannot use them, such as a coupon being expired, here we can see how his desk supports storing and re-accessing different materials to suit his needs.

4.3.2 Storing objects based on their informational use

During interviews, it was brought to my attention that many family members keep materials because of their possible informational use. Similar to the previous example, here we see that the mother's intention for storing is to keep *all* her bank statements and bills based on their informational use in a cupboard. In home 4, the mother was the one who picked up the mail and her husband's mail usually ended up spread over in different parts of the kitchen, before he got hold of them. With her own mails, she stored all her bills and bank statements in a cupboard and she claimed that she never intended to go back to them:

> "With regards to my bills and bank statements, I keep them in the cupboard and I'm planning to keep them for ever. If I need more space, I add more boxes. I'd rather add more boxes than going through them. I never liked paperwork. It's chore for me to have to look into it. I have other important things to do; more priorities than dealing with papers. With papers I need time with no distraction, having two young kids around, that would be impossible."

Her description gives some sense of the difficulty in sorting out her paperwork, which appeared to be due to her lack of interest and the presence of other competing priorities in her life. In this, the high volume of the contents, their value and material properties were factors that influenced her storing practices. Unlike the previous household (home1), she never intended to go back to her storage (i.e. the cupboard), whereas the mother in home 1 kept adding to her temporary storage (on top of the microwave) with the intention to re-access the materials at some point. In both families, the mothers kept a very large number of objects, based on their informational content and possible future use. They both tended to use piling practices for storing things, whether storage included just the same objects (paperwork) or various objects (CD, book and letters).

During an interview in home 9, the participant discussed the pictures from her photo diary, explaining how she stores *all* her letters in a carrier bag, takes them to work every day, hoping to go through them and categorise them based on their informational use (see fig 4.3):

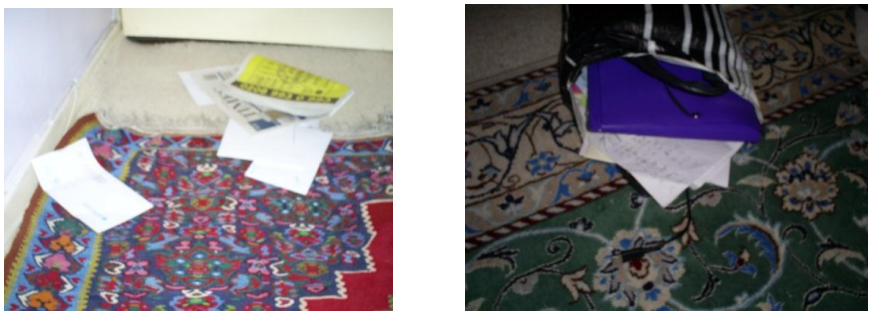


Figure 4.3 (a) First point of entry of mail coming to the house (b) Taking this bag to work everyday for categorisation

She explained that she receives a lot of letters for herself, and sometimes for her sister and parents who live abroad. As the participant works full time, she discussed how limited time she has to go through all these letters. Therefore, she decided to keep all of them based on their informational use to her or her family and because she found categorising the mail a time consuming procedure, she decided to temporarily store them all in a big carrier bag and take them to work every day hoping to go through them in her lunch breaks. She also, mentioned that

this may become a very long procedure, as she sometimes do not feel like going through them on her lunch breaks either. Therefore, this temporary storage keeps moving from one place to another. The participant also explained that sometimes she had to change the carrier bag because it got broken. She added this seemed to be the only way she could think of to go through her letters and she would appreciate a technology to assist her in categorising her mails in a short period of time. This example illustrates how materials such as letters can get stored temporarily based on their informational use and get delayed to be stored permanently.

4.3.3 Storage and social relationships

While conducting the interviews, it became apparent that some participants store items on a temporary basis to pass these on to either relatives or friends. One example illustrates how a mother's interests and social relationships reflected on her storing routine. In household 7, the mother explained that she kept a stack of magazines in her bedroom, next to, under and beside her bed as they were more accessible, and every night she reads them. She discussed how she kept the magazine for a week and then swapped them with a friend. Here we see that sometimes, participant's intentions for storing an object are to keep it for a short period of time and exchange it with someone else. Thus, a de-valued object to a participant becomes a valuable object to someone else. There are a few points to make here. First, 'time' works as a factor in object devaluation. The mother explained once the magazines are read within a week, they hold no value to her anymore and she and her friend decided to exchange these magazines, so these time-affected devalued objects become valuable ones in another household. Interestingly, though they hold no personal value, they do hold some kind of social value, or at least an exchange value. Second, the mother stored objects to be exchanged in a way that would be more accessible, as her intention is to keep the materials for a short period of time. Here, we see how social relationship plays a role in a participants temporarily storing routine. Because she knows that her friend swaps magazines with her on weekly basis, she stores them in an accessible and regularised way.

Some participants also store things not to exchange because they hold no personal value for her, but to pass them to other people. During an interview in home 2, the mother of two explained how she kept things like vouchers and newspapers to pass them on to other people (see fig4.4):

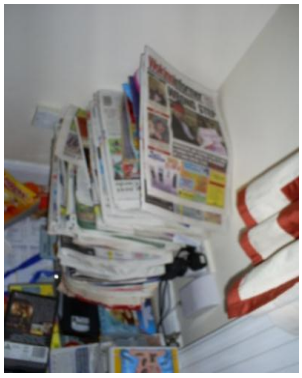


Figure 4.4 Pile of newspapers to pass to other members of family

"Certain vouchers with short dates, for example Burger-king vouchers, next to my keys on the kitchen windows to pass them on to my cleaner. The keys are like a reminder for me, so I won't forget."

"Also newspapers go to playroom downstairs. They stay there, till they become 1metre long. I never read them. I just scan through them. I keep them for my family. They're interested in property sections."

From the two interview excerpts above, we see that some householders store objects on a temporary basis, to pass them to others whom she thinks might be interested. Sometimes they store them next to an object that can work as a reminder. She explained that she keeps the vouchers next to her car keys, which is something in constant access and used by her where it can work as a reminder to pass the stored objects to someone else. Yet, as she mentioned later in the interview, it is not enough to simply store these items for sharing; she needs to be reminded by her family and friends to physically move and pass these objects to them. In both families, the mothers kept objects for future use to pass them to their families and friends. They both stored these objects in an accessible way and sometimes next to an object which is in constant use, in the hope of re-accessing them with less problems.

Similar to family 2 where the mother keeps a stack of magazines in the corner of a playroom, in home 6 the male partner discussed one of the photos from his photo diary and explained how he keeps unwanted items such as a

microwave, a video player and some video tapes on a stack on top of a corner table (see fig 4.5):

Figure 4.5 Storing unwanted items with different sizes and shapes to pass them to others.

There are a few things to discuss here. From two examples (home 2 and home 6) we can see in home 2 the mother stacked unwanted magazines in a play room because of her family's interest in properties. She explained her photo and mentioned that she shows these magazine when her family visit them every couple of months and she disposes them after their visit. In home 6, the male participant discussed how he decided to store different objects, with different sizes and shapes on top of each other in an accessible way which is on top of a table in the hallway to pass them to someone who might be interested in them. He mentioned that he was thinking of passing these unwanted items to the charity, but then he decided to leave them on a table in the hall way to check with his friends first. He explained that he is planning to keep them there for a while, because they are not on his way. I contacted him two years after the interview took place and he told me that the microwave was passed to his friend, and the video player and the video tapes were passed to the charity. These examples illustrates how people sometimes store objects on a temporarily basis to pass them to others and this sometimes may result in delayed disposal as the mother explained in home 2.

4.3.4 Storing sentimental objects

From interviewing the families it became obvious that all participants stored things that have some sentimental values to them, so those things are more than just functional objects (Kirk et al, 2011). All of them kept things with links to their personal or family history. In household 1, for example the mother of two children explained her reasons for storing her children's first outfit:

> "I kept the first outfit they born in the hospital. Their first shoes, photos and toys in two suitcases under the bed. Maybe in future, when they get to the age of 18 or 20, I can present them in a box, saying well, this is your life, this is what you were and where you come from."

Within the same household, the father had a different reason for storing his sentimental objects, which was not only to provide a link to his past, but as a form of respect for his loved ones. He explained that he kept some books that his parents gave him long time ago (see fig 4.6). He could not read the books because they were written in another language and he cannot understand them, but emotional attachment did not let him throw them away. He also kept the letters from his parents to him, when he was a child and last time he went back to read or look at them was two years ago when he moved into the house. It is interesting to note that within the same household, as we have explained in section 4.3.1, the mother stores her daily posts in a different way compared to her sentimental items (e.g. children first outfit, shoes, etc.). Thus, we can see how she spends less time on storing and tidying her daily mixed objects, by placing them all in one general storage space (see fig 4.1), whereas she mentioned in the interview, sentimental objects are kept differently by spending more time to keep them clean and dusting them regularly.

a


b

Figure 4.6 (a,b) Storing sentimental books as sentimental objects

There has been a good deal of research in HCI and CSCW concerned with how families deal with and share memorabilia especially with regards to photos (Crabtree at al., 2004; Frohlich et al., 2002; Rodden and Wood, 2003; Kirk et al., 2006). More recently there has been interests in how physical objects also acquire some sentimental values in homes which together with photos and videos, they have called mementos or memorabilia (Petrelli et al., 2008, 2009; Frohlich and

Murphy, 2000; Stevens et al., 2003). These authors have also considered a sentimental factor in the design of supporting digital technologies with the aim to bring the benefits of digital world to the physical in new archiving systems. For example, the living memory box (Stevens et al., 2003), Memento (West et al., 2007) and The Family Archive (Kirk et al., 2010) have provided facilities for the archiving of memorabilia. While Kirk at al. (2010) and the others have done an admirable job of mapping out the digital interaction with physical photo archiving at home, their approach has not addressed what we would argue are the serendipitous rediscovery of sentimental materials at home (Frohlich et al., 2002). This is the materials that have sentimental values to participants that have different attributes and are stored together. For example, in home 1 during a tour around their home, the mother showed that a sentimental teddy bear was stored with a child's first pair of shoes and a paper copy of a child's hand print are stored together as sentimental valued objects. Specifically, we apply our thoughts to what it might mean to design technologies that are sensitive to the way family members organise their homes, materially and sentimentally.

4.3.5 Neatness and storing

In observing families, I noticed that most participants' intentions for tidying and storing were in both recovering space and creating what they referred to as neatness. In one of the households (home 1), the father mentioned there were the two main reasons for him to tidy up his desk and store its contents. He explained that he takes his mail to his office desk every day and he does not have to deal with the huge amount of papers as he checks most of this information online. The only papers that he regularly checks are credit cards and bank statements, which he reads every month before paying for them (see fig 4.7). In a tour around his office, he talked about his file tray mechanism:

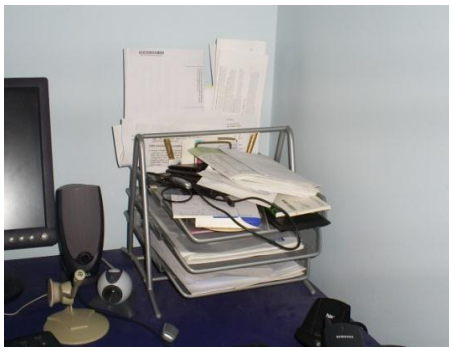


Figure 4.7 Neatness and storing

"If the papers were vertically upwards, then I can see it has not been dealt with. Before I file away a paper, I put it in the inner tray, so whenever I get time, late in the evening I either file it away or get rid of it, if I think I don't need it any more. From there, papers go to filing cabinets or suitcase if it is business related. It is a visual thing. If I see there are a lot of junk there, then I go through it. If it is nice and tidy, then it doesn't need to be looked into."

It is interesting to note that behind the logical reasons for information organisation, he has structured his desk visually, to refer to different activities, whether to file away a paper or act on it or simply tidying up. In his home, like many other households, neatness was an intention to store objects. There is also a point here, that is tidying and storing routine at home is an on-going activity. Here we see, even in a claimed-to-be-organised household, there are still objects and information to be categorised and stored.

Similar to the example from the previous home, neatness was the mother's key intention to store things away in home 3. The household was composed of a mother, a father and a child, where the mother complained about having to do constant tidying up and storing things away. She explained how she clears her son's unwanted clothes and toys into storage:

> "I kept most of his clothes (her son), because they are in good condition, but some of them I give them to charities or nurseries, so they can be re-used. Sometimes it's just too much. I have two big bags of his clothes and then again there are couple of bags of new clothes that he can't wear them anymore. I don't want to have small bags ever where. So sometimes I hide them in my wardrobes or under the bed. I ignore them for a while, so after sometime, I say OK I can't ignore them anymore. I need to sort them out, so I go through them again and I either give them away to charities or store them properly."

In this case, like the previous example, the visual factor was the mother's intention for storing. She explained that she did not want to see small bags around

in the bedroom, so she had to hide them in the cupboard for a while to make her son's wardrobe look neat and tidy.

Swan et al. (2008) in Making Place for Clutter and Other Ideas of Home discussed that "neatness" is an important factor that people take into consideration when they deal with clutter and mess on a daily basis. Swan et al. (2008) revealed that sometimes family members organise clutter into neatly stacked piles and sometimes they leave them in a mess as there are always things that cannot be neatly classified, or that need some time and thoughts to be sorted out. Our work is similar to how people tidy up, store and retrieve physical objects at home, including stuff that do not fall into any categories. Having said this, following our interests on family members' intentions for tidying up and storing physical objects, in the next section we focus on the ways participants make physical efforts to store and categorise things at home.

4.4 Tidy up and storage

Having addressed participants' intentions for storing things, this section is concerned with householders' tidying and storing practices around information and physical objects, using illustrations from the fieldwork. The first section highlights householders' efforts in storing objects and applied strategies in categorising them. The second section details participants' intentions for re-use, including important factors in categorising materials at home. Finally, the third section examines the problems concerning re-accessing the stored materials, and illustrates how storing practices do not always fit into participants plans, detailing variety of constraints affecting family members' storing practices.

4.4.1 Efforts and storage

All of householders in the study used some forms of strategy to store the materials around their homes. It was the variety of these strategies that led me to

focus on what sort of effort they put into storing things and re-accessing them. A single parent (home 8) with a child aged 11, was a good example of someone who had a very clear categorisation and made a lot of practical effort to store things in the "right" categorisation (see fig 4.8). She explained the routine of filing her post on a daily basis:

Figure 4.8 separating useful and non-useful piles

"When the post comes, I divide them into two categories, useful piles and none-useful piles. Useful piles include bank statements, bills, letters from insurance company and none-useful pile are recycled materials which has no beneficial information for me. At the end of the week, I take the useful pile upstairs to study room for more categorisation. I have two boxes in that room. One is for temporarily letters and documents which work by date and when it gets full, I go through them and keep the last three months. The other box is a permanent storage, which contains bank statements, bills and other legal documents and I go through the box once a year."

Here, we see how she spent a substantial period of time to categorise her materials over a series of occasions to be stored and the high level of efforts she put into organising the storage made it easy for her to re-access any of her required documents. In talking through her storage practices, she conveys the sense that considerable efforts has been put into arranging what might seem to be ordinary storage routines. Through her discussions, we see that a good deal of effort can be necessary to categorise her materials to be stored in order to re-access them in less time.

Continuing to examine how household members make efforts to categorise their papers and other objects, the female partner in home 6 explained how she dealt with new things coming into her house (see fig 4.9):

> "Apart from my unique documents like my passport or car documents which I put them in a suitcase and lock them, the rest of my stuff go on my bed, desk or inside the suitcase. They stay like that for six months or so till we expect a guest coming to the house for sleep over. I have a lot of problems accessing my stuff. For example, two days ago I was looking for a letter from the Home Office, but I couldn't find it. I don't have any categorisations for new things coming to our house. Everything comes to the house, goes

either on bed or desk or inside my suitcase, which is in the corner of my room. I don't feel like categorising and cleaning."

a **b** **c**

Figure 4.9 (a,b,c) Everything that comes to their house, go either on bed or inside the suitcase

This example illustrates that by making little physical or cognitive efforts to categorise and store her materials, she constantly had to deal with problems re-accessing stored objects. She recalls how difficult it was in an occasion to re-access an important legal paper, even though she thought she had the letter with other unique documents in her suitcase. It is interesting to note that unlike her storing plan, the paper was not in the category that she was primarily expecting to retrieve it from. She therefore had to start looking for the paper in other rooms, and she explained later in the interview (pointing to the piece of paper) that the paper was found in the dining room and it was still there at the time when interview took place. The point here is that, even though she had problems retrieving the paper from her planned category, she still had left it in a place, where it was not originally assigned to. What is apparent here is that storing methods at home are continually evolving which are not fixed procedures to be followed by family members.

The next example (home 3) gives some sense of how families make efforts to tidy up and store things away over periods of time. The family consisted of a mother, a father and a child aged 5. In one of the interviews, the mother explained that she made a lot of effort to tidy up and store objects away:

"There are many things around the house. You know you are not going to use them, but you keep them, you hang on to them for a while. There are different stages that you remove them, you put them away from yourself. First they might be next to yourself, then you might put them in a cupboard, then you don't use them, and the next tidy up,

you might take them to the loft and next tidy up time they might go to the shed. So they go further and further away, but you don't throw them away. You know you're going to throw them away one day but you won't do it straightaway."

In the excerpt above, the mother revealed her efforts in tidying up objects around the house, and stored things in multiple stages of time differently. Even though the participant said that she would throw the stuff out at some stage, she made efforts to tidy up and store them away and wait for that one day to throw them out. Thus, she worked to tidy up and store the same objects repeatedly. Furthermore, instead of making the effort to store similar objects into the same categories, she focused her efforts on storing miscellaneous objects together, but stored them in different places over periods of time.

There are several points to consider from the above. First, all householders made an effort to tidy up and store different objects around the house. Second, efforts in families can range from spending a long time, categorising objects in tidying up and storing them appropriately according to their categories, so as to retrieve required objects in less time. On the other hand, there were some participants who made little efforts to categorise their objects, but constantly had to deal with re-accessing problems. Third, the data presented demonstrated that despite the efforts made by some participants to store various objects in an appropriate category, these categories changed according to their needs and intentions for re-accessing.

4.4.2 Intentions for re-use

In examining home storage practices, participants' intentions for re-use were discussed in great details to reveal their purposes for re-accessing the stored materials. The following examples highlight their intentions for re-use which were described as important factors for categorising materials at home. The fact that all of these objects were described to be valuable enough to them to make efforts in storing was also interesting to probe and examine in details.

The fourth household in the study was composed of a mother and a father and two young children. During a fieldwork session, the mother discussed her intention of re-use for keeping travel magazines for several months:

> "I've got piles of travel magazines. We look through them, but still keep them for months and months. We store them under the coffee table. We look through them, but still keep them. We think that one day we'll go to that specific place. Sometimes we cut out the article we're interested in and bin the rest of the magazine, but to come to this point takes months and months. When under the coffee table becomes full, we keep them in a pile, like a mountain in a corner of the room. Then they move from one corner to another corner of the room and then we know it's time to sort them out."

So, in this case, their intention for keeping the magazines is based on their informational properties. Either all information on magazines is valuable to them or part of it (as she mentioned they keep part of a magazine). In both cases they treat all the magazines the same and store them in the same way, hoping for that one day to come to sort them out and act on those information provided in their storage; in this case travelling to their desired holiday destination.

Another mother (home 1) explained her reasons for re-using the stored objects, regarding to her children (aged 2 and 4) clothes and toys:

> "Every couple of months I go through the 4 years old child that are small for her and put them in the 2 years old drawer. When the clothes get too small, the new ones go to friends and the old ones to the charity. I more or less do the same things with the toys. When they don't use them or lose interest, either go to charity or toys that they lose novelty, are stored in a box in a garage and every couple of months, I bring them out and they are like new toys to them and I put the other ones away."

Here we see that she re-accessed the stored materials (clothes and toys) frequently, so as soon as she realised they lost interest in some toys, she stored them away. After a period of time, the children re-used them and found same values in the stored materials again. Then, she stored the other materials and re-accessed them similarly, and the values of the objects stayed the same. She also described how a piece of clothing that was no longer in use by her older daughter was re-used by her younger child. In this particular case, the intention of storing

away was to re-use once an unused object as a usable one again. So, unused items can re-store their value by the same person or other family members after a period of time.

The previous examples have focused on participants' intentions for re-use, based on objects' informational properties or other values to family members. In home 7, the father described how he checked the validity of family's passports to reassure themselves that they were still usable. In this case the participant's intention of re-access was to check the value of the stored object. Furthermore, the object that was considered to be a valuable item in terms of its' informational properties can get transformed to a non-valued one as its' informational value was based on temporal features.

In home 10, a mother discussed the photos from her photo diary to show the procedure of storing her daughter's school letters temporarily. She explained how a stack of school letters moves from one corner of her house to another to be displayed on the fridge door (see fig 4.10).

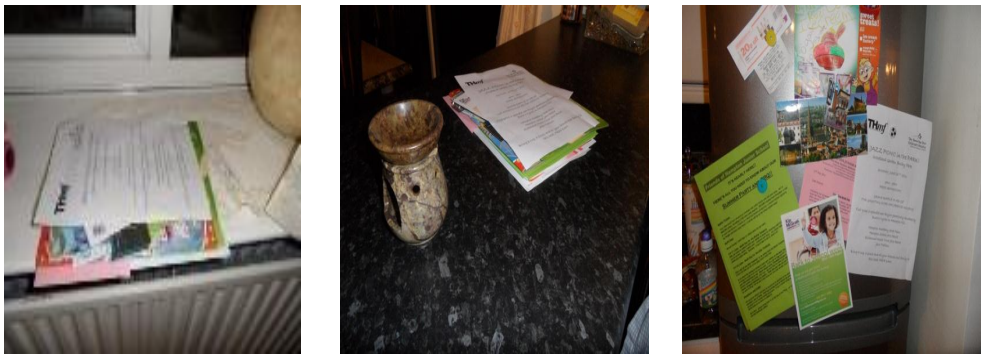


Figure 4.10 (a) First entry point of school letters (b) The stack of letters move to the kitchen surface (c) The mother displays the letters on the fridge to remember the

In this example, the mother explained that every day when her daughter comes home from school, she asks her to leave her school letters on the window shelf which is located next to the door. She mentioned that window shelf was selected for this purpose because it is the first surface available at home. Once the mother finds the pile with a lot of letters, which is usually at the end of the week,

she takes the pile to the kitchen and leaves them on the kitchen surface for a couple of days. Then she decides to go through them, stores the important ones with a date to remember on the fridge door and dispose the rest. In this case the participant's intention for re-use is based on the letters' informational properties. The mother also discussed that because of the location of the refrigerator, she can access the letters easily to remember the important dates and discard them once the letters become out of date. This is done on a routine basis, so every week the same procedure happens, and the mother checks the date of the ones on the fridge before storing the new ones. This example illustrates the stages that letters with important informational use get stored permanently. As a result of this process, moving a pile form the window shelf to the kitchen and then the fridge door, there might be a delay on disposing unwanted/unrelated letters.

The fieldwork demonstrated participants' intentions for re-use in household storages. The value of stored objects was a key purpose, leading them to re-accessing the stored materials. Here, we see that participants had various intentions to access stored physical objects based on their informational use (holiday magazines and school letters), as well as the intentions that unused stored materials would restore values to another member of the family after a period of time. They also occasionally re-accessed stored objects to check their informational value (passports' expiry ends). All of these intentions led to particular storage practices, but also to some problems in re-accessing them.

4.4.3 Problem re-accessing

The previous examples illustrated householders' intentions for re-using stored materials. As might be expected, there could be several reasons leading to problems re-accessing things that have been stored. Most participants had a very clear plan for doing storage, but due to a variety of constraints they were not able to follow their plans to store objects away as planned (see fig 4.11). The constraints were usually described as relating to time, space or emotions. The example below illustrates that storing

practices do not always fit according to participants' plans. It is well recognised in HCI literature that plans are not always followed like rules and that peoples' activities are highly contingent (see Suchman, 1987).

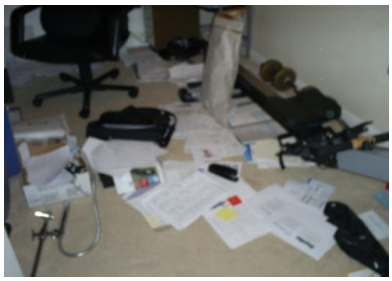
In the second interview, a father of two children aged 9 and 11, who mainly works from home explained:

> "There are cases, when I'm coming back from a meeting. I will use bed-side table and spaces on television in my bedroom. I have receipts in my pocket. What I do, I put them in my bedroom on top of TV, so I know next time I go to the office in my house, I try to take them with me. More often, they end up filed up there for quite few days and I have problems when comes to the end of the quarter. I need to tidy things up. If I have flight tickets, train tickets, hotel or taxi receipts, so I know if they are not in their usual place in filing cabinet where I usually put them, then I hunt for them in my bedroom." (see fig 4.11.a.b)

a **b** **c**

4.11 (a,b,c) Re-accessing problems

In the excerpt above, the father revealed although his plan was to keep his work-related papers together in a filing cabinet, sometimes he left them on various surfaces in his bedroom (see fig 4.11). He then explained when he had a problem re-locating a paper from his filing cabinet he had to look for it in his bedroom. His explanations showed that he had a clear plan for storing his materials, but for practical purposes, he did not always follow it which resulted in constantly dealing with re-accessing problems. During an interview he complained that there is too much information to be categorised and not enough time available to do this:



"I end up with children's homework in one pile and same pile related to my work and house bill. There have been many occasions where I was going through children's homework, and a house bills that I was looking for days before, was found."

Figure4.12 Problem re-accessing

What is particularly interesting in his explanation was that by re-accessing his storage (children's homework in a pile), another object (house bill) was discovered which didn't belong to that place (see fig 4.12). Here we see, by re-accessing something in mind something else was found. Similarly in home 9, the participant discussed an occasion when she was trying to organise her storage, but something else was found:

> "Sometimes, if I'm organising something, I suddenly see my sentimental box, and sometimes I just feel like looking at them."

Her description showed how she sometimes went back to her sentimental storage which was a box under her bed. This was not something that she had started to look for, but was found as a result of re-accessing another object in a place next to her sentimental box. The next example also illustrates this further. In family 4, the mother, like many of the other households, was the person who picked up mail in the morning, took it to the kitchen and left mail on the kitchen surface. Her husband complained about this as he explained his way of categorising things:

> "My mail are not always in the same place. It's not in an eye sight. If it's somewhere for me to be seen and in one particular place to put your postage then you know it's going to be in that place all the time, but it's quite disorganised. They go in a pile in the kitchen moved around. So you're not sure what's around. It's suddenly a pile, my letter will appear when organising the kitchen. I found a letter of mine which has been 4 weeks old."

The problem with re-accessing in this case was that the person who first dealt with the object was not the same as the person who categorised and stored

that object. Therefore, sometimes when the father came across a pile of letters in the kitchen, and found letters which has been 4 weeks old mixed within other more recent letters. This example also revealed that similar to previous ones, by re-accessing something in mind, something else was found. Interviewing another family (home 3), the mother explained how she stored her own and her son's legal documents and by not always placing them back in the original storage, she ended up searching for them in different places:

> "Unique papers and documents are divided between me and my husband somehow. I keep my own and my son's birth certificates and passports and he keeps his in his box. Some of the documents which are shared, I keep like letters regarding house mortgage. Some of them he keeps in his box. So there is no specific rule for it really. As long as they're safe and we know where they are. One of the boxes is in my bedroom and the other box and the other one in office/guest room. But, the ones that I use, I may move around, like my passport. I would take it from the box. I put it in my drawer where my clothes are. I don't know why. I might look for it later, because I go to the box, but it's not in the box, or, I might put it in my jewellery box. I don't know if it's laziness or I'm in a hurry. I really don't know the reason behind it."

Unlike the previous example, here we see that the person who dealt with storing an object was the same who tried to re-access it, but she still faced problems trying to retrieve the object. She revealed that she did not place the retrieved object back in the right category, as she came across dilemma.

During the fieldwork, in an interview (home 6) the female partner explained that she had no categorisation or storage method. She used her bed as a place to store everything coming to her house, be it a piece of information or a new piece of clothing. When asked about the last time she had problems re-accessing an object and she replied:

> "Two days ago, I was looking for a letter from Home Office and I couldn't find it. I don't have any categorisations. I just don't feel like it."

As previously mentioned in section 4.3.2, this participant explained that she did not spend time making efforts in categorising and storing her materials, and she constantly had to deal with re-accessing problems. Here we see, by not

categorising appropriately, householder seemed to encounter problems re-using her stored materials- Yet continued to do so.

From the example here we see that although households build simple ways of object categorisation; and often put a substantial effort into their classification, they experience problems re-accessing the stored materials. Reed's study "Learning from Loseables: an exercise in critical reflection", 2005 discussed that the act of deliberately redefining the character of the device can lead to interesting opinions, questions and design insights. He argued that although a device can be defined as a loseable to speak negatively to its design because it should not be loseable, the designers become aware to ask how they can stop it from being a loseable. Reed (2005) has developed subcategories, including 'misplaceables: a thing that it is possible to put in the wrong place, either by a deliberate action or by an accident', 'stealables: Things go missing; when they do, we are forced to ask why.' and 'tidyables: Portable devices are not always being carried around; at some point in the day they are at rest.'

Here, the fieldwork examples demonstrate how family members faced re-accessing problems around their storage practices and revealed how these problems were varied and continually evolving. From the interviews several points that seem to lead to re-accessing problems in the households are revealed here. The first point is that sometimes the problem occurs when the person who first deals with the objects is not the same who usually categorises them. Inspired by Reed's subcategorisation, we can see that in this case the object can be classified as "stealable" when designing a technology to support storing physical objects at home. Therefore, the likelihood of it being placed by another member of the family and not being found by the person who is looking for the object becomes minimal. The second point shows that some participants have a clear plan for storing the materials, but for practical purposes, they do not always follow their plans, which result in re-accessing problem. According to Reed's study and subcategorising this item as "tidyable", the designers can take this attribute of the item into consideration when designing a technology to support

tidying physical items at home. The third point illustrates that some participants experience re-accessing problems, by not categorising appropriately. Inspired by Reed's subcategorisiation again, we can see that some of the objects at home can be categorised as "misplacable". Therefore, by considering the fact that these stuff can be put in the wrong place, the designers can help by asking how they can stop a thing to be misplaced when considering to design a technology to support tidying up practices at home. The next section highlights the properties of storage media as well as properties of objects to be stored in the home.

4.5 Material properties of storage materials

The properties of materials to be stored and the properties of storage media are an important feature of a household storage. In the course of conducting fieldwork and interviewing families, asking how they store things, participants often pointed to the storage materials during their conversation. All of the households had some versions of what could be called a storage area. Amongst these storage places were all variety of things; letters, clothes, sentimental objects, books, toys, vouchers, children's arts and crafts, photos and many more household objects. After visiting a number of families, I began to expect to be shown the storage area and the materials in them. When I thought about the storage area and the objects in them, there appeared to be several different types of storage materials. Based on this, I decided to explore the use of storage materials and their material properties. Using illustrations from the fieldwork, the first section focuses on the properties of storage, their physical characteristics and in particular their shape. The second section then highlights some of the characteristics of materials stored within the home.

4.5.1 Storage materials and storage media

The physical shapes of stored things tend to have different attributes. Items are usually stored in folders, filing trays, shelves, boxes, filing cabinets, drawers, suitcases, and even plastic bags. Sometimes a storage medium itself can be stored inside other forms of storage. Storage locations and usage within the home varies in different households. The following examples from the fieldwork reveal how

families build upon the material features of storage. During an interview in home 5, the mother of two kids described the arrangement of her magazine storage:

> "I'm not a magazine person. The only magazine I'm interested in is National Geographic. I get them once a month. I leave them on the coffee table in the lounge. That's the only place I like to sit and have a look at it and when I finish it, I put it on top of a pile beside the sofa. If you go beside the sofa, there are about 20 or 30. I haven't moved them. They've been there for the past 2, 3 years. The reason I left them there is because they're nice and other people can also have a look at them."

Here, we can see that there is a "theoretical" order to her permanent storage and the participant explained that there is an order to the way she stores her physical objects. . After she finishes reading, it will go on top of the pile next to the sofa, the permanent store for her magazines. So, clearly she has allocated herself a space, albeit of a limited size, on the coffee table. This underlines the shared use of the coffee table; a resource for others to peruse its content. Likewise, the location of her permanent storage (beside the sofa) has a bearing on what is put on it; the sofa's location and use by all family members and guests assigns the contents (magazines) the status of "public" and thus it is a shared object .

During the interview (home 9), a single female participant whose nieces visit often, with regards to storing her unique papers explained:

> "They go to the bedside table in spare room, because the handles are out, and the kids can't access it, if they are around."

As well as relying on the drawer of the bedside table, this drawer has also been appropriated with respect to its peculiar properties. The use of bedside table in the spare 'guest' room assigns the status of "public" and the surface is shared, whereas the drawer with no handles makes the use of this storage media "private". The drawer can of course be opened, but this extra effort somehow is enough for her to assume that it is understood as a private space for storage.

Another example illustrates how the material properties of objects have a direct impact on choosing the storage medium. During an interview (home 3), a mother discussed the way she decided to store her photos in a box:

> "I used to have my photo albums on a shelf in a room. Then, I had to get rid of the shelves to make more room for my son, so they became homeless really. So, I put them in a cupboard box and they were sitting in my bedroom. But, it didn't look good, so I bought a good leather box and I put the albums in there. I've got lots of photos without albums. I would love to put them in albums, but I cannot, because they take more space."

This raises another interesting feature of storage media, which is the presentation of storage, and has been created bit by bit, over time. The albums which were stored on the shelf, had to be moved to a cardboard box, and because it didn't look presentable, she decided to move them to another box that looked more presentable to her. As well as the importance of the storage presentation to the participant, this storage has 'only' been appropriated with respect to its current contents (photo albums). Although the participant explained that she has a lot more of the same objects (pictures without albums) to put in the same storage, because of the size of them (albums, in this case) she cannot store them all together.

In an interview, the same participant discussed her storing practices around her bank statements and bills. She explained that her bills go on one side of her diary and her bank statements go on the other side of it. They stay there for two to six months, and depending on the space left in the diary and participant's time, the bank statements and bills will eventually get stored in a filing box. There are several points to consider here. First, in this example, a space in her diary is given over to bank statements and bills, which suggest what might be thought of as a "working" space, where a space is allocated for the specific purpose of containing materials to be stored in a multi-functional medium (her diary). Furthermore, we see that the diary's shape and size lend itself to storing such materials with mixed informational properties. Second, further on in the interview, she explained that she keeps her diary on the dining table, because it makes it visible and accessible to work on. In this case, a storage medium (diary),

is itself stored on another storage medium (dining table), where practical and working items can come together and get stored for "display" (see fig 4.13 a). This example shows that storage media (diary) can allow different objects (bank statements and bills) to be arranged and stored. A storage medium (here the diary) can also be stored on another medium (the dining table). The material properties of the diary thus permits objects with different informational uses to be stored together, but in an easily separable way. The surface of dining table also allows different objects with different shapes, sizes and characteristics to be simultaneously stored on it whilst at the same time, acting as a display for them. Here, we see that the way these materials are stored is interesting, because it reflected the material properties of the objects. The different sizes and shapes of materials allowed stacking in ways to separate and identify different objects without obscuring each other. Furthermore, the material properties of what is presented on surfaces is important in how these materials are used in a visible and accessible way and also allows an easy means of continuously reorienting what is stored on it (see fig 4.13.b).


a


b

Figure 4.13 (a, b) Material properties of storage media

Moreover, how horizontal surfaces are made use of may give rise to conflicting demands between availability of surfaces and use, issues of orientation, embodied material and their social embeddedness (Salovaara, Zarabi and Perry, 2008):

"It is not just the information on these surfaces, but their physical embodiment that allows them to be placed, interpreted and used in particular and meaningful ways."

This section explained how families build upon the material features of their storages and in particular revealed that the material properties of what is presented on surfaces is important in how these objects are used in a way which allows an easy means of reorienting what is placed on it. Following this point, in the following section, material properties of these objects are examined in detail.

4.5.2 Material properties of stored objects

In examining the storage media, we found very different materials stored together by the participants. Probing further, this section considers the properties of these objects. In the course of collecting fieldwork about storage of different materials, several of the participants demonstrated methods that they had devised to store things according to their properties. The following example from the fieldwork describes how a father (home 2) organises and stores different objects differently (see fig 4.14):

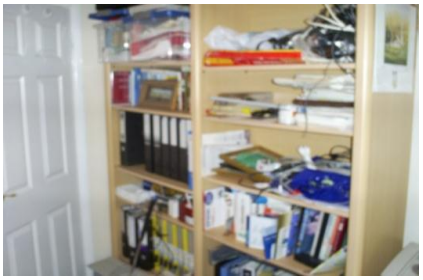


Figure 4.14 Storing objects based on their sizes

"The books are either on the shelf or in the cabinet, depends on their size. If it's bigger like manuals end up on the shelf, smaller books, some of them reference books, even date back to university time, end up sitting in the cabinet, along with cassettes which have been recorded, where have been relevant to the past, because of my lectures. I may not listen to them, but rather keep them."

This example reveals that same types of objects, but with different sizes may be stored differently. This can be seen in formally classified systems, such as libraries. On the other hand, different objects with the same topic may be stored in the same place, even if their physical properties are not the same. This underlines that storage media may be selected based on the sizes and shapes of the objects within it, and not necessarily chosen based on similar categorisation of the objects contained or their informational properties. In the following example

from (home 2) a mother explained how she categorises and stores video tapes differently according to their sentimental value:

> "If it's a video (movie) goes to video section downstairs. I don't mix personal video with movies. Personal videos go on a cabinet upstairs, because I want to make sure kids cannot record on them."

From this, we see that by considering some sentimental values, she stores objects with the same physical properties very differently. It might be interesting that the tape itself is a media for information, and it is the informational content of the media that distinguishes these near-identical physical objects together and different informational properties can carry different sentimental values. In a similar way, the sentimental reasons have effects in choosing a storage medium, and this illustrates the relations between objects, their storage containment and location. For instance in another interview (home 3), the mother mentioned that she kept her sentimental letters and small objects from her mother, father and friends in a box under the bed. Her reason was to keep them physically close to herself. The characteristic of the box, such as its size and shape, made it suitable for the participant to store sentimental objects with different physical properties.

In another interview (home 5), a mother explained how she stores her daughter's and son's art works (see fig 4.15):

Figure 4.15 Material properties of children's artwork

"The artworks the kids do, I usually get rid of, unless it's something really special, then they have a little space in their room and I keep them there. There is a box at the back of their wardrobe. Because of the way the wardrobe in their bedroom is built, there are no drawers, they have shelves, and they have to have boxes to keep their papers and artworks."

The properties of papers and artworks allow them to be stored in the same storage media (box) and the storage media itself can be looked at as another object, itself to be stored on the shelf in a wardrobe. The box offers a relatively large space, where its' distinctive qualities (strength and shape), can make it easy to use for storage allowing stacking and separation of contents. Although storage is achieved because of the material properties of box, the ease of use and means of continuous reorienting and reconfiguring the objects within them promotes the use of a chosen storage medium.

4.6 Effectiveness of storing and retrieving

This section concerns the efficacy of storage and retrieval in the home. Three main factors which have effects on effectiveness of storing and retrieving are highlighted with relevant examples. In the course of collecting fieldwork about storage, several participants discussed issues that resulted in *not* being able to follow their intentions to store things away. The following examples describe how family members encountered problems storing and re-accessing objects. These constraints can be classified into three main categories (time, space and emotion), and are discussed in the following sections.

4.6.1 Time

After visiting a number of families, I began to realise that their expressed time constraints caused them a good deal of disorganisation in terms of their storage. Despite a very clear plan that most participants appeared to have in mind, most of them were unable to categorise things and store them the way they would ideally have intended to, and they consequently often had problems re-accessing the materials. The fieldwork examples show how families categorise, store and retrieve materials, when facing limited time. The problem with storing materials and re-accessing them is illustrated in an example from home 3. A mother who works full time at a nursery claimed that she did not have enough time to store her materials in the pre-planned storage, and this caused problems re-accessing the materials. She described her own method of storing and re-accessing:

> "Sometimes, I look for a letter and I don't find it. So, I have to look in 2, 3 different places, because I don't know whether they're downstairs on the dining table or upstairs or in the kitchen. I find it difficult and messy and it kind of messes up my mind that all the papers from my study, my work, personal letters and bills get mixed up. It really bothers me. I keep separating them, even if the bills go to the usual place in my diary and the papers go to the box, but, sometimes I'm using them and if I'm in a hurry, I don't put them back where they belong to. Because I'm working full time, I'm not at home often and I don't have time to sort them out all the time. Then, they get mixed up. That really bothers me."

The way in which she described the routine nature of her storage is interesting in this excerpt, showing her 'theoretical' storage practices relied on the ready availability of time sometimes she did not have. She revealed that re-accessing problems started to happen when she was not able to re-store an object in a pre-planned storage. Here we see that although she mentioned that she did not have time to tidy up and store objects, it can also be possible that the values of these objects were not sufficient for her to spend time on them, and she would rather spend time on other activities.

As a result of deciding not to spend time to categorise and store objects to the pre-planned way, another participant (home 9) who works full time as an office manager, explained how she deals with constant lack of time to organise her storing activities:

> "I open my letters and leave them on my desk in my room, and they just sit there for a week or two. When I don't have time to go through them, I get fed up with them and I shove them inside a carry-bag and take them every day to work, try and sort them out there, when I get time. Then after a week or so I categorise and store them in the right folder."

From the above, we see that time has an impact on the way she tidied up, categorised and stored her letters. By deciding not to spend time on storing, she had to remove her letters from her desk, which she appears to use as "temporary" storage, put them in a carrier-bag and treat it as "intermediate" storage until she decides to store them all "permanently" at once. What this example demonstrates is the manner in which a participant's storing practices can get affected by

deciding not to spend time organising her storage, leading to storing her materials differently to her theoretical ideal. The point to be emphasised here is how participants' storing methods can get affected by time, which seems to be an issue that most participants have to deal with, while tidying up and storing objects.

4.6.2 Space

Most informants find the limitation of space in their homes a major issue for not being able to categorise and store the materials in what they considered to be an appropriate way. One mother (home 3) went into some details explaining how she has chosen different sections of a room to categorise and store her letters, study papers and books:

> "Things from my study, job and personal letters get in one pile, when I don't have enough space to categorise them. That bothers me, so I have a way of categorising them, papers related to my job end up on the floor, my personal letters go to the lower shelf and my study papers on top of printer. Papers and book regarding to my career used to be in an office. The room is now used a as guest room. So they are in a big pile, between bedroom and dining room. If we have guests that we want to use the dining table, they go back upstairs."

Here, the mother discussed how limited space had an effect on keeping her stored items organised, so she used any available space on her desk to separate and categorise her paperwork. What this example demonstrates is the manner in which one household's storage is constantly moving storage location. There are several points to emphasise in this excerpt. The first is how the mother is confronted with the lack of space to conduct her organisational matters. She revealed that the office, which was used to store her work-related papers and personal papers, was now a guest room, so she attempted to get to grips with the storing routine. Here, we see that despite the 'theoretical' order to her storage, this could not be enacted in practice as she encountered a problem with a lack of space. Her eventual storing method made use of any available space to stack her papers. She discussed that her papers can be stored in a stack in the dining room, and if she had guests, the storage will be moved to her bedroom again. Therefore, we see how the assignation of the table as a "public" space also had an effect on

her storing routine, as she constantly had to move her stack of papers between locations.

In another example from home 6, the male partner who buys magazines on a regular basis demonstrated the flow of the movement when a magazine comes to their house:

> "With magazines (Kerrang and IT Now) that I buy, I usually bring them home for my partner to read, they probably stay on the floor in bedroom, till next time that I clear the house, then I put them in a cupboard in living room. The cleaning is not regular thing, could be once a month, could be three times a month. They've been in the cupboard, and when I get out of space I move them in attic. I usually just keep them, but I might actually go back to them, that's why I like to keep them."

In a follow up interview conducted two years later to find out whether the magazines are still in the cupboard, he elaborated on his reasons for choosing the attic as the next location to store them and explained the way he decided to arrange, store and re-access them, he explained:

> "Regarding to Kerrang magazines, they are still in the cupboard. When I get out of space in the cupboard, I take them in the attic. There is a big box, right when I open the door and I just leave them there, with the other old magazines. I decided to put them in first box next to the attic door, because it fits there OK, unlike other bulky stuff. When it comes to re-access them, I know where they are."

There are several points to be examined here. The fact that he keeps the storage in a cupboard in the dining room shows that he sees it as an easy-to-access location to re-access the magazines. The other interesting point here is that he is planning to move this storage location to the attic, alongside other old magazines that are stored in the box. Also, as claimed by the participant, the properties of the box (as a storage media) makes it suitable to position it next to the attic door as the material properties of other objects in the attic have forced them to be placed further from the door. Finally, because the magazines relate to a distinct period in time (as mentioned by him in one of the interviews) they have some sentimental values, and he explained that he would like to go back to them to see what had been happening during the interesting period. Yet, the magazines have no immediate purpose of use. This issue between functionality and sentimentality in

home life with regards to storage and space is an important characteristic of storage in domestic environment and we explore this further below.

4.6.3 Emotion

This section concerns a constraint that affects the storage methods at home. The fieldwork examples below illustrate how participants' routines for tidying up and practices for storage can be affected by their emotions and moods. During the fieldwork sessions in home 5, the mother discussed her categorisation routines and conveyed the sense that her feelings have effects on arranging what, at first glance, might seem ordinary routines of domestic activities. She explained her reasons for not getting a chance to sort her things out at home:

> "Lack of interest! Usually I'm not in a mood to spend hours tidying up. I'd rather do a sport day out, I like gathering with friends rather than staying home, tidying up, sorting things out and cleaning."

With regards to new pieces of clothing coming to her house, the same participant explained how she leaves them in the bag on the floor for some time, because of her "laziness" and claimed that this was due to her rarely being in a mood for clearance and cleaning:

> "Just laziness and not being in a cleaning mood. I like to buy new things. This happens all the time. Sometimes I throw them under the bed to forget about them for weeks."

In discussing her routines regarding new things entering the household, a number of interesting aspects to her tidy up and storing practices came to light. The most obvious of these is that even though she decides to add new things to her storage she may decide not to categorise and store them in a "permanent" storage for a while. The other interesting point is that her mood and attitude towards cleaning or tidying up have an effect on her storage routines. In this case, the floor is used as "temporary" storage space for her new pieces of clothing to be stored permanently.

During fieldwork interviews, another mother (home 3) described how she organised and stored her sentimental objects. She talked about how she kept sentimental objects in a box under her bed, and explained how she had managed

this storage for a period of time and about how her moods and emotion had effects on her decision of clearing out those sentimental things:

> "I used to keep a lot of letters from my mum and friends who used to write to me, when I first moved here. And, every time I moved house, about 5 or 6 times within the last 10 years. I carried them with me every time. They were in a box under my bed (because I wanted them to be close to me), but about a year ago, I travelled back home, I brought some more stuff form my childhood and teenage years, photos, letters. There were a lot of them and I didn't want to have a big box, full of personal objects, so I had to choose. I had a selection, even my mum's letters which were so dear to me. I had to throw some of them away. It depends on the mental state. Sometimes you want and need to get rid of the past. You don't want to hang on to them anymore. It's a mental and emotional clearout as well as clearing out the space."

In the excerpt above, the participant revealed how her sentimental storage was managed and how her mood reflected on her practice of storage. While she kept a box of her own personal objects under her bed for some time, as she travelled back to her home country (Iran), she found more sentimental objects from her childhood and brought them to the UK where she lives. She had decided not to go for a bigger box of personal things: sentimental and emotion seem to have a spatial dimension. Size seems, to matter. Another interesting point is that she clearly stated that when it came to clearing out sentimental objects, it mostly relied on her mood and emotions rather than a need to clear the space based on some new criteria.

In sum, storage practices and routines in domestic environment can be affected by some ubiquitous constraints, such as time, space and mood which have impacts on categorising different objects or retrieving and clearing out stage. The next section is an overview of storage management. The examples will demonstrate how families decide to throw things out and what actually makes them clearing out their storage, whether their clothes wardrobe or folders of their letters and their children's toy room.

4.7 Storage management

Building on the nature of storage and the importance of its use in everyday life, the features of the storage and the on-going movement, categorising and re-storing of items make it a site where relations within a family can be negotiated. During fieldwork, it appeared that the management of storage practices at homes was a central player in families' social relations. The following examples illustrate how families manage their storage activities at home. The first example considers home 2. In an interview the mother explained how clearance and maintaining their storage is done on a routine basis:

> "We do keep shopping and having big families from both sides, every Christmas, birthday and occasions they give lots of toys, books and videos. This gets repeated every year. So, we constantly do clearance. Children clothes go to either to school nursery, friends or the cleaning lady. The toys go to nursery and the same with the DVDs and videos. Once they are grown out of it, we have to give them away."

In talking through her storage, she conveys the sense that considerable efforts has been put into managing what might seem to be ordinary routines of home-related activities. The example shows that the family's storage clearance is based on a temporal routine. The mother's timeline (a plan for when things will happen or how long she thinks something will take) is coordinated with those of her daughters in such a way to manage and clear their storage. Here, we see that relevance properties of toys and DVDs allowed the items to have been cleared based on temporal features as well as when children grew out of them.

Another example highlights how a family dealt with the clearance of sentimental objects. Home 3 was composed of a mother, a father and a son. During an interview, the mother discussed stages for clearing her storage and when the storage materials relate to sentimental objects, her family deals with them differently:

> "You remove the sentimental objects like letters, stuff from my childhood, teenage years, further away from yourself. You know you are not going to use them, but you just hang on to them. There are different stages that you remove them and put them further away.

> It depends on your mental state, you need to get rid of thing from the past, so you have to wait for the time to start putting them away. First you put them in a cupboard, the next tidy up you take them in the loft and next tidy up time they might go to the shed. You know you are going to throw them away at the end, but you don't want to do it straight away."

In the excerpt above, the mother revealed how her clearance was 'done' to reflect the management of her storage and, specifically, to clear her sentimental storage space. Her explanation showed that the clearance of her sentimental objects was done at different stages of time; each stage located them physically and emotionally further and more distant from herself. Each stage depended on her level of emotional detachment from them. Similar to the previous example, we see once again that 'time', alongside other factors such as 'emotional state' can have effects on family member's clearance practices. Similarly in home 5, the mother went through her collection of presents and explained how she managed her storage:

> "Things I get as presents, books, I try to fit them round the house, even if they don't fit, I still keep them. I don't like throwing them away. [...] I put them in a cupboard with plates. And things that I don't use, the old ones and odd ones I put them in a box and in a shed. We have around 3 boxes of plates, mugs and bowls in the shed."

This imbalance of clearance of the storage and the nature of sentimental objects are also apparent in previous examples from other participants. The sense of emotion towards the sentimental objects can be embodied in the storage systems themselves, which can be at odds with the clearance of storage and can affect the management of that storage. In home 5, the informant revealed that even when she thought the presents did not fit her house, she still tried to keep them around the house or put them in a box in garage.

During an interview in household 1, the mother explained how she kept everything, even if she thought there was only a tiny chance of something being used. She explained how she had come across her daughters' vaccination forms from couple of years ago and because they were out of date, she threw them away:

> "I only threw things away only if they're expired. If I think there is a piece of information or a thing that for 1% I may use it in future, I put it back on top of my microwave."

In this case, she made it very clear the way she manages aspects of her storage practices by temporal relevance or by anticipated salience in her future home based activities. Once again we see that 'object's information expiry end' has a direct impact on the participant's clearance activities. She explained that anything out of date got thrown away otherwise it sat there on top of her microwave for longer, until it too becomes out of date.

There are several points to consider from the above. The examples from the fieldwork illustrated how management and clearance of storage relied on many factors, such as time, emotional state and an object's information expiry end. Although householders employed multiple methods in clearing their storage, the material features of objects, whether they were stored for their informational usage or sentimental value, were bounded up with multiple factors in these set of practices. This has revealed some broad findings to be considered in the design of organisational tools for the home storage which will be discussed further in chapter 6.

4.8 Social interaction around storage location

The final empirical section in this chapter is concerned with the social interactions around stored materials. When multiple people are involved, tidy up and storing methods could be different and problematic, as individual members may apply different methods to tidy up and store objects in the household using various types of interaction. So, it is important to find out how family members co-operate when storing physical things. The following examples from the fieldwork illustrate some of the ways that they organise, store and retrieve items from their storage, examining the social interactions involved around these materials.

In family 1, the mother spends most of her time in the kitchen and her immediate information storage is on top of her microwave, which holds her books, recent printed pictures and food recipes. These objects may stay on top of the microwave, and if she does not deal with them within around two weeks, she usually gets a reminder from her husband to sort them out:

> "My storage at the moment is my kitchen, on top of my microwave. So when it comes to s stage that I think oh, my god, there are so many papers here, I go through them, if I don't deal with them within 2, 3 weeks, my husband usually asks me to clear them out, then I go through them and I say, OK, this is very old and I throw things away that are either expired or I know for sure, for sure, that I'm not going to use them anymore."

Here, her descriptions gave some sense of difficulty in separating out various objects to be stored in a general storage, so, they all piled up on top of her microwave which didn't always look tidy. The underlying text to what she said, however, showed there was a problem when the pile got too messy. For her, it was not the storage practice itself that failed her. The material properties of her storage allowed different objects to be stored together but the shared nature of her storage allowed another member of the family to have authority to remind her to clear it. Later, during a telephone conversation I asked her what usually happens when her husband reminds her to sort out the unattended objects piled on top of the microwave:

> "I usually say, OK. I'll get it done soon, and after couple of more days, he comes back to me and complains that I think you said you were going to deal with this mess but it still looks the same. Then, I say, yes, I know, but I've been busy with the kids or I say I was doing the house work. I'll do it tomorrow and that's how I usually get it done."

This suggests that the form of the storage practice and the 'shared' feature of this storage space do not map well onto one another. If the storage had not been a shared resource, she would have had the full responsibility and authority for her storing, retrieving and clearing, but, since the space was shared, this feature led to social interactions around this storage. As a result, we see that her husband's actual and expected notification worked as a reminder for her clearance routine.

The previous example has focused on families' communications around storage practices. The following example illustrates an on-going social interaction in a family life. In home 3, the mother explained how they deal with their mail at home on a daily basis. When their post comes through the door, usually her husband picks them up and leaves them on the dining table:

> "Sometimes I take my husband mails from the dining table (which previously in the interview she mentioned this to be their immediate shared mail storage), whenever I decide to tidy up or expecting guests, I either take them upstairs and put them in a drawer, or put them somewhere else. Sometimes my husband takes the mail and put them on top of mantelpiece instead of dining table, then when I decide to tidy up, I remove them from there and put them on dining table or take them to the kitchen. Then when my husband can't find his letters on either mantelpiece or dining table, he asks me for help. Sometimes I remember where I put them and say for example that they are in the kitchen, next to the fridge, but sometimes, if it's been a while since my last tidy up, then I have to tell him that I don't really remember. He then starts complaining that why did you remove them from the mantelpiece, and that he needs the letters, and they were important ones. And, I have to say, OK, let me think and then I start looking for them everywhere, in the kitchen, dining table, upstairs, downstairs and this is how I usually find them."

The above interview shows even though the couple had a regular practice for immediate shared storage (dining table), they don't always follow their plan. So, when they come to a point that cannot re-access a thing, they have to ask each other for help. Here we see the dining table (i.e. its surface and the materials on them) is a site where the couples' interaction happens. The mother's effort to keep the surface clear is seen as an initial step into participating in the family's social interaction. There are several points to make here. Similar to the previous example, the shared feature of the storage sometimes (dining table, sometimes mantelpiece) made this a central location for her husband to store his materials. On the other hand, the 'public' feature of storage can lead to problems. So, when his wife cleared her husband's letters, if she found it messy and if she could not remember where she placed his letters, then this can lead to problems around their storage area at home. Therefore, it is not just the shared feature of storage that leads to social interactions around the storage location. The re-positioning of

objects by couples is quickly recognised by them and communication starts around these locations.

In another case that illustrates social interaction around storage location, a father in home 4 described how he had to ask his wife for his letters on a daily basis. In this family of four (composed of a father, a mother and two young kids, aged 1 and 4), the father explained that his wife was the person who picked up mail every day from the door, and because there was no regular place for his letters he had to ask his wife. During an interview with his wife, she also mentioned that once she picked up the post from the door, she usually took them to the kitchen (where she spent most of her time) and the pile moved around the kitchen worktop. Then the husband explained a situation that he found his letter in a corner of the kitchen worktop a month late. So he had decided to ask his wife on a daily basis to see if he had any post on that day or not. Thus, the position of the storage location (pile of letters) triggers the social interaction which relies on on-going practices of communications in their home life.

The physical location of objects also appears to play a role in social interaction. During fieldwork interviews (home 5), a mother of two kids described how she deals with her letters:

> "I go through my letters and file them myself. The only ones that I leave for my husband are my bank statements, so I put them on his desk for him to have a look at them, then I'll file them myself. While filing my other letters, if he is in the room, I show him the bank statement and ask him to have a quick look and then file them with the other letters myself. If he is not in the room, next time that I go to that room for tidy up, which is usually once a month, I ask him again whether he had a chance to have a look at it, in either cases, I file it away after a month."

The point to be emphasised here is that the position of the objects on her husband's desk indicated an action that they expected to be taken on them. Her descriptions gave some sense of expectation of action to be taken on her papers, and, in this case she started the interactions by asking her husband about them. She also mentioned that 'time' played an important part in her interactions with

her husband. She usually stores her papers away "after a period of time", regardless of her husband's action on them. Again, this underlines that this social interactions around materials is not only activated by the location of objects, but likewise time on pending objects plays a role in a way that family members start interacting with each other to store the objects away.

In the previous example, the husband had to take actions on objects, but it was not his responsibility to locate the objects to be further stored in their permanent storage. He acted as a 'checker' to validate the objects and the social interaction was happening when the objects were pending. In a similar situation, another female participant (home 6) discussed how physical situations of objects play part in their social interaction at home:

> "My partner buys magazines and brings them home for me to read. Once I'm finished with them, I leave them on the floor, so he knows I've finished reading them. They stay there, until he picks them up and put them in the cupboard. They may stay on the floor for one day or two weeks."

It is interesting to note that although she was aware of the permanent storage for magazines was the cupboard she still left them on the floor, which in this case was treated as a temporary storage. Her partner recognised that she did not like tidying up, categorising and storing things in a separate storage locations. Thus, when he saw the magazines on the floor, he knew she had finished with them and that they were ready to be stored permanently. Here we see, unlike in the previous example, the person who acts on objects, also place them in a way that is noticeable by her partner. Thus, the objects can get stored away permanently in a way that is appropriate and acceptable to both partners without the need for further interactions.

4.9 Conclusion

By considering home storages and the ways family start from tidy up to store, retrieve and clear the storage, we have seen how family households organised themselves around their storage area. The tidy up and storage part of chapter involved examples from families' intentions for storage. Whether their

intentions was to keep things, just in case they may need it in future, or pile and file up things due to lack of interest to go through them, neatness, sentimental reasons or simply keeping items to pass them to other people. They all had one thing in common, which was a constant clearance, tidying up and storing physical objects. While fieldwork examples illustrated that physical things at home are dynamic around multiple locations at different times for the various practical purposes of activities, we uncovered these physical things that participants were routinely engaged with to tidy up, store and retrieve them on a daily basis.

The data showed the efforts that family members put into storing items in their households. Some spent more time, organising, categorising objects and information, and consequently less time in re-accessing them. Some appear to refuse to make any sort of efforts to categorise items to be stored, and would rather have a very general form of loosely structured storage and they may spend more time re-accessing a required item. Some families make efforts by creating the storage practice over multiple stages of time, and most importantly in ways that are meaningful to the participants. Moreover, the factors which made re-accessing problematic and difficult were illustrated in this chapter. The examples from the fieldwork interviews show participants explanations of encountering problems re-accessing objects at home. These problems were either related to the high volume of information to be categorised and not spending enough time to organise and store them in a pre-planned way, or in some cases not having a way of categorising things at all. Sometimes, trying to re-access something led to another one being found. Also households are composed of different members, who co-operate together to maintain their storage , this could end up causing problems in re-accessing items, when the person who first deals with the object is not the same as the one who tries to re-access the same object. In some cases, the person does not place the objects back in their original or expected storage location, so the problem occurs in second time re-access of the same item for the other household members.

Storage management was another issue. It was very important to know how participants decided to clear out their storage, whether it worked by emotional detachments from items, or dates on objects or pieces of information. Finally, social interactions around stored materials were discussed, illustrating examples from fieldwork interviews to show different ways in which family members interacted with each other regarding their storage materials. These interactions varied from verbal encounters such as requests or previous arrangement between family members. Many participants explained how the physical situation of objects works as a way of interaction between partners. As storage practices involved family members constant accessing and re-accessing the materials, I was increasingly interested to investigate how families shared different things at home, and what sorts of social interactions were taking place in order to organise a family and manage a household. The following chapter presents materials from a second study which will examine shared resources at home and uncover social interactions around shared resources in different households as routines in their home life.

Chapter 5- Social interaction around shared resources

5.1 Introduction

This chapter concerns the topic of social interaction around shared resources in practice. As the previous chapter concerned storage practices that involved family members constant accessing and re-accessing the materials, I was interested in finding out how families shared different things at home and what sorts of social interaction were taking place in order to organise and manage a family and household. They would refer to *sharing* a dining table, a coffee table, kitchen's surface, a TV, a laptop, games or even a car where all households had some version of what could be called a 'shared resource'. Since these shared resources varied from a dining table to a computer, they can be shared in different ways in practice. There are multiple ways in which household members practice sharing with various intentions behind their routines. The fieldwork also illustrates that participants have to constantly deal with sharing resources while encountering social interaction problems around these shared materials.

The chapter is composed of four sections. The first section focuses on some of shared resources and their material properties which make resources sharable and useful to households. The second section explains participants' intentions for accessing shared resources at home. The third section details some of interactions happening around these resources with regards to families' routines and practices, which go beyond simply representing functional information, and become a part of the communications of a family social life. The fourth section highlights the issues which have impacts on effectiveness of social interactions around shared things. It also examines the problems around shared resources and social interaction problems around these materials, and the fifth section explores the management of shared resources and participants practices around these activities.

These shared resources present a variety of aspects of household organisation; they are so commonplace, so ubiquitous and yet so multifunctional,

that suggests any development of information technology for household organisation should seriously consider the attributes of shared resources and social interactions involved around them.

5.2 Studying home shared resources in practice

Following visiting a number of families from study one, I began to expect to be shown shared resources. As my interest developed, I developed these further to examine how families sharing practices change, how they experience problems, what makes surfaces important at home, how and in what ways people communicate around these limited shared resources, how they manage their sharing practices and whose responsibility is to manage the use of shared things. In the previous chapter family social interactions around storage materials were discussed in details. Fieldwork examples in section 4.8 described how they organise, store and retrieve items from their storage, examining the involved social interactions around these materials. Developing these further, I decided to investigate the kinds of social interaction that occur in home life around shared resources. Also, in the process of observing families, I noticed that many appeared to have similar routines for sharing resources. These similarities and differences were discussed during interviews and are presented and explored in the following sections. In the process of spending time and observing families, I noticed that sharing practices are often managed by cohabiting adult partners who use different methods to share things around the house. It was the range and variety of these methods that seemed specifically interesting for investigation. The fact that all the families that I interviewed were using age-old techniques, such as first come first serve rule of thumb to share resources, such as a laptop was also intriguing. Because my intention to study household organisation and sharing routines was with an eye towards informing design of technology, trying to figure out the appeal of sharing limited resources seemed a good place to start.

5.2.1 Shared resources and material properties

The shared resources' location and usage within the home tend to share common features. They are usually placed in the most sociable area and become a

type of focal point at home. The routine use of shared resources such as TV, dining table, kitchen worktop, laptop, desk to name but a few, shows that they are regularly accessed by family members. The use of these shared materials for tidying, storing and retrieving objects means some shared resources' surfaces are seen regularly and sometimes nearly continually. There are also several literatures on the use of surfaces, especially with regard to their shared attributes (e.g. Malone, 1983; Crabtree and Rodden, 2004). Their common-sense view is that surfaces (desk, table, shelves, filing cabinet, and kitchen's surfaces) are associated with their success in sharing activities, and more generally with everyday routines.

After visiting a number of families, the uses of surfaces were discussed with me as shared resources. Based on this, I decided to look into just what it was about surfaces that made them so popular for families. The following examples from the fieldwork give some sense of how families build upon these material features of shared resources. The first example (home 3) concerns a family routine, and describes how spreading books on the dining table (used as a shared resource) is an inevitable consequence use of the table, due to its location. In an interview, going through the photographs taken of her shared resources, the mother of two explained how her daughters shared the dining table (see fig 5.1):

> "They share the dining table in the lounge, which is next to a piano. The children use it to put their music books when they want to practice. They play different instruments. They have a stand to spread the books on it, but sometimes they need to spread the books on th e table for music."

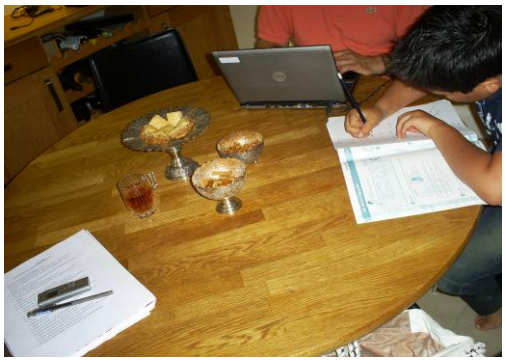
a **b** **c**

Figure 5.1 Shared surfaces

In practice, it is the actual location of dining table (next to piano), which draws the children's attention to it, storing their books on it, allowing them access and re-access them continuously. There are a few points to make here. First, *placement* works as a factor that makes the table-top an easy to access surface for children to place their notes and books on it. Second, the *material properties* of the table and its' *affordance* make sharing possible, thus the surface becomes a predictable significance of its use.

There are several literature on affordance with a rich history in HCI (e.g. Norman, 1988, 1993; Gaver, 1991; Sellen and Harper, 2002; Dourish, 2004). Norman's study (1993) has made considerable use of the concept affordance in his work on design and interaction in both the physical world and the world of computer interfaces. He has shown how good design can make the appropriate use of a device clear to a user. Later, Dourish's work "Where the action is" (2004) defined affordance as a three way relationship between the environment, the organism and an activity. In a revealing ethnographic study, Taylor and Swan "Artful systems in the home" (2005) have also considered the material qualities of informational artefacts in the home and how these qualities lend themselves to afford particular uses. Similarly, this research emphasises on these qualities of materials at home which makes them sharable by family members.

In the second example (home 6), the orientation of objects in space and the affordance of the surface support the dining table's use as a sharable resource (see fig 5.2). In describing the arrangement of the materials placed on it, the mother explained how the table is shared by her two sons and her husband, and sometimes by all four of them:



"We all kind of take chunk of it, David (husband) plugs the laptop in the wall behind, he seems to use it for catching up emails form work, sending emails, watching horseracing. Sometimes, the boys do their homework here. Sometimes we eat here, when we want to chill out and relax. We eat here if we are not in a rush, on Saturday night; share a bottle of wine, that sort of things."

Figure 5.2 shared surface orientation and affordance

The following example (home 7) concerns a family sharing activities and the mother of two sons (aged 16 and 18) describes the way her children share and play games:

> "My sons also share games. The games today is good, if you're playing a game you can save it and then someone else can use it and save it for himself. At first they didn't know that and they were arguing, but now they know it and sharing it. Now they have a memory card, so they put it on the memory card and they can come back to it later."

We see that her children share the same game, using a memory card to save their progress on it. Having said this, the mother explained that when the children were unaware of using a memory card they experienced trouble sharing the game. What is relevant here is that by using a memory card, sharing a game becomes more manageable in their home.

This section demonstrated examples of material properties of shared resources; showing how these surfaces were continually evolving due to many reasons, such as their placement, material properties and affordance, which were detailed in the above examples. Other resources were also examined during home interviews, for example sharing a game and its material properties in one of the households were overviewed in the previous example. All families that I studied practiced sharing information and physical objects using different methods. The fact that all of them had intentions for sharing was intriguing, which led me to

examine these intentions behind their sharing practices. The following section focuses on participants' intentions for accessing shared resources at home.

5.2.2 Intention for accessing shared resources

There are different ways in which household members access shared resources having various intentions behind their routines. The fieldwork illustrates that participants have to constantly deal with accessing and re-accessing limited resources that are shared at home for different purposes. The first example (home 2) concerns a family sharing a kitchen space and surfaces and describes how the normal use of the kitchen is intertwined with other family activities. The mother has to take one of the girls to school and the younger one to nursery three mornings a week, and organises events and social activities for them. She explained that the kitchen is the hub of their house and she has to coordinate multiple people, tasks with routine activities (see fig 5.3):

> "Basically the hub of the house is the kitchen. Whenever we receive anything it comes to the kitchen. My diary is in the kitchen, next to the phone. When I receive letters, they go directly on the kitchen surface. Also the children's homework goes straight to the kitchen on the surface, their painting and drawing. Also, I have a notice-board and I put a lot of things that the kids do. In terms of sharing a space in the kitchen, I'm afraid sometimes I have letters on it, food on it and kids toys on it as well. But the end of the day is the time that I have to clear everything up. I ask the kids to take the toys upstairs with them. If there are letters for me, I open them, or if I'm tired I leave it to the next day. We also share the kitchen table for multiple purposes. We eat at the table, painting, homework, if I need to write a letter or if I have to prepare something when guests come over, basically everything. The kitchen table is the hub, the core of the house which is constantly shared."

Figure 5.3 a,b,c,d **Sharing kitchens' space and surfaces**

Examining the layout of her kitchen, we see the kitchen is shared by several people for multiple purposes. In talking through the activities in the kitchen, the mother conveyed the sense that considerable care and effort has been put into arranging ordinary activities of home routines. She explained how sharing the surface becomes possible by dividing the kitchen into different parts, so everybody in the house could share the kitchen at the same time. Later in the interview, she discussed how sharing the kitchen surface helps to accomplish her routine tasks (helping children with their homework, cooking, etc.). For example in one of the interviews, she mentioned that she finds it easier to keep an eye on children doing homework or painting while she's preparing food for dinner. The mother's own timeline is juxtaposed with her daughters' activities but she orders them in such a way to accommodate her children's activities and thus suits everybody's needs. Here we see the properties of kitchen surfaces and the table that allow the items on them to be arranged and re-arranged in this way.

The next example (home 6) illustrates that a household member's intention for accessing a shared resource depends on the relation between the participant's purpose and the shared resources. Here we see that the access to shared resources in home 2, are of different way to family 6. In the previous example, the family's shared resources were accessed by different people in the house for different activities and based on the mother's timeline, the activities were arranged and the needs for the family members were accommodated. In contrast, members of family 6 accomplish their tasks on their own, and, to do this, they seem to find a connection between their intentions for accessing and the resource itself. Below, the mother and her son (aged 17) both described their intentions of accessing to family room (see fig 5.4):

> "[...] on top of the computer, there are shelves with household bills. It seemed logical to keep house finances and the bills near the computer. If you are on the computer and you are looking at your house finances, you can stand up and access it, without having to walk anywhere. The kids also do their homework near the computer. They can do their homework on the kitchen table or they have a desk in their bedrooms as well, but that's not a shared space." (see fig 5.4.b)
>
> The son aged 17 carried on:

"I think there is a mixture. I think I do history or geography in my room, but others, like art, I do in this sort of area (pointing to the space next to the computer), because I have to use pictures." (see fig 5.4.c)

I asked if his brother does the same, and he explained:

"Yes, he uses the space here and if he is not done he might leave it here for a day or two to finish it." (see fig 5.4.a)

a **b** **c**

Figure 5.4 Intention for accessing a shared resource

In the excerpt above, the mother revealed how participants' intentions for sharing can be accomplished under particular circumstances. She explained that they keep household bills near the computer, so they can check them on the computer. The computer is also continually shared by her sons to meet their tasks and activities requirements. Her son discussed how they use the surface next to the computer to carry out their coursework and access the computer at the same time. Here we see that, according to the family member's needs the computer is shared between the children and their parents. Later in the interview the mother explained that sharing the family computer is arranged in such a way that everybody's tasks can be achieved. She has also mentioned that sometimes depending on the importance of the children's activities, sharing is prioritised in a way that the kids can complete theirs first.

Another factor that differentiates sharing practices between two families is the impact of age on sharing. In the first family with young children, the mother had to accommodate children's needs for sharing practices, whereas, in the second family with teenagers, the children can access the shared resource according to their intentions.

Another example illustrates how sharing is done when different members of family intend to access a shared resource at the same time. Family 2 involved a father, who sometimes worked from home, a full-time mother and two young children. The mother described how the couple share the desk in the office in a situation when her husband works from home.

> "As for sharing a computer, he has his own laptop, but when he is working on his laptop from home, I can't use the computer. I have to wait for him to finish at 6 or 7 in the evening. So, when he is working on his laptop in the office, I don't even ask him. But, if it is urgent, I explain the situation to him and hopefully he says yes. It's just the surface that he's occupying, because he has his own internet connection and laptop. Computer at home has its own internet connection, so it's not the connection. It's the desk, chair and when I do something I don't want him to watch over my shoulder and when he does something he doesn't want me to hover around."

In the excerpt above, the mother reveals how sharing is done when the resource is used by her husband. Her explanation shows that the physical involvement of her husband does not allow the shared resource to be used by any other members of family, unless it is an urgent matter. If the desk is used by her husband, his physical participation with the resource shows that his wife cannot share the desk with him. .In this case possible cultural effects may have an impact about how these family members feel comfortable in each other presence in particular circumstances.

There are several points to consider from the above examples. First, that the term 'sharing resources' can serve a variety of purposes ranging from sharing kitchen surfaces to sharing a computer. Second, the data from home 2 and home 6 presented demonstrates that sharing resources allows for the multiple tasks and activities related to the home to be ordered in various ways. In the first example, the mother explained that by dividing the kitchen surface, she can coordinate her routine tasks in the kitchen alongside her children's activities to meet everybody's needs. Also, in the second example the son explained he and his brother share a family computer to complete their coursework while they use a desk next to it. Further on their mother mentioned that depending on the importance of her sons' tasks to be completed, their activities take priority to be accomplished. Finally the

third example illustrated how physical involvement of a family member with a shared resource and possible cultural background effects express how accessing the shared resource could be done in a particular situation. Here we see sharing resources specially surfaces sit well with the opportunistic creation of the organisational systems devised to manage sharing activities of the home.

5.3 Social interaction around shared resources

This section looks at interactions around shared resources to show different ways in which family members communicate with each other and make compromises in relation to their sharing practices. When multiple people are involved, it is important to find out how they cooperate and share limited resources at home. In the process of observing families in study 1, which was concerned with family organisation, tiding up things, storing and retrieving, I noticed that the adult partners were mainly responsible for this sort of organisation. It seemed to me that sharing practices were correlated with the use of limited resources in their households. Particularly, they were all giving examples of the kinds of communication taken place in the process of sharing materials. This section considers a variety of ways in which family members negotiate their sharing routines using the empirical findings. I will then argue that social interactions around shared resources perform a multitude of functions which are simple and ubiquitous by which I mean they are so imbedded, so fitting, that family members use them naturally on a daily basis.

5.3.1 Timeline and Social Interactions

This section highlights the interactions around the use of a limited resource to be shared at home. During the fieldwork sessions, the mother explained how their family shares a TV:

> "Sharing a TV is no problem, because due to the nature of my husband's job, he's not at home in the evening, so there is not a problem of having who's going to watch what, but with my son again, it's just like a routine. I let him have his own freedom to choose what

> he wants to watch, but that freedom comes in a framework. After a certain time, he can't switch it on and he can't watch it for long. Weekends are routine changes, because he's off school, but if it becomes too much, and he still asks to watch more TV I have to remind him that and it's mummy and daddy's time to watch TV, so it's an ongoing negotiation."

In the excerpt above, the mother revealed the sorts of interactions performed to share a television by allocating a time slot to her son. Here we can see that time has an impact on the way a TV is shared; depending on the day of the week, a certain 'time slot' is allocated to her son. Yet this apparently clear time allocation does not represent exactly how sharing is done, as the mother admits that on-going discussions are also involved in the practices of sharing. Thus, the communication is done to express how sharing TV should be accomplished under particular circumstances considering the day and time. Similarly, the next example reveals how the use of shared kitchen table is managed by constant interactions and time allocation.

In home 4, during an interview, the mother explained the communication procedure around the use of kitchen table for dinner. She explained that her husband uses the kitchen table to fix things, so he put his tools on the table and if it's time for dinner, the whole family have to wait for him to finish it. She explained how the interactions take place:

> "When it's dinner time, I ask him "how long more?" He says "give me 5 more minutes." After that, if he can't finish it, he has to move it from there. Sometimes he says "oh, 10 more minutes." Then we wait...I'm not very patient, so 15 minutes is max. After 15 minutes I ask him again to move them. Sometimes he says "give me 5 more minutes and I promise it'll be done". I sometimes say "OK, and I wait for another 5 minutes." but then after that, I start moving the stuff from the table myself. He carries on complaining, but I don't listen. There are so many bits and pieces, so I move them to the office. On the office desk, they can stay for weeks until I remind him to finish that."

Here is another example of time allocation and communications around sharing a kitchen table. The mother discussed how she negotiates with her husband, giving him more time to clear the table so it can be shared by all the

family to have dinner. So in home 4, the interaction routines are of similar nature to home 1. In both families mothers are responsible to manage the discussions around the use of a shared resource, whether a TV or a kitchen table. In both homes, the sharing procedure is done based on 'time' allocation and communications around this allocation. The examples illustrate how these procedures are used, and they are continually being appropriated to handle other home activities, for example in home 4, to get the kitchen table ready to serve dinner.

5.3.2 Decision making and Social Interactions

Because the resources are limited and shared between family members, discussions need to occur when two people want to use the same thing at the same time. Thus, the role of managing the interactions around these resources is illustrated in the next example. During one of the interviews in home 3, looking at a diary picture taken by the mother (see fig 5.5), she explained how a computer in the kitchen is shared between the family members:

Figure 5.5 Sharing a computer (personal items obscured as requested by the participant)

"We use the computer in the kitchen for family email. So, every night my husband and I check the emails. Also the girls use it to search on the internet. They both have computers in their rooms, but when they come home from school, they usually come here (kitchen), because they want to do their homework too and be with us. So, kitchen is the heart of the house."

In examining how the computer is shared when both of her daughters want to access it at the same time, she explained further:

> "If they both want to use it at the same time, we ask the reason. One might say "I want to play a game on the computer". The other one might say "I want to do my homework." The one who wants to play goes upstairs. If they both want to use it for homework, depends on their tasks. So I ask them what their homework is about. If the little one has to be supervised then she has to be downstairs and the older one goes upstairs. They sometimes negotiate and for example the older one says, "oh can I stay here and use the computer downstairs and Sara goes upstairs. I went upstairs last time." Then I have to say

> "No, she needs my help with her homework." And the older one might say again "but I want to be here with you, too." So it just sometimes carries on for a while till we come to a decision. "

In talking through the sharing practices, the mother conveys the sense that considerable thoughts have been put into arranging what might seem to be simple sharing routines. Through her discussion, we see how children's sharing practices and communications are managed, based on their intentions of accessing this limited shared resource at home. The mother explained that depending on the types of her children's tasks for accessing the computer in the kitchen, she has to decide and prioritise their access. Similarly in another household, the mother (home 5) explained how her family members share the coffee table and how she manages the discussions and sharing of the table, based on their expected intention of use:

> "If my husband is reading a newspaper, he leaves it under the coffee table, which then I tidy up the next day. I leave the stuff that I know my husband and the kids either read them or go back to them. If I know they are done with them, I sort them out. And to do this, I ask them, "Have you read this paper?" If they say "yes", then I take them away, and if they say "no", then I ask them: "How long more do you need?" If they say "a day or two more days", I leave the stuff where they are. Then after two days, I ask them again: "Have you finished reading these papers?" If they say "no" and I see that they have added more stuff to them, then I tell them that "the table looks messy like this. You should sort them out soon." They usually listen and tidy them up, but if they don't, then after a day or two again, I have to ask them. They either ask for more time. For example they might say, "we are busy right now, we'll sort them out later", or they might just say that they have finished with them, and then I take them away myself. "

Here we see how the female partner discusses the use of a shared resource with her husband and two kids by asking whether they have finished reading the papers. Later, in the interview she explained that she has to ask them (her husband and two sons) the reasons for keeping their papers on the table and as long as they need to refer to the papers and the coffee table does not look messy, they can keep their stuff on it. Here, we see considering member's intention of use, the interaction is managed in such a way to accommodate her husband and children's activities.

5.3.3 Social Interactions around alternative use of a shared resource

The previous section has focused on how various kinds of interactions and solutions are "done" to arrange family members' access to shared resources. Sometimes, however, compromises and efforts involved in creating options for sharing activities can result in less conflicts and better sharing practices. In the following excerpt from home 3, a mother describes how she makes compromises and provides options to her husband, so both of them can share a program on TV:

> "Lets say my husband and I want to spend time together, watching TV. I put the kettle on and take some tea with me to the room and he is already on a channel that I don't like, so, I say "Oh, honey, can we check to see what's on other channels?" so he checks the other channels and goes back and I say "Well, lets see what's on the next one." He goes through a few more channels and he realises and say "oh, I was watching my program." And I say "Can we watch a bit of this, now?" the he says "Ok," and we do, so, I think with adults it's the matter of compromise. With children you can just say no, but with adults it's the matter of compromise."

Her description gives some sense of how she offers various options to her husband to select a TV program, so, they can both enjoy watching. Through her discussion, we see that a good deal of forethoughts can be necessary to provide enough options to her husband to arrange sharing a TV program with him. If she thinks the options are not enough, in this case after going through some TV channels and not finding an interesting program to share, she asks him again to try and skip through more channels in the hope of finding something to share which works. In this particular case, as she mentions it is also, the factor of "age" that makes compromising work well in sharing practices.

Similarly, in home 7, a mother of two teenagers, aged 17 and 19, explains how her sons share the TV, giving options to each other and making compromises around these options:

> "They sometimes want to watch different channels. They start to fight at the beginning, but at the end they compromise. They come to think about options that they have and for example the older one says "ok, you can watch this now and because it is on SKY, I can record my movie and watch it later." However, at times, things are not solved as easily as mentioned, so this becomes an ongoing negotiation by giving more options to each other.

> Sometimes for example the older one says "If you let me watch this, I'll let you borrow my Nike Tshirt." Then the younger one says "ok, but can i use your laptop now?" the older one might say "ok" or sometimes he might say "no" and this can carry on until they come up to a solution that suit them both."

Here, we see that the son's talking is doing more than simply negotiating what needs to be done; due to sharing collaborative features of TV programs, they compromise by providing options to each other which makes sharing practices work better in their home life. For example the older son let his younger brother watch his program, and records his program to watch it later. Thus, both sons do not miss out on anything the TV system has to offer, and as a result sharing it will not cause any problems, as social, collaborative and interactive TV formats and systems are designed to meet the needs of multi-users. Any development of interactive technology for household sharing should consider supporting social and collaborative functionalities in order to satisfy family members needs regarding sharing. An example of this time shifting resources through digital media allows limited shared resources to be 'multiplied' and make less scarce as a resource.

From the above excerpt, we can also withdraw that in this home similar to home 3 interactions are sometimes happening by her sons providing further options for each other, in which sharing a resource work better in their home life.

5.3.4 Reminders and Social Interactions

The sense of artfulness, as well as the importance of social interactions is further illustrated in a reminding practice adapted in some households. During one of the interviews in home 6, the mother of a teenager described how she reminds her son to clear a shared space:

> "My sons bring things to the kitchen all the time and they can stay there for a while, but if the days go by and they don't take them away and couple of more things come, then, mum gets angry and words have to be said, like "aren't you going to take your football with you?" he says "I'll take it upstairs on my way up." I keep reminding him, till it gets through. So, next time when I see the stuff in the kitchen, I say "When are you going to take them upstairs?" and he says "in a minute" and he forgets. So when I see him going

upstairs again, I say "Darling, take these stuff with you, please." And then he says "Ok" and takes them with him. "

In the excerpt above, the mother notes that when her sons bring a lot of things to the kitchen, she gets angry, and asks them to clear the kitchen. Here we see that reminding is not only about the work to be done, but artfully and simply expresses how it should be accomplished. It is interesting to note how a shared surface in her family can be used for a short period of time and if the surface gets overloaded, then she has to use her reminding practices to ask her son to start clearing up.

Similar to the above example, in family 9, a mother of two sons aged 24 and 26 explained how she uses her reminding methods to manage access to a shared resource.

Figure 5.6 Sharing a TV

"My sons know what I like to watch on TV, which is usually 2, 3 times a week and when it gets to 10-15 minutes before the program, I say "Oh, my God, that's my favourite program." That works as a reminder to them. Sometimes they seem to forget and then I have to remind them and say "I think the program's started." Then they usually say "Ok" and change the channel and sometimes, they say "only 5 minutes of this is left." And I say "Ok, I'll wait darling." And usually they change the channel to my program. So they go to my bedroom and watch their program in a small TV there. I guess they respect me, let me sit in front of a big TV and be comfortable. Sometimes one of them sits in the corner and watches football on his mobile."

This excerpt underlines another example of reminding methods around sharing a limited resource. The mother discussed how she has to remind her sons, giving them time to change the channel to watch her favourite program. She explained that she uses an implicit reminding method to share the television with her sons, in such a way that they make the shared resource available to her. From this example, we see how the reminding practices can work with sharing activities, because reminding methods can be created and tailored to suit family

members' needs. Here, the age of children (24, 26) might have an impact on the reminding practices to share the TV in a way that meets their mother's need.

5.4 Problems with social interactions around shared resources

The previous examples have focused on a variety of interactions that occur in home life around shared resources, and how social interactions and sharing practices, enable the opportunistic design of sharing practices at home. In the course of collecting fieldwork about shared resources, several participants explained the problems their family members had accessing shared resources at the same time. This has proved fruitful to explore these. There is also a common approach in the CSCW and HCI literature to examine breakdowns (HCI calls these 'system failure analysis'). They give insight into normal operating procedures when the methods used are not extensible to all situations, and also about the resources that people bring in to fix them. Therefore, the following sections describe problems participants encounter whilst sharing resources and the materials and practices they apply to overcome these problems. The first section will focus on some of the problems participants have using the shared resources at the same time. The second section highlights social interaction problems around these shared resources.

5.4.1 Problems with sharing resources

The following examples from the fieldwork give some sense of how families experience sharing problems. The first example concerns sharing a laptop. The laptop is owned by the wife but also shared by the husband with the wife using it mainly to study (home 1). She explains on-going discussions when problems occur sharing the laptop:

> "We have problems using a laptop. Sometimes, it's late in the evening and I need to go online to research for my study, then I have to prompt him to finish his work. Sometimes we might end up with nothing serious, but conflicts like I say "oh, can't you do it tomorrow?" and he says "Ok, I'm going to finish it now, give me couple of more minutes." Then he carries on and I have to ask him again "I need my laptop to study." And he says "Ok, wait a second please. I'm nearly done with it." He sometimes hand it to

me after that and sometimes I have to ask him again, So it's an on-going negotiation and we have to solve it. It's an on-going process all the time and I normally have to wait."

The wife's descriptions give some sense of difficulty in sharing a laptop if both the husband and wife, want to use it at the same time. She made it clear that she has to ask her husband several times in order for her to access the laptop. We see that *time* is a key factor that limits sharing use of the resource, and how family members constantly struggle when accessing a shared resource at the same time. Since the task he was undertaking was not reported by the wife in our interviews as being seen to be particularly important, it is likely that gender effects and their cultural background may also have an effect on sharing the laptop in this household.

A second example involves a family (home 3), where the parent of two daughters has to make the decision once children start complaining about sharing and therefore parents should assign a shared resource to the right person. Unless she notices the first sign of conflict, she does not get involved:

"Once we finish our dinner, then they decide to play piano, so I ask who want s to play first and usually the little one says that she wants to go first, so she goes first. But if both of them want to use it at the same time, I have to ask the reason why. If the older one wants to practice her homework I ask the little one "could you please let your sister go first?" In this case, the older one practices for 15 minutes, then the little one goes for 15 minutes. Then if it takes longer the little one says "it's taking longer" and I have to ask the older one to let the little one play and she can carry one after her sister goes to bed. Usually, once the little one complains, I'll say something. I have to explain to older one that her sister's been waiting for a while and older one is sensible, so she listens."

In examining the excerpt, we can see that the possibility of *accessing* a limited shared resource by two people at the same time can be restricted and it is interesting to examine how the mother accommodates the children's sharing activities by providing alternative options for them. In this example as with many other examples from home interviews, time allocations to members of family are used to give some order to whom gets the "priority" accessing a shared resource at

home. In describing prioritisation of the use of shared resources, parents explained that there are on-going "time" negotiations for the use of limited resources at homes, by allocating time slots for sharing to their children.

A third example from home 6 illustrates the situation in which members of family are all engaged with a shared resource, but due to interruption by one member of the family, one has to stop using it. In discussing problems with sharing, the mother explained a situation, where both of her sons were using a dining table and one starts to interrupt:

> "The worst case is going to be when one is trying to concentrate desperately and the other one starts talking about football. Sam: "Did you know what happen in football today?" Mark: "Can't you see I'm concentrating hard here?" And if the person who is making the noise doesn't calm down, one of them has to walk away. If it goes on for 5 minutes then we say, "come on, what's going on?", sometimes they might listen to that and come to their senses and another time if they usually made up their mind, then one of them might walk away, calm down and then come back. If they can't decide who should leave, we ask the one who is messing about to get out."

There are several points to make here. Unlike the previous examples, accessing a shared resource does not seem to be a problem here, since the table can accommodate more than one family member. They start experiencing problems when one of them starts interrupting the other one. In this case, if they are unable to sort it out between themselves within a short period of time, and a warning from parents does not resolve the problem, a parent in charge enforces the use of the resource to end the problem. Therefore, this can prioritise the child who is focused on his task. In describing the problems with sharing resources, the mother explained that the difficulty with the shared resource occurs when two people are in the process of sharing a resource. Thus, here we see that accessing a shared resource is not the only problem people may encounter at home, but conflicts may happen in the *process of sharing* the resource. This attribute of shared resources may be seen as an opportunity for designers of domestic technology to consider organisational and social challenges of home environment when designing a technology to improve home sharing practices.

5.4.2 Social interaction problems

In discussing routines regarding sharing resources at home, a number of aspects related to social interactions came to light. During one of the fieldwork interviews in home 1, the mother described how she organises the dining table. She talked about an on-going conflict between family members with sharing the dining table. An illustration of this is evident in the following excerpt from a mother describing her interaction with her husband (see fig 5.7):

"Sometimes it's a non-verbal communication, like with papers. He puts them on the dining table and tidy them up and he put them back on the table and I tidy them away. Because, when I come home from work and see the untidiness, I just want to tidy them up and I don't like the fact that if he puts the papers on the table, he does that for a certain reason. I just want to tidy them up and put them away and sometimes it gets on his nerve. Because, he thinks when I put them away, he can't see them and he can't deal with them. So, he spread them on the table again. Sometimes he gives up. Sometimes he nags. Sometimes I might leave them for a day or two, but organise it differently. Put them away nicely, tidy up a bit and it's an ongoing conflict. Because we can't come to a decision of how he's supposed to do his paperwork. I tell him "when you finish with them for a day, put them away." He likes to see them on the table. He likes to see all of them."

Figure 5.7 Centre of conflicts

This excerpt underlines that the dining table and the physical presence of the objects make sharing problematic, due to the involvement of other family members in this household. Here we see how the wife explains issues around sharing the dining table. The non-verbal communication for sharing resources highlights some problems with sharing in this household. Although the physical appearances of the objects on the table show that they are in use by her husband, the wife acts on them by positioning the objects to satisfy her tidiness standards.

Another interesting point from this home (and the other examples) explains that most participants rather keep all their working documents in a place to go back to and act on them. They mentioned this later in interviews that they find this method helping them process their documents in a more manageable way as they seem to forget them if they are not set in a visible way. This leads us to another quality of paper, that is, the visibility and longevity (see Sellen and Harper, 2002). The example from this household shows that the father spends more time in doing paper work, leading to occupying the shared table more often, which results in conflict between them.

The next example (home 4) raises another interesting feature, involving time allocation by the mother. Although the appearance of the kitchen surface may not look satisfactory to her, she asserts her authority to pay no attention to children and her husband to share it for a short period of time. She explained:

> "The kitchen surface belongs to me, all of it. I made that clear to everyone. But, I still have to scream and ask them to come back and pick them up. My husband is the worst. He comes home, he comes to the kitchen and he puts whatever he has in his hands on the kitchen worktop. I always have to pick them up and put them on his desk in his office. Because, when I ask him to take his stuff, he ignores me completely. If I'm cooking I'm not bothered, but after 9.00pm, the kitchen has to be spotless clean, before I leave it and if he hasn't taken them to his office by then, I put them away and he hates me touching his things."

Similar to previous household, the mother complains about the untidiness as a result of social interaction problems. This leads to a conflict in this household with regards to using limited shared stuff at home. Here we see that dislike the mother's wish the kitchen surface is used by all family members all the time and she needs to remind them to remove their physical objects from the kitchen.

The following example (home 4), also highlights another interesting issue of social interaction problems when sharing a laptop. The mother of two explained that her laptop is shared between her children and herself. She talked about the process of sharing her laptop with her children (aged 8 and 11):

> "The children both have laptops which are both broken. So, three of us have to share a laptop. We have two computers downstairs; one in the office and one in the toy room. They don't want to use the one in the toy room, because they get stuck, they want to be mobile. So, we fight; three of us, over my laptop. They have to do a lot for me before I let them use it. They have to work for me. For example I ask them: "Have you done your bedroom, if you want to use my laptop?" and little jobs that I can get out of them. For examples, if they have sorted their book bags, their lunch boxes and sort of things. Then, whoever asks first get to use the laptop, unless one of them needs to use it for their homework. In that case I give the laptop to that one right away."

We see that by asking children to finish some tasks and activities, she plays her parental part to physically control the laptop. Relevant here, is the fact that by asking children to do some tasks, she facilitates a method that allows a mechanism for children to test out their rights, in this case, to finish what they have been asked to do before getting the chance to access a shared resource. Thus, we see that her practice is doing more than simply allowing an access to a shared resource. It is also a resource that allows her to negotiate specific family routines and values. So, the fieldwork examples demonstrate how family members faced problems accessing shared resources and revealed how these problems varied and continually evolving due to a host of reasons detailed in the above examples.

5.5 Management of shared resources

Building on the nature of sharing and the importance of it in everyday life, the features of sharing and the on-going access and re-access of shared resources make it a site when relations within the family can be negotiated. This section of chapter considers a variety of organising routines for the home. In the course of collecting fieldwork about sharing, several informants explained methods that they use to manage the use of shared resources in their family. The following examples from the fieldwork describe how several mothers use different practices for organising and managing the use of limited shared resources.

5.5.1 Surface allocation

There are many ways in which household members manage the use of their shared resources by allocating a surface to family members. The first household in the study composed of a mother, a father and a child. She explained how she tries to be fair in sharing different resources with her son:

> "We share the fridge surface. I've divided it into two. The bottom bit belongs to my son. I let him put his drawing, his magnets or whatever that he wants. And I use the upper area, on the side and front and my husband doesn't use it."

In this home, like many of the other ones, the mother seems to play her parental part into giving authority to her son to use the kitchen surface. We see that by dividing the surface into two, she makes the resource to be shared in a better way. Similarly, in home 2, the mother allocated a part of the kitchen surface to her daughters' activities. She explained that she has divided her kitchen surface into different sections. She went over the photos taken by her to show how the kitchen work top is shared between her and her two daughters:

> "I use the work-top, which is next to the kitchen entrance, to pile up letters, homework, painting and things like that. There is a microwave there, which I put some of the painting that I'd like to keep for the children, but don't know when I'm going to file them; but, I keep promising myself that at some stage I have to do it. There is a small part in the kitchen that is given to children for their painting and drawing. They keep some paints and papers in the kitchen."

Examining the picture (Figure 5.3), we see that, the mother takes control to divide the kitchen surface into sections. In a similar way to home 1 with the fridge surface, the physical layout of the kitchen surface in home 2 also shapes a method where the sharing activities between family members are managed and organised. Therefore the mothers' own sharing activities is managed with her children in all families.

Having said this, the next example illustrates that this surface allocation is not only confined to manage sharing resources between mothers and children.

Some of the participants explained how dividing the shared surface into sections for children make the use of a shared resource more manageable. In home 4 the mother of two children (aged 9 and 12), describes how space allocation is 'done' to organise sharing of the kitchen table:

> "The children use the kitchen table to do their homework. We have a round table and I ask them to sit with one space, so they can't reach with their feet underneath the table. Then I start cooking and they know if they start to mess about, I will take one of them to the other room."

So, in this case, the parent takes control to divide the table between her children, leaving a space between them, so they can not disturb each other. Furthermore, the mother also explained how she arrange her activities in a way to suit her routine actions (cooking), while her kids can share the resource at the same time. Examining the above examples we see that participants make choices to structure their surfaces and divide them into multiple areas with the physical boundary between these areas (children sit on the table with one space) to make sharing the surfaces more manageable.

5.5.2 First Come First Served

The previous examples have focused on how shared resources are managed by parents to arrange family members' activities and how features of surfaces, in particular, enable them to manage various tasks by different people at home using different methods. Sometimes, however, there is not enough space on the shared surface to be divided between participants, and the shared resource can be used on the basis of a 'First Come First Served' rule of thumb. In the process of observing families and going through pictures taken by them, I noticed that many participants who were interested in sharing a surface to carry out their activities, would rather use the shared surface one at the time due to the lack of space. The following example, (home 6), a mother of two teenagers aged 13 and 19 shows how the kitchen table is shared based on a first come first served basis:

> "Sometimes four of us, share the kitchen table. Generally, the person who comes last, would have to compromise and he might end up putting his paperwork on the floor, because he is the one who came last."

The mother's description gives some sense of the difficulty in sharing a shared surface by all members of family. She made it clear how the lack of space made them compromise, sharing the surface, based on first come first served order. Similarly, another family (home 8) shared the dining table, and the one who can access the resource for various tasks at first, has the right to finish her/his activity. With this family, like many others, it is the practice they create for sharing, and not only the shared resource that makes family members access sharing a resource. Home 8, composed of a mother who is a full time student, her husband who runs a car dealership from home and two young children aged 2 and 6. In the following excerpt she describes how they have a method to manage both her personal and study activities and her husband's personal and business activities, on a first come first served basis system:

> "If I am the first one who's spread the papers on the table, my husband has to use the sofa to spread his papers instead of the table and vice versa." (see fig 5.8)

a **b** **c** **d**

Figure 5.8 Sharing a dining table to spread mix objects

A first come first served rule of thumb here is applied to their sharing practices. Thus, what we see here is that a first comes first served method is used to manage the disparate activities of the home (see fig 5.8), so the table can be used by either partners to accommodate their needs.

5.5.3 Compromises

During the fieldwork sessions in home 6, the mother explained how she applied a method for managing the use of shared resources between her children. This role of organising children's activities is further illustrated in the next

example. In their family, a mother of two sons aged 9 and 12, describes how it is her who is responsible to manage the use of a shared resource. She encourages her children to make compromises their access to a shared resource. The following is a discussion between her and her sons who get into fight over sharing a computer:

> "They both went upstairs to use the computer. They were playing peacefully, then after half an hour I heard shouting and screaming. "I was here first." "No, I was here, first." So, obviously there was a fight. I went upstairs, asked them what was going on, and what we could do to solve the problem. They couldn't come up with the solution, so I had to come up with the solution. "Which one of you wants to go on the play station?" Obviously no one. Of course they both wanted to use the computer. "Who wants to go on DS?" None of them wants that either, so I say you either find a solution to play nicely together or none of you gets to play. You either take turns for 5 or 10 minutes or I turn it off. That way they started sharing it nicely."

In the excerpt above, the mother reveals how the compromise is done around a limited resource, when her children both want to access the resource at the same time. Her explanation shows that making compromises can result in less conflicts and better sharing practices. This process reveals how the compromise practices manage the sharing routines at home. By applying a set of compromise methods, she explains that she provides options to her sons, and they recognise that they have to either make a compromise to access the shared resource one at a time or none of them will be able to access it. From her description, we get the sense of the compromise practices in a family life to accommodate the children's activities.

5.6 Conclusion

In this chapter, I have drawn a number of representative examples from the fieldwork which illustrated how family members share limited resources. The material properties of shared things and participants intentions for sharing were discussed in a great detail. The example have also served to reveal the ways in which parents take on main role of managing the use of shared resources, initiating and developing methods to organise sharing routines at home.

The key to the presented findings is the part a family's sharing practices have in shaping the social interaction of home life. The findings have been used to suggest that homes' sharing methods are through accomplishment of its social interaction activities. Moreover, it has suggested that these practices are afforded in different ways. It is this point which is seen as a crucial issue for the designers of information technologies at home. From this, my argument has been that home-based information devices should be built with careful thought given to how their form and use might lend themselves to particular sharing practices and in turn, what parts these methods might have in constituting a homes' social interaction activities. The following chapter summarises the key findings of the two studies undertaken in this thesis, and provides design relevant materials by focusing on the importance of objects and information that are arranged and organised in places like home.

Chapter 6- Synthesis, Reflections on Design and Implications

6.1 Introduction

The aim of this chapter is to synthesise data from the two studies, based on the findings presented in chapter 4 on tidy up, storage and retrieval and chapter 5 on social interaction around shared resources. Both studies aim to extend the thinking around design by discussing some broad implications. This chapter is composed of five sections. The first section includes concerns how domestic technology design might be made insightful to the distinctive qualities that make up home life. Design relevant materials from the data are picked out in the third and fourth sections respectively. The fifth section reviews existing storage systems, such as warehouse technologies, comparing their common functionalities with the home, but do highlights problems with these technologies are discussed. In final part of this chapter critical points for designing domestic information technologies are presented.

6.2 Design 'Methods'

The early ethnographic studies in the CSCW literature provided useful insights of the social aspects of work and the use of technology in cooperative work settings such as a control rooms (Heath and Luff, 1992), and research laboratories (Harper, 1992). While ethnography has demonstrated its usefulness in these studies, how the use of ethnography might influence the design process in general was rarely discussed. The relationship between the ethnographers and designers in the air traffic control, for example was the beginning of the work towards how ethnographic study and analysis could be placed within a system design in a more structured manner (Hughes et al., 1994). Later studies were concerned with the issue of communicating ethnographic analysis to designers by structuring the findings from fieldworks (e.g. Hughes et al., 1997). Work on presenting ethnographic studies in this way tried to reveal what was found to be

the most relevant to design. The framework was intended to be used by ethnographers to structure their reports to make them more useful for design, and focused analysis towards *distributed coordination, plans and procedures,* and *awareness of work.* Nevertheless this work still fell short of fitting in with the day-to-day practice of systems designers (Viller and Sommerville; 1999, 2000). They have addressed this issue and presented their integrated approach called *Coherence,* with a particular focus on the support provided by ethnographers. The Coherence approach supported the analysis of a problem situation using Unified Modelling Language (UML) and use case driven analysis to describe social interactions. Coherence was intended to improve the understanding of social aspects in requirements specification produced as a result of the everyday work of software requirements engineers. However, despite its apparent benefits, there are problems with the Coherence method with regard to supporting this thesis. For example, the Coherence method appears suited for understanding systems with *fixed* procedures. However, in designing for home organisation systems technology, there are many different patterns that need to be considered and accommodated by designers.

More recently, Dourish (2006) argued that a bullet list of design implications provided by an ethnographer is not the most appropriate method:

> "Ethnography provides insight into the organisation of social setting, but its goal is not simply to save the reader a trip; rather, it provides models for thinking about those settings and the work that goes on there. The value of ethnography, then, is in the models it provides and the ways of thinking that it supports. Ethnography has a critical role to play in interactive system design, but this may be as much in shaping research (or corporate) strategy as in uncovering the constraints or opportunities faced in a particular design exercise." (p.549)

Here, Dourish (2007) explains that profound implications for design can go beyond the list of features that are often requested, where such lists minimise the more radical implications that may be caught up in ethnographic work. His

argument was that ethnographic contributions should not be judged on the addition of delimited implications for design.

The aim of this chapter is not to go beyond the general problem of translating ethnographic materials into broad design implications, as this is a problem beyond the scope of this research. The purpose of this thesis is to establish and better understand what family members do to manage and achieve their routine activities at home. The results from both studies illustrate how tidy up, storage and retrieval are a particular interesting instantiation of household organisation, involving constant usage of shared resources, arrangement and object sharing. My purpose is to extend the thinking around the design by drawing out some critical points for design. Because fieldwork focuses on uncovering the routines of home life rather than identifying a series of set tasks, the identification of explicit design implications was never in the question in the first place. More generally, the movement from ethnographic engagement to design practice is an imaginative move rather than translation of empirical evidence into design facts (Dourish, 2007). Therefore, my intention here is to illustrate how domestic technology design can be made sensitive to the specific sorts of qualities that make up home life. Finally, we sought to provide critical points for the design of home interactive technologies to consider the attributes of storage systems, shared resources and social interactions involved around them. The following section recounts and synthesises the most important findings and design relevant materials from chapters four and five. Each finding can be used to help inform the development of future home organisations technologies.

6.3 Home storage practices

The first field study in my PhD research concerned the home storage in practice. The findings suggested that storage does more than simply including a variety of household objects; rather, by the act of tidying up, other functions are called into play around storage practices in different homes. The fieldwork focused on understanding the practical accomplishment of a home's social interactions more than detailing its functional requirements. The study covered

tidying up and storages at home, looking at various family members' intentions and practices for storages at home. Related to this, we addressed members' intentions for re-use and the problems that they faced in re-accessing the materials. It also overviewed the material properties of storage objects, storage materials and storage media. Using examples drawn from the fieldwork, we illustrated informants' reasoning for choosing particular storage materials and media and discussed how the properties of items to be stored have impacts on their selection of storage media. The presented findings also detailed discussions around the members' perceived effectiveness of storing and retrieving materials, giving detailed examples of how factors such as time, space and emotion influence the effectiveness of their storage practices at home, from clearance practices to storage methods. It discussed storage management, illustrating how families manage and discard items from their storage at home. Finally social interactions around storage materials show different ways in which family members interact with each other in relations to their storage practices. The following issues are presented to reflect the value of detailed fieldwork of home life for designing domestic information technology.

6.3.1 Tidying

All families studied practiced tidying and storing physical objects using different methods. The fact that all families interviewed were using age-old techniques to tidy physical objects around the house was intriguing, so, I tried to identify the appeal of tidying mixed objects. One of the findings from the fieldwork on storage was that household members, in their day-to-day routines, often created easy-to-use techniques for tidying their physical 'stuff'. By tidying, they created easy-to-access places to store their stuff informally. A key feature to these types of places is that they allow family members to place mixed objects in a variety of forms to suit their needs and activities relating to household organisation. These places require minimum effort to use, which is their key factor to be accessed by participants on a day-to-day basis, where families find tidying difficult due to lack of interest in non-ending tidying and presence of other competing priorities in their lives. They therefore often devise simple techniques

for tidying their physical stuff and information. There is also a rationale behind their easy-to-use techniques; one of the findings from the fieldwork was that family members sometimes tidy up to store objects on temporary basis in order to pass them to others, so they create easy-to-hand places to store this material and again these places, given the temporary character, necessitate minimum effort to use and create.

In contrast, by considering the PC, we can see that the PC performs different functions on various formats, such as digital letters, photos, videos, and so on. However, the way the PC handles digital data contrasts with the minimal effort, practices and storage limitations afforded by surfaces, boxes and drawers. Surfaces, boxes and drawers are seen as a 'lightweight' method which is easily adapted in the home to store, access and re-access physical objects within them. While the PC is better suited to the storage of contents that requires highly focused interaction, these sorts of activities are often not appropriate in family home in daily life and across non-digital materials. Thus, designs that allow for easy storage and require minimum effort to use are likely to be appropriated in family homes.

6.3.2 Making Place for Storage

Drawing together the fieldwork in chapter 4, *Sorting thing out* (Bowker et al., 1999) and a project on clutter, *Digitally Augmented Bowl* (Swan et al., 2007), we can also suggest that by configuring classifications, householders are *producing* place. People's understanding of place is by product of how they conceptualise and practically group things in the world. This is particularly relevant in the domestic realm, in the ways that people classify stuff are integrated to what homes look, feel like and become special to householders. One of the particularly important findings from the fieldwork on storage was that household members often stored mixed objects based on their informational content and projected future use. Family members also revealed how they stored objects based on visual factors to keep the house tidy and for this intention they made place for storage. For example a mother (home 3) discussed the way she cleared her son's

unwanted clothes in his wardrobe. She explained that she did not want to see her son's unwanted clothes in small bags around in his bedroom, so she had to hide them in the cupboard for a while to make her son's wardrobe look neat and tidy. This is of interest for design as it combines the processes of classifications and people's shared and negotiated ideas of place. In contrast to the idea of storing placeless information or objects, it would seem that classification and place are tightly bound together. From fieldwork findings we could see that when families move house, they carry over their classification systems, so even though the location changes, the place does not. Designers of home technology should be aware of considering technological visions that promise complete classification for families or no classification at all. Electronic sensors and tags that inform people where things are can be seen as technologies to be designed with sensitivity (these technologies are discussed in section 6.4). Instead, we should be considering how we might give the digital, physical attributes so that it can be grouped, stored, accessed and re-accessed and so on in our material homes.

6.3.3 Places for sentimental objects

One of the findings in chapter 4 demonstrated how family members stored objects that have sentimental value to them, so those things are more than just functional objects. All of householders created place to keep sentimental stuff with links to their personal or family history. Peoples' mechanism is allowing things to remain loosely classified in boxes, bags, surfaces, envelopes and so on. This thesis extends the importance of sentimentality to show how it is enacted and used as a constraint on storage routines- how it is a problem for users; a problem that they may not always want to go away. The way these sentimental objects are placed together effects the boundaries of ordered and disordered, functional and non-functional, even sacred and profane. The value these points have for designers of technology is to consider how they might provide material space for sentimental objects with a measured tolerance to disorder.

Places for sentimental value objects might also inform other design possibilities. As mentioned in chapter 4, storage media allow for a movement

between an objects' conceptual states. This juxtaposition is in part what gives rise to the possibility of things moving between categories, simply by its physical placement. For example, from the findings in chapter 4, in home 1, a mother of two children explained her reasons for storing her children's first outfit, to present them in a box and pass it to them. Here, we see how an object can move from questionable to sentimental value by its physical movement. In this case, the baby's first outfit moved from a functional status in storage (wardrobe) to a non-functional box of sentimental value objects. Similarly, we have seen how sentimental value objects can be discarded over period of time. In home 3, a mother explained how she stored her sentimental objects (stuff from her childhood, letters and pictures) in a box under her bed and the box stayed there for years: as the selection of sentimental objects became bigger over time, she decided to discard some of them, due to her emotional detachment from them. What the key here is that people have material sites which allow things from different classifications to move between states, or simply sit in waiting with no immediate interest. The designers of computer and technology should therefore reconsider these ideas of instability and lack of interest in a way that is closer to how homes are lived in.

6.3.4 Time, Space & Emotion

The fieldwork demonstrated several factors that affect the efficiency of storing and retrieving physical objects. Several participants discussed issues that resulted in *not* being able to follow their intentions to store things away. Despite a very clear plan that most householders had in mind, most of them were unable to categorise some objects and store them the way they would ideally have intended to, and consequently they often encountered problems re-accessing these materials. Furthermore, fieldwork showed that most participants encountered problems with lack of space and interest as they decided to spend time to deal with other priorities in their lives. They also discussed how their emotional status can have an impact on their storage methods and their practices are influenced by their emotions, rather than a systematic need to clear the space. As a result, the space becomes crowded and some objects and information may become hidden

from their views. This can have an impact on these stuffs which are time critical. These include shopping vouchers, social events, bills to pay and so on. The problem arises when these information and objects are in a 'pending' process of storage and rely on family members to act on them at a right time. Processing these objects relies on people who often have to deal with so many other important family activities as well as work. This suggests a point to designers of technology to consider how technologies can provide simple ways of drawing attention to information and physical objects that are stored in a crowded space in families' material homes.

6.3.5 Social relationships

Building on the nature of the storage and the importance of its use in everyday life, the features of the storage and the on-going movement, categorising and re-storing of items make it a site where relations within a family can be negotiated. During fieldwork interviews, it appeared that the management of storage practices at homes was a central player in these families' social relations. One of the main sections of storage study concerned the social interaction around stored materials, which involved householders' practices and co-operation on storing physical objects of daily life. One of the key points was how considerable effort had been put into managing what might seem to be ordinary routines of home-related activities. What has been evident in the storage study is that the responsibilities of storage are distributed between people in families. For example, householders revealed how clearance practice was more than what needed to be cleared, due to its collaborative feature. Furthermore, in most families, the shared feature of the storage medium made it a central point for people to store their materials which can lead to point of negotiating and re-negotiating. It is therefore not enough to design technologies that optimise the performance of particular storing practices; designers of technology should consider technological solutions that contribute to the broader co-ordination of a home storage practices.

6.4 Sharing practices

Shared resources' location and usage within the home tend to have common features; they are usually placed in the most socially rich area and become a focal point of home. The routine use of shared resources, for tidying, storing and retrieving objects, means some shared resources' surfaces are seen regularly and sometimes nearly continually in some families. This use contributes to their success as a shared surface. Based on findings in chapter 5 on shared resources, the following sections present what it was about surfaces and other shared objects that made them so prevalent as a site of social interaction and material organisation for families.

6.4.1 Sharing resources

As discussed in chapter 5, shared resources such as kitchen's surface, dining table, television, laptop, games and so on, in combination with physical objects and information such as papers, books, CDs, etc., provides a sociable place where information and objects can be shared by accessing and re-accessing them. The fieldwork results gave some sense how families build upon these material features of shared resources. One of the key findings is that the *location* of a resource can give it a status of shared. For example, in home 3, the actual location of dining table which was placed next to the piano draws children's attention to it, storing their books, accessing and re-accessing them continuously. Moreover, the location of a shared surface has a bearing on what is placed on its surface; therefore, its location and use by all family members assigns it the status of shared. Thus, we can see that shared resources are immediately useful in a home, because they help family members achieve their home-related activities in a lightweight manner. Therefore, building appropriate technologies for homes can allow sharing to be treated casually and true to how they live.

6.4.2 Beyond sharing

In the previous section, I have used shared resources study to develop a line of thinking around the material properties and location of shared resources. The emphasis in this section is to reassert the importance of how things are shared in places like home and impact of "age" on sharing. One of the finding from the study demonstrated the way parents make the use of a surface sharable. For example in home 2, the mother of two young children conveyed the sense that considerable effort has been put into arranging her children's activities, as she orders them in such a way to accommodate everybody's needs. Similarly, in home 6 which consists of two teenagers, sharing lend themselves to a set of practices where the children's intention for sharing can be accomplished under a particular circumstances. One key factor that makes sharing practices different between two families is the impact of "age" on sharing. In the first family with young children, the mother had to artfully "divide the surface" to accommodate children's needs for sharing resources, whereas in the second family the teenage kids can access the shared resource according to their intentions. This could be considered as another starting point for design; the possibility of building flexible technologies for sharing, considering the impact of children's "age" and the material properties of surfaces in sharing practices in home environment.

6.4.3 Ownership

The findings from both studies demonstrated the ways that storage and shared resources are used collaboratively in households. Yet it is often the case that aspects of storage are understood to be the domain of one person, for example, the way a mother stores her letters, CDs, food recopies, magazines and books on top of her microwave. In the fieldwork example, a mother asserts her authority to assign the status of the microwave surface as "private" storage/surface and not shared by other family members. Nevertheless, because of the placement of microwave lay in a shared area, she explained how she gets reminded by her husband to tidy up the surface of microwave. In another family, a wife talked

about an on-going conflict between family members over sharing the dining table. Although physical appearances of objects on the table show they are in use by her husband, the wife repositions the objects in a way to satisfy her own neatness and tidiness standards. Another interesting point of findings from sharing study is the creation of "time allocation" by the mother who makes the surfaces of kitchen sequentially available to her husband and children. Although the appearance of the kitchen surface may not look satisfactory to her, it can be shared by them for a short period of time. This could be used to inform technology design interesting ways that people might claim ownership over storage/shared areas, considering on-going conflicts around these places. Technology with the functionality of allowing people to assign ownership to their storage location and shared resources to reduce conflicts in a wide variety of ways would be a challenging idea to design technology that fits with an existing households' ways of thinking around their ownership.

6.4.4 Social Interaction

From the initial interviews, we have been able to recognise many occurrences where householders used verbal communication and social interactions to coordinate and collaborate effectively with other members. In most families, someone, mostly mothers, were responsible to manage the interactions and use of a shared resource, where this procedure was done based on 'time' allocation. The examples illustrated how these procedures were created, so that they were continually being appropriated to accomplish other home activities. Findings also revealed how family members made compromises by providing options to each other which made sharing practices work better in home life. Another interesting finding showed how the social interactions could lend themselves to acting as a reminder. Therefore, social interactions around shared resources do more than simply communicating around household organisations; rather by the act of negotiating, it performs a multitude of functions which are simple and ubiquitous. This suggests that any technology for home environment should have a great deal of potential for supporting family members' activities

through providing effective awareness of the types of interactions that families use to access the shared resources at home.

6.4.5 Management of Sharing Practices

The findings from the study on sharing resources revealed how sharing practices were continually being designed and re-designed to suit particular circumstances and to meet the ever changing needs of families as children age and develop. As discussed in chapter 5, several informants applied various methods to manage the use of shared resources in their families. While most of the mothers encouraged their children to make compromises their access to a shared resource, a 'First Come First Served' system also seemed to be helpful in managing the use of shared resources at home. Findings also provided many examples on how mothers allocated parts of a sharing surface to children's activities. It is interesting to note that due to properties of the surfaces, they can be divided into different parts to accommodate various tasks in the home. In chapter 5 we established that there appeared an interweaving of parents and children's activities around the use of shared resources. In a family, a mother explained that by dividing the kitchen surface between her children, she can coordinate her routine tasks in the kitchen alongside her children's activities to meet everybody's need in the home. This suggests any technologies that support parents and children's activities and parent's maintenance of social order with children should engage more effectively into overall routine that parents lead in families.

6.5 Existing Storing Systems

6.5.1 Introduction

One of the main goals of this thesis was to draw attention to the home as a place of study to inform designers of information technology. As my interest was to focus on storage and sharing practices, family members' routine activities were uncovered. I decided to return to materials form both studies and reflect on what I

had observed and in a more elemental way, consider how the findings might have some bearing on design. In section 6.3 and 6.4 I have used the findings and reasserted the importance of how objects and information are arranged and organised at home. To foreground their relevance to design, I decided to consider the existing storage and retrieval technologies which currently only exist in the warehouses to demonstrate through the data why they may or may not work. . As in both places physical objects and information are stored and retrieved, this section looks at technologies for finding goods within a warehouse. Thus, the aim was to overview the technologies used in warehouse management and consider whether there are broader lessons that could be drawn from this investigation that might go beyond informing the design, as a means of demonstrating that technologies used in warehouses also have some general applicability.

6.5.2 Existing storage technologies in warehouses

Similar to home storage, to manage a warehouse efficiently one needs to know what is in it and where exactly each object is stored. Now, different types of labels such as *bar codes, 2D data codes* and *radio frequency identification (RFID)* facilitate automated reading, and operatives can carry hand-held scanners around the warehouse to speed up these tasks. In a warehouse, knowing where items are stored is essential to efficient order picking. Simple physical labels give a unique address to every shelf, and databases record the address against every item. There are various ways of communicating picking instructions to human operators, including *pick by light* and *pick by voice* (Connolly, 2008). Fully automated systems are now coming into use in warehouses in which cranes or fork-lift trucks are controlled direct from the database, and radar and inertial sensing systems accurately monitor the position of the machine. In this section, these technologies are explained briefly and problems with adapting such technologies at home are discussed.

Labelling technologies: Similar to tidy up and storing routines at home, labelling items in warehouse is done on daily basis. In a warehouse, digital optical barcodes and RFID tags are currently the most preferable technologies used to

store items on the shelves. Digital optical barcodes allow fast and reliable laser-based scanners. RFID tags have overcome many of the problems with barcode. Tags have a microchip to store the data and a tiny antenna to communicate it. Detailed data labels can be attached to or embedded in goods and read automatically, without the manual process involved in scanning barcodes. An RFID reader can read all nearby tags at the same time, and it can read through the packaging material, which gives advantages over optical coding when handling pallets and crates of goods. Optical and RFID labels are used in picking goods to fulfil customers' orders, for checking goods in and out of the warehouse and keeping an up-to-date inventory.

Label reading systems: Similar to retrieving objects at home, in warehouses, handheld barcode scanner and RFID readers can communicate with its warehouse software for stocktaking and order picking. The software can also interfaces with scanners that monitor all incoming and outgoing goods to give real-time inventory information, track current orders and store historical transactions.

Location finding: Similar to family members' accessing stored objects and information at home, in a warehouse workers can find orders by moving about the warehouse collecting items from the position listed on a clipboard or displayed on a hand-held computer. A more sophisticated approach is *pick by voice*. Each worker wears a handset and microphone, and a belt-mounted wireless computer, and moves through the warehouse to locations directed by the headset. This does away with the clipboard and leaves the worker's hands and eyes free to move. This system claims dramatic improvements in the accuracy of order picking compared with a paper-based system (Connolly, 2008). The *pick by light* approach requires indicators permanently on the shelf units. The indicator lights up to attract the worker's attention, and it displays a number to show how many items are to be picked up from that location. Each operative has a particular work zone and for each order all the relevant indicators light up simultaneously. Lighting pick technologies claim that this leads to faster picking than any competing operator-based technologies (Connolly, 2008).

Automated handling: Some examples of commonly used automated materials handling processes include robotics in warehouses; computerized scanning and counting and sorting equipment. These resources allow warehouse workers to perform work faster, to manage routine tasks and time-consuming aspects of retrieving goods. Fully automated systems, such as an *automatic fork-lift truck* can stack and retrieve palettes of goods in a warehouse. Each truck has an on-board computer to maintain the desired path using the inertial path using the inertial sensors (Connolly, 2008).

6.5.3 Problematising existing technologies

Although warehouse and home share similar functionalities in storage, they differ in some ways. For example in a warehouse, the objects are stacked on different levels, much higher than people's height, whereas in our study family members stored items, typically on three levels; ground floor, first floor and the attic. In a warehouse, there are a limited number of items and categories, whereas in home, there are a lot of objects and many that do not fall into any categories. Also, all the items in the warehouse are stored in boxes, but in the home, sometimes stuff with different material properties are stored together which is not necessarily in a box with printed description on it. Another interesting factor which makes home and warehouse different is the 'look'. Most warehouses do not have to look smart and homely like family members prefer their homes to be.

Previous chapters presented how homes are arranged and organised by householders in different ways. The fieldwork showed that practices for storage and sharing at home, provide a place where information and physical objects can be stored, shared and retrieved on daily basis. One of the properties of these practices is that family members can access and share storage locally; however, the converse to information being in storage means that it is not available remotely. Physical objects and information such as children's toys, pictures and sentimental objects are not typically available remotely. Thus, this can suggest thinking about how technology might make such information available remotely.

But before we begin to explain the critical points to design, the following describes how applying barcodes and RFID tags may become problematic at home.

Consider the home. There are several factors which make the use of barcodes for home storage difficult. First, a barcode only holds small amount of data on an object to be stored, and as we have examined home, family members may need to store more than a dozen digits to describe a sentimental valued object. Second, using a barcode may not be appropriate for all physical objects at home, due to their material properties. For example, a barcode may not stick to a woolly teddy bear, sentimental jewelleries, or plasticine children's artworks. Third, it may be time consuming to barcode pictures, letters and magazines which are usually to be stored in big stacks at home. Finally, the readability of barcodes is reported to be occasionally problematic due to dirt and bending, resulting in reduced accuracy of reading physical objects; which is more likely to happen in homes.

Although applying a RFID tag maybe helpful to access a stored object in less time, there are also problems with RFID tag which make the use of them difficult to be used in home. As the contents of an RFID tag can be read after the item leaves the supply chain, this makes the use of them inconvenient or inappropriate for family members. Such tags maybe difficult to remove; some are very small and as thin as a sheet of a paper. For example, let's consider a situation when a mother who has tagged a sentimental valued piece of her jewellery, has now retrieved it from her storage box and is wearing it outside or somewhere else. Because the tag is not easy to remove and RFID tag cannot tell the difference between one reader and another, RFID tags can be read from a distance, from a few inches to a few yards, this allows anyone to see the description of her jewellery as she walks down the street.

The warehouse technologies for location finding and automated handling such as pick by voice and pick by light, are better suited to the more formal

storage and organisation of contents that require highly focused interaction, the sort of activities that are put off in the family home in daily life. Similarly the use of an automated fork –lift truck makes it difficult to incorporate into the everyday routines, as the level of stories in warehouses and homes are very different. People at home cannot move from one level to another to pay attention to a voice or light in an attic for example, nor can't employ the automated vehicle to run up and down in the house. Consequently, warehouse technologies may not allow the casual and easy storing.

Section 6.5 focused on similarities of home storage practices and warehouse storage systems. Central, was the idea that there are available technologies in warehouse, which may be appropriate to be used in home. Section 6.5.2 and 6.5.3 develops this line of thinking, with the aim of drawing some broader implications from the insights into warehouse technologies. Thus, the aim was to consider whether there were broader lessons that could be drawn from the fieldwork and warehouse technologies, lessons that look into account the nature of how families store, access, re-access and share object in home life.

6.6 Critical Points for Design

This section recounts the most important concerns from the thesis in the light of domestic design. These concerns are consistently apparent in the field materials. The reason for presenting them here is to provide some general directions to help inform the design of home organisation technologies. The following is the list of design concerns are informed by the preceding fieldwork. The selections of categories are intended to give a sense of the motivations of my thinking around design in this thesis. They are as follows:

1. Lightweight Interaction

The research has shown that there is a design approach based around lightweight and simple artefacts, as opposed to computationally complex devices. The fieldwork illustrates that households are able to achieve effective functionality using simple and easy solutions. This suggests that designing technologies to support home storage and sharing practices and lightweight interactions would be beneficial to family members and failure to do so would tempt users to employ solutions around and/or ignore or reject the technology. For example, figure scanning can be designed to help householders to scan their objects with different sizes, shapes and materials belong to various family members to be stored together in a box. The picture and description of the object can also be printed and displayed on the box. Here, interaction designers might find value in designing to support householder's lightweight interactions with the figure scanner; otherwise they may reject the technology. For example, scanning an object should be done quickly, with a minimum number of buttons pressing, and requiring minimum system configuration.

2. Communication/Social Interaction

From the initial interviews we have been able to recognise many occurrences where family members used verbal and non-verbal communications/interactions to coordinate and collaborate effectively with other members of the family around their practices for storing and sharing. This can suggest that a technology should have a great deal of potential for supporting householders' activities through providing effective awareness of family communications and notifications of the activities of other people around these organisation systems. For example, by a using a figure scanner if someone in the family intends to access a stored object e.g. a family photo album, they should be able to find the object from the available picture and description on the box. It may also be useful to know when it was stored and

if any interactions happened after this when and if these occur. Once an object is retrieved, if another person then tries to locate the same object in the box, there should be a notification for the person to know that the item is unavailable. This way the technology can support the communication activities of these people, and that this communication occurs directly through the object of interest.

3. Privacy and Sharing

During the research, we identified that family members are often concerned with possible intrusion into their privacy by other members of family. This implies that new technologies should accommodate a range of sensibilities by providing user controlled mechanism to make different levels of privacy protection. However, caution needs to be considered when supporting privacy, because for example by hiding an activity, that person may have to answer to other family members for his/her action, especially when children are involved. Instead it may appear more acceptable by a family to show on the system the name of the person who is accessing/sharing a resource and set the status of the resource to 'unavailable to be shared'; so other members of family become aware that the resource is unavailable and is in use by a member of family for a set period of time. For example, interactive designers can design an informer interface to support sharing practices of home kitchen surfaces by focusing on privacy issues. Here we can imagine a mother who wants to prepare for cooking uses the kitchen surface. At the same time, young children at home want to share the kitchen surface to do their homework and to be close to their mother. An informer interface can give the mother a power to set the status of the resource to "unavailable to be shared" provide an approximate time for the resource to become available to be shared by her children while she still can carry on with her other activities e.g. cooking or washing up in the kitchen.

4. Sharing by multiple people

The fieldwork revealed that such cooperative and collaborative interaction tends to occur on an ad hoc basis rather than being pre-planned. However, the findings also identified that collaboration for sharing takes on a distinctive social character, because of the organisational and social challenges of home environment. In addition, because many of the sharing challenges faced by family members are communicative, negotiable and collaborative, an acknowledgement of values of home in sharing and family should be taken into consideration when designing new communication technologies. To continue with the previous example, the mother can set a timer for that space and the timer would visible to all of the other members.

5. Social and Domestic Bonds

The most significant point here is that the kinds of individual tasks households perform to organise and manage their activities are part of larger set of practices. We established, during the research, that there appeared an interweaving of parents and children activities in family life. This suggests technologies that support parents' activities where parents are engaged in while maintaining the social bonds with their children, can mesh more effectively into the overall lifestyles that family members live in. Thus, it is not enough to design technologies that contribute to performance of particular tasks; technical solutions that optimise the coordination of a home's activities should support larger set of practices of social organisation. The example of social and domestic bond is demonstrated in the third point of this section "privacy and sharing" by looking at a way that an informer interface can support family members' various tasks to maintain the social bond.

6. Flexible and Adaptable

Findings from both studies illustrate storing and sharing activities where family members reveal interest in adapting artefacts to their own needs. The research has confirmed that home activities are heterogeneous and home technologies that seeks to effectively support such complex activity patterns need to facilitate flexible and adaptable interactions, enabling it to be re-purposed in ad hoc ways. For example, it is sensible to provide a range of flexible negotiation options for family members to access a shared resource. Dourish and Belloti (1992) introduced "shared feedback" approach. This approach fitted naturally with the shared text editor, allowed multiple people, each working at a separate network computer, to work simultaneously on the same document. There are two ways to think about shared feedback; one way is to think about it as part of the interface which the system displays information to the person about how the application is responding to his/her action. The second way is to think about it as part of artefact which the application gives the person access and his/her actions transform the artefact and he/she can see the transformation take place (Dourish, 2004). In a home setting, flexible shared feedback should be designed to provide the object to be shared naturally, and for all family members be able to see the results of an access, because they all should be able to see the same object. For example, an informer interface can be designed for tables, such as a kitchen table, a dining table or a coffee table. Because of the properties of the surfaces, this interface can be designed by dividing the surface between different family members. Therefore multiple people can share the surface to carry out different activities. For example a kitchen table can be shared by a mother and two children age 5 and 13. The mother can sit down put her coffee mug on the table while reading her magazine. The child age 5 can do her homework and ask her/his mother for help and the child age 13 can place her laptop on the table to perform a task. The informer interface should be deigned in a flexible way to make the shared use of the table in a natural way and give shared feedback to everyone in the household, including the ones who are not using the table, for example in this case a father should also be able to see how the

kitchen table is shared by various members of his family, and to know how long he has to wait for them for finish performing their tasks.

7. Awareness

Dourish (2004) argued that the problems of the visibility of actions of one person has been recognised as critical to success of many collaborative technologies. In the interviews, the data clearly demonstrated that family members did not tidy up, store, retrieve and shared resources in isolation. Instead they had to organise, coordinate and negotiate their activities around each other. To support families, the research implies that, and technology introduced into these settings should provide information for users of storage about the other member of family's activity. Approaches to providing awareness information have included visualisation mechanisms for collaboration (e.g., Gutwin and Greenberg, 1998; Dourish and Bellotti, 1992). In addition, findings from both studies established that to support future home technologies, design should be sensitive to *on-going* organisations of home by different family members. Awareness technologies can be provided directly through the visibility of other family member's actions on storage or sharing, or indirectly through the visibility of the effect of actions on the objects of their work. There can be a 'control' over the degree of access by other family members and such awareness information can be provided to the whole family members. The previous example demonstrated the need for this feature to be designed to support family members' need. It can also provide a certain degree of access control by parents, who wish to supervise their young children and teenagers activities in their households.

8. Space and Emotion

Bringing previous points together provides a way of thinking about the home as a place, where space is used through daily activities, such as tidying, storing and sharing resources. As seen in the fieldwork, the home is a place where physical objects are stored, retrieved and shared in certain parts of the

home, and householders set up rules to organise their daily routines. Finding from the studies illustrate that family members' emotion also play a role in home organisation and management. Factors such as 'emotion' around the use of space in home organisation make the homes become the unique places that they are, and technology design should be sensitive to these factors to this on-going management of home. For example, to relate emotion with the informer interface the parents in the households should be in control of the device to monitor the children's access to the interface (i.e. using pin code) and make a better use and management of the device under particular circumstances.

9. Material properties & Storage materials

In chapter 4 and 5, the households employed different methods for organising and managing home life. The fieldwork showed that storages' physical shapes shared different attributes. Items often stored in folders, filing trays, shelves, boxes, filing cabinets, drawers, suitcases and even plastic bags. The material properties of objects can have a direct impact on choosing the storage medium. The same objects with different sizes may be stored differently, and this underlines that the storage medium maybe selected based on the size and shape of the object within it, and it is not necessarily chosen based on similar categorisation of the objects or their informational properties. This method selection is also related to concept of 'affordance', for example by considering objects' stickiness or stackability. However, by considering sentimental values, the same objects with the same physical properties are often stored very differently. In examining boxes as storage, we found a medium where practical, sentimental and playful objects can be stored together. Although a storage solution is achieved because of the material properties of the box, the ease of use and means of continuous reorienting and reconfiguring the objects also promotes the use of this chosen medium at home. Previous examples demonstrated this idea by discussing how different objects can be stored together in a box. Using a 3D figure scanner an object (i.e. a teddy bear or a bag), can be scanned and the description of the object

including the size, colour and material can appear on the interface to give a better insight of what objects are stored in the box.

10. Value/ Effort

Bringing points 5, 8 and 9 together provides a way of thinking about the 'value' character of the home. As seen in the fieldwork, the home is a place where family members place physical objects and information in certain parts of the home. Households build simple ways of object classification; people often put a substantial effort into their classification. Their classifications of multiple objects allow family members to make appropriate efforts according to the value of this stuff to them. For example a piece of information may lose its value due to time and people may make different efforts in organising it at different stages of time. Home values change and are continually reproduced and transformed through on-going practice, so the designers need to consider how family members can express objects values through tools. Flexible systems should be designed allowing people to categorise things in different ways, and have the values of home asserted in technologies. For example, by using a figure scanner, different family members may assign the value to the same object differently. Therefore, although the pictures of the objects are the same, the value descriptions of them are not. Two children in a family for instance may assign different values to the same object (i.e. a scarf as a present). One of them may decide to assign a "sentimental" value to the scarf, while the other one may assign a "random" value to the second scarf. Also, they should be able to change the value status of the objects. For example, after a while both of the children may decide to assign sentimental values to the scarves or may wish to dispose them at different stages of time.

11. Categorisation issues

Findings from both studies highlighted examples of how people categorise objects and information in a variety of ways. One person categorisation may be visible or invisible to any other family members. For example, at home a

category can be made visible to parents, but invisible to children. As seen in chapter 4 and 5, a category might be loosely or tightly coupled with a person. For example, we have illustrated how category of "age" is tightly coupled in accessing the shared resources. Beside this, a lot of loosely categorised objects were found in home storage practices. Bowker and Star (1999) argued that classifications are powerful technologies. Everyday categories are precisely those that have been disappeared into the habit of tidying up, making places for storage, management of sharing practices. Data from both studies illustrated these everyday categories are interwoven with formal and practical categories. Thus, it is not enough to design technologies that contribute a set of formal categories: designers of information systems encoding classification should leave certain terms open for multiple definitions used across different households to do their organisational work. Having said this, the system should maintain the maximum flexibility and be sensitive to exclusions. For example, parents may decide not to make the sentimental values of an expensive item (i.e. a piece of jewellery) visible for security purposes. Therefore, the designing a figure scanner should provide multiple definitions for categorisation purposes in the most flexible way to fulfil the householders' needs.

6.7 Conclusion

This chapter has described and synthesised the data from two studies. Design relevant materials from data revealed the most important results of two studies and were presented in sections 6.3 and 6.4. I used the findings and reasserted the importance of how objects and information are arranged and organised in places like home. For this purpose, I considered a similar place to home like the warehouse system which shares same activities; multiple people store, access and re-access objects and information in both places. Some of the existing storage technologies in warehouses were overviewed and the problems with the use of such systems at home were discussed in detail. My aim was to consider whether there were broader lessons that could be drawn from the

fieldwork and warehouse technologies, lessons that look into and account for the nature of how families store, access, re-access and share object in home life. A number of design concerns emerged from the presented work and provide some general directions for the future design of home information technology within HCI.

Chapter 7- Conclusion

7.1 Introduction

This aim of this chapter is to provide a brief summary of the thesis and contributions to the larger body of HCI and CSCW. It also concerns some of the challenges faced in undertaking this research and identifies the research limitations. The chapter after that describes some topics related to the two studies that offer opportunities as potentials for future research. The final section is brief concluding remarks.

7.2 Contributions

This section describes the core intellectual contributions of this thesis. Each contribution maps back to the research's objectives set in chapter one. The contributions presented are first, 'routines investigations in home life'; second, 'social interaction around material stuff in the home'; and third, 'implications for designing home technologies to support daily routines.' Each of these are now discussed respectively in the following sections.

7.2.1 Routines investigations in home life

Investigating the phenomenon of home routines in detail is extremely challenging considering the collaboration around organisational aspects of family members' daily lives. The research has suggested that the reason why family members' daily practices continue to be so important in the home is due to the nature of interaction with physical aspects of material stuff. These interactions shape the ways in which they can be used by different family members in a whole range of different kinds of ways to get on with their daily life. By focusing on unremarkable routines such as tidying, storing, retrieving and sharing, we have uncovered the importance of physical objects when householders were trying to create a set of practices to organise their family and manage their household. Being focused practically on the home organisation systems, this rich data is intended to reflect the value of detailed studies of home life for designing novel

technologies, where families' caring and creativity should be taken into account and be accommodated in such designs to support families' storing and sharing routines.

7.2.2 Social interaction around material stuff in the home

This thesis shows some of the ways that social interaction plays a role in the establishment and maintenance of family organisation. In brief, the analysis shows how information and objects in physical forms are moved around the house to support the social organisation of the family. We have developed a set of sensitising concepts from careful consideration of the data that make visible the socially organised production and consumption of material stuff in the home. Through storing and sharing practices, these are the physical objects where 'social interactions' get done and around which, different types of interactions are used.

7.2.3 Implications for designing home technologies to support daily routines

At the end of chapter six, implications in the form of critical points for future home technology design were presented and discussed. These points are intended as a useful resource for both researchers and designers. They aim to support the development of future home organisation systems, revealing the role of routine activities from tidying and storing, to sharing play in families' everyday lives. Our aim in raising these issues is to provide awareness of how family members practice storing, retrieving and sharing around material stuff in the home, and the benefits that these can bring to bear on the design of supportive technologies for the home.

7.3 Challenges faces and Limitations

This thesis has used ethnographically oriented methods to collect and analyse data which is typically a lengthy process. As a consequence, the limitations of this research are natural to the methods used, and some of the challenges faced are highlighted here. First, the time needed to find families and arrange interviews were underestimated at the beginning of the research. As I was interested in interviewing couples and families together, arranging a suitable day

and time to interview them at the same time was even more difficult and seemed challenging at the beginning of the research. Second, as part of ethnography, the fieldnotes (jotted notes) which were written keywords and phrases while in the home for myself to recall the scenes, experiences and observations had to be transformed into final texts, alongside the voice recording transcripts. Being new to the field of ethnography and considering the nature of ethnography itself, while interesting, I found the process challenging. These fieldnotes provided a critical first opportunity to write down and develop initial interpretations and analysis. Making new linkages with or contrasts to previously observed and written about experiences, I found the concept of interpretation of data the most challenging. Also, as choice of families was explained in the method section, having a scale of different types of families might have provided richer results. Including more variability, for example, more working class families, having more children and participants from several generations would have been interesting, as would have studying families from different parts of UK, or even abroad.

7.4 Future Research Directions

In keeping with the nature of PhD thesis, the work of this thesis was restricted by its initial scope. Ideas for future research direction extend beyond this to look at other shared groups and their sharing methods in larger studies. One area I would like to follow up is to explore how sharing methods are used in *care homes*. It seems that elderly people also share information and objects in care homes. It would be interesting to examine the social and organisational implications of this. This is one area where it appears that technology can help to automate domestic tasks and in particular sharing for elderly people. We may also want to take inspirations from the critical points of design that emerged at the end of chapter six and envision new domestic sharing technologies that seek to apply the knowledge gained from the research.

Another area of interest worth investigating with respect to shared resources at home, would be shared surfaces. This topic has already been raised at a work shop held by Microsoft 2008 called ‘The fine art of surfacing: practices

of use at the table top'. At this workshop, the use of horizontal surfaces at home and offices were explored and contrasted with the implicit design assumptions underlying table top computing (see Salovaara, Zarabi and Perry, 2008). This path of interest may take us from purely studying horizontal surfaces to surfaces theoretical value and motivation that most matters when researching mundane technologies to establish any further refinement needed for the design of home technologies.

7.5 Concluding Remarks

Despite number of years of HCI and CSCW research on home life, there is not still enough understanding on how everyday activities are done. This research presents a number of ways in which tidying, storing, retrieving and sharing practices are used in managing home life. Our attempt has been to investigate how home organisation systems employed in households are multiple and continually evolving. As this thesis illustrates, it has helped reveal the role that storage and sharing practices plays in families' everyday lives, and how objects and practices around these systems offer an even greater understanding about the nature of home life. Such understandings can go on to be fed into the design loop to help achieve more appropriate future technologies for the home.

References

Agar, M. H. (1980). The professional stranger: An informal introduction to ethnography. Orlando, FL: Academic Press.

Atkinson, P. (1992). Understanding Ethnographic Texts. Thousand Oaks CA: Sage.

Atkinson, P. (2001). Handbook of Ethnography. London: Sage.

Aronson, J. (1994). A Pragmatic View of Thematic Analysis**.** *The Qualitative Report*, Volume 2, Number 1, Spring.

Backlund, S. et al. (2006). Static! The aesthetics of energy in everyday things. *Proc. of DRSIC.*

Bailyn, L. (1989). Toward the perfect workplace?. Communication of ACM.

Becker, H. S. (1974). Photography and Sociology, Studies in the Anthropology of Visual Communication 1 (1):3-26.

Becker, H. S. (1984). The Making of the Moonie. Oxford: Blackwell.

Becker, H. S. (1993). Theory: The necessary evil. In Flinders, D., J. & Mills, G. E. (Eds.), *Theory and Concepts in Qualitative Research.* Teachers College Press, London, 1993, 218-229.

Bell, G., Blythe, M. and Sengers, P. (2005): Making by making strange: defamiliarization and the design of domestic technology. ACM ToCHI, vol. 12, no. 2, pp. 149-173.

Bell, G., Dourish, P. (2006). Back to the shed: gendered visions of technology and domesiticity, Springer-Verlag, London Limited.

Benner, P. (1985). Quality of life: A phenomenological perspective on explanation, prediction, and understanding in nursing science. *Advances in Nursing Science, 8*(1), 1-14.

Berg, A.-J. A gendered socio-technical construction: the smart house, in *The Social Shaping of Technology*, D. MacKenzie and J. Wajcman (eds.), Second ed. Buckingham: Open University Press, 1999, 301-313.

Bentley, R., Hughes, J. A., Randell, D., Rodden, T., Sawyer, P., Shapiro, D., Sommerville, I. (1992). Ethnographically-informed systems design for air traffic control. CSCW 92 Proceedings. ACM Press.

Björksko, C. (2007). Human Computer Interaction in Smart Homes. http://www.hiit.fi/~oulasvir/58307110/smarthomes.pdf.

Blythe, M., Monk, A., (2002). Notes Towards an Ethnography of Domestic Technology, ACM Press.

Blythe, M., Park, J., Monk, A., (2004). "Tele- Biographies: Data Collection Techniques to Capture the Ways People Interact with Digital TV", CHI 2004, April 24-29, 2004, Vienna, Austria. ACM Presss.

Bourdieu, P, Chamboredon, J.-C.,&Passeron, J.-C. (1991). The craft of sociology: Epistemological preliminaries. Berlin: Walter de Gruyter.

Bourdieu, P., (1996). "Understanding", theory, culture and society, 13 (2): 17-37

Bourgois, P. (1995). In Search of Respect: Selling Crack in El Barrio. New York: Cambridge University Press.

Bowers, J., Button, G. & Sharrock, W. (1995). Workflow from within and without: Technology and cooperative work on the print industry shopfloor, *In: ECSCW'95, Fourth European Conference on Computer-Supported Cooperative Work, Stockholm, Sweden*. Kluwer Academic Publishers, 51-66.

Bowker, G. C., Star, S. L. (1999). Sorting Things Out: Classification and its consequences, The MIT Press, Cambridge, Massachusetts, Lodon, England.

Buchli, Victor, ed. The Material Culture Reader. Oxford: Berg, 2002. See esp Buchli's "Introduction", pp. 1-22; Christopher Tilley's introduction to "Metaphor, Materiality and Interpretation", pp. 23-6.

Burawoy, M., (1998). The extended case method, Sociological theory, 16 (1):4-33

Button, G., Dourish , P. (1996). Technomethodology: Paradoxes and Possibilities. CHI 96, Vanvouver, BC Canada. ACM.

Calvey, D. (2000). Getting on the door and staying there: A covert participant observational study of bouncers. In G. Lee-Treweek & S. Linkogle (Eds.), Danger in the field: Risks and ethics in social research (pp. 43-60). London: Routledge.

Chappells, H., Shove, E. (1999). Consumption, Everyday Life and Sustainability. Bins and the history of waste relations. Funded by the Wuropean Science Foundation's TERM Program. International Planning Studies.

Clifford, J. and G. Marcus eds 1986 *Writing Culture: the Poetics and Politics of Ethnography*. Berkeley: University of California Press.

Cockburn, C. and Omrod, S. (1993). Gender and technology in the making, Sage Press, London.

Cohen, E., J. (2005).Kitchen Witches: Martha Stewart: Gothic Housewife, Corporate CEO", *Journal of Popular Culture* **38,** 650-677.

Connolly, C. (2008). Warehouse management technologies, Stalactite Technologies Ltd, Wakefield, UK.

Constas, M. A. (1992). Qualitative analysis as a public event: The documentation of category development procedures. *American Educational Research Journal, 29*(2), 253-266.

Covington, M.J., Long, W., Srinivasan, S., Dey, A.K., Ahamd, M., and Aboud, G.D. (2001): Securing Context-Aware Applications Using Environment Roles. In: SACMAT'01, Chantilly, Virginia, USA

Crabtree, A., Hemmings, T., Rodden, T. (2002). Coordinate displays in the home. *Proceedings of the Conference on Computer Supported Collaborative Work (CSCW'02), Workshop on Public, Community and Situated Displays*. ACM Press

Crabtree, A,. Rodden, T,. Hemmings, R,. Benford, S,. (2003). "Finding a Place for UbiComp in the home", UbiComp 2003, LINCS 2864, pp. 208-226, Springer-Verlag Berlin:Heidelberg

Crabtree, A. & Rodden, T. (2004). "Domestic routines and design for the home", *Journal of Computer Supported Cooperative Work (CSCW),* **13,** 191-220.

Crabtree, A., Rodden, T., Mariani, J., (2004). Collaborating around collections: informing the continued development of photoware. *Proc. of CSCW* 396 - 405.

Chung, K. H., Oh, K. S., Lee, C. H., Park, J. H., Kim, S., Kim, S. H., Loring, B., and HAass, C. (2003). A user-centered approach to designing home network interfaces. *Proceedings of the Conference on Human Factors in Computing Systems, (CHI"03)*. ACM Press, Ft., 648–649.

Csikszentmihalyi, M. and Rochberg-Halton, E. (1981). The meaning of things. Domestic Symbols and the Self. Cambridge University Press.

Davis, F. (1959). The Cabdriver and his fare, American Journal of Sociology, 64: 158-65.

Davies, H. (2008). 'Reflexivity in Research Practice: Informed Consent with Children at School and at Home', Sociological Research Online, 13 (4).

Durkheim, E. (1895). The Rules of Sociological Method, Free Press

Delamont, S. (2004). Ethnography and Participant Observation, in C.Seale, G. Gobo, J. F. Gubrium and D. Silverman (eds), Qualitative Research Practice. London: Sage.

Denscombe, M. (2007). The Good Research Guide for small-scale social research projects, Berkshire: Open University Press.

Devine, F. (1992) Affluent Workers Revisited, Edinburgh: Edinburgh University Press.

Dourish, P., Bellotti, V., (1992). Awareness and coordination in shared workspaces. Proc. ACM Conf. Computer Supported Cooperative Work CSCW'92. 107-114. Toronto. New York: ACM.

Dourish, P. (2001). Where the Action Is: The Foundations of Embodie Interaction. Cambridge, MA: MIT Press.

Dourish, P. (2004). Where the Action Is. The foundations of Embodied Interaction. First MIT Press paperback edition, Cambridge, Massachusetts. London. England. ISBN 0-262-04196-0

Dourish, P. (2006). Imp[lications for Design. CHI 2006 Proceedings, Montreal, Canada.

Dourish, P. (2007). Responsibilities and Implications: Further Thoughts on Ethnography and Design.

Dourish, P., & Button, G. 1998. On "technomethodology": Foundational relationships between ethnomethodology and system design. *Human-computer interaction*, 13, 395-432.

Dourish, P., Graham, C., Randell, D., Rouncefield, M. (2010). Theme issue on social interaction and mundane technologies. Pers Ubiquit Comput: Springer-Verlag London Limited 2010.

Edwards, K. and Grinter, R. (2001). At home with ubiquitous computing: seven challenges, *In: Ubicomp 2001: 3rd International Conference on Ubiquitous Computing, Atlanta, Georgia*. Springer, 256-272.

Emerson, R. M., Fretz, R. I., & Shaw, L. L. (1995). Writing ethnographic fieldnotes. Chicago: University of Chicago Press.

Felski, R. (1999). The invention of everyday life, *New Formation*, 39:15-31.

Ferri, E. and Smith, K. (1996) Parenting in the 1990s, London: Family Policy Studies Centre.

Fielding, N. And Lee. R. (1991). Using Computers in Qualitative Research. London: Sage.

Fielding, N. (1993). 'Ethnography', in N.Gilbert (ed), Researching Social Life. London: Sage. Pp.154-71.

Forlines, C., Esenther, A., Shen, C., Wigdor, D. and Ryall, K. (2006) Multi-user, multi-display interaction with a single-user, single-display geospatial application. *Proc. UIST '06.* New York: ACM Press, 273-276.

Frenkel, K. A. (1989) "The next generation of interactive technologies", *Communications of the ACM* **32**(7)**,** 872-881.

Frissen, V. A. J. (1999). ICTs in the rush hour of life, *Information Society* 16, 65-75.

Frohlich D.M. & Murphy, R. (2000). The Memory Box. *Personal Technology 4:* 238-240.

Frohlich, D.M., Kuchinsky, A., et al. (2002). Requirements for photoware, *Proc. of CSCW*, 166 – 175.

Froehlich, J., Findlater, L., & Landay, J. 2010. The design of eco-feedback technology. *Proc. CHI '10*.
Garfinkel, H. (2002). Ethnomethodology's Program. New York: Rowman and Littlefield. ISBN 0742516423. Page 6.

Gaver, W. (1991). Technology affordances: use of familiar things in the design of interfaces. *In: CHI '91, Extended Abstracts on Human Factors in Computing Systems, New Orleans, Louisiana.* New York: ACM Press, 79-84.

Gaver, W., Boucher, A., Pennington, S. and Walker, B. Cultural Probes and the Value of Uncertainty. *Interactions, 11*, 5 (2004) 53-56.

Gaver, W., Dunne, T., & Pacenti, E. Cultural Probes. *Interactions, 6*, 1 (1999), 21-29.

Gaver, W., & Dunne, T. Projected Realities: Conceptual Design for Cultural Effect. In *Proc. CHI 1999*, ACM Press (1999), 600-607.

Gaver, W., W., Beaver, J., Benford, S. (2003). Ambiguity as a resource for design, *In: CHI '03, Extended Abstracts on Human Factors in Computing Systems, Ft. Lauderdale, Florida.* New York: ACM Press, 233-240.

Gershuny, J. (1992) 'Changes in the domestic division of labour in the UK 1975-87: dependent labour versus adaptive partnership' in Abercrombie and Warde (eds) (1992).

Gilbert, N. (2008). Researching Social Life, London & California: SAGE Publications Ltd.

Gold, R. (1958). Roles in Sociological Fieldwork. Social forces, 36: 217-23.

Gray, S. H. (1990). Assessing the impact of computers on the home and family, *In: Proceedings of the Conference on Computers and the Quality of Life Washington, D.C.* New York: ACM Press.

Greetz, C. (1975). The Interpretation of Cultures. London: Hutchinson.

Guglielmelli, E., Dario, P., Laschi, C., Fontanelli, R., Susani, M., Verbeeck, P,. Gabus J, C. (1996). "Human and technologies at home: from friendly appliances to robotic interfaces", IEEE International Workshop on Robot and Human Communication.

Grudin, J. (1988). Why CSCW applications fail: problems in the design and evaluation of organisation of organisational interfaces. In *Proceedings of the Conference on Computer Supported Cooperative Work (CSCW 1998)*, (p.85-93). NY:ACM Press.

Gutwin, C., Greenberg, S., (1998). The effects of awareness support on groupware usability. Proc. ACM Conf. Human Factors in Computing Systems CHI'98. 511-518. Los Angeles. New York: ACM.

Hammersly, M. And Attkinson, P. (1995). Ethnography, Principles in Practice, 2nd edition, London: *Routledge.*

Hardyment, C. 1998. From Mangle to Microwave. Oxford Polity Press, Cambridge.

Harper, D., (1986). "Meaning and work". Current Sociology, 34: 24–46.

Harper, R. H. R. (1992). Looking at ourselves: An examination of social organisation of two research laboratories. ACM 1992 Conference on Computing Supported Cooperative Work- CSCW'92, 330-337. Toronto, Canado: ACM

Harper, R. Evergeti, V. Hamill, L. and Shatwell, B. (2003): The social organisation of communication in the home of the 21st Century: An analysis of the future of paper-mail and implications for the design of electronic alternatives. Cognition, Technology and Work, vol. 5, pp. 5-22.

Harrison, B. (2002) "Seeing health and illness worlds using visual methodologies in a sociology of health and illness: a methodological review", Sociology of Health and Illness, vol. 24. (6), pp. 856-872.

Heath, C., Luff, P. (1992). Collaboration and Control: Crisis management and multimedia technology in London Underground control rooms. Computer Supported Cooperative Work, 1, 69-94.

Heath, C., Luff, P. (1991). Collaborative activity and technological design: task coordination in London Underground control rooms, *In: ECSCW '91, Proceedings of the Second European Conference on Computer Supported Cooperative Work,Amsterdam, The Netherlands.* Kluwer, 65-80.

Hegelund, A. (2005). Objectivity and Subjectivity in the Ethnographic Method, QUALITATIVE HEALTH RESEARCH, Vol. 15 No. 5, May 2005 647-668

Hindus, D., Mainwaring, S. D., Leduc, N., Hagsrom, A. E. & Bayley, O. (2001) "Casablanca: designing social communication devices for the home", *In: CHI '01, Extended Abstracts on Human factors in Computing Systems, Seattle, Washington.* New York: ACM PRess, 325-332.

Hoskins, J. (1998). Biographical Objects. London: Routledge.

Horst, W., Bunt, T., Wensveen, S. and Cherian, L.Designing Probes for Empathy with Families. In *Proc Dutch Directions in HCI 2004*, ACM Press (2004).

Hsieh, H.-F., & Shannon, S.E. (2005). Three approaches to qualitative content analysis.*Qualitative Health Research, 15*(9), 1277-1288.

Hughes, J. A., Randall, D., AND Shapiro, D. (1992). Faltering from ethnography to design, *In: CSCW '92, Proceedings of the 1992 ACM* C*onference on Computer Supported Cooperative Work, Toronto, Canada*. New York: ACM Press, 115-122.

Hughes, J., King, V., Rodden, T., Anderson, H. (1994). Moving out from the control room: Ethnography in system design. Proceeding of the ACM 1994 Conference on Computer Supported Cooperative Work- CSCW'94, 429-439. Chapel Hill, NC: ACM.

Hughes, J. A., O'Brien, J., Rodden, T., Rouncefield, M. (1997). Designing with ethnography: A presentation framework for design. Proceeding of the Symposium on Designing Interactive Systems- DIS'97, 147-159. Amsterdam: ACM.

Hughes, J., O'Brien, J., and Rodden, T. (1998). Understanding technology in domestic environments: Lessongs for cooperative buildings. In *Proceedings of the 1st International Workshop on Cooperative Buildings—Integrating Information, Organization, and Architecture* (CoBuild '98, Darmstadt, Germany, Feb. 25–26), N. Streitz, S. Konomi, and H.-J. Burkhardt, Eds. Springer-Verlag, Vienna, Austria.

Hughes, J., O'Brien, J., Rodden, T. & Rouncefield, M. (2000). Ethnography, communication and support for design. *In:* LUFF, P., HINDMARSH, J.HEATH, C. (eds.) *Workplace Studies: Recovering Work Practice and Informing System Design.* Cambridge: Cambridge University Press.

Hutter, B. (1988). The Reasonable Arm of the Law. Oxford. The Clarendon Press.

Ito, M. (2005). Mobile phones, Japanese youth, and the re-placement of social contact. In R. Ling & P. Pedersen (Eds.), Mobile Communications: Re-negotiation of the Social Sphere (pp. 131-148).Godalming: Springer-Verlag.

Izadi, S., Hodges, S., Taylor, S., Rosenfeld, D. Villar, N., Butler, A., & Westhues, J. (2008) Going Beyond the Display: A Surface Technology with an Electronically Switchable Diffuser. In *Proc. of the 21st Annual ACM Symposium on User interface Software and Technology*. UIST '08. ACM. 269-278

Jiang, J. H., Wang, B., Goya, K., Hocke, K., Eckermann, S. D., Ma, J., Wu, D. L., Read, W. G., (2004). Geographical distribution and interseasonal variability of tropical deep convection: UARS MLS observations and analyses, published 13 February 2004.

Johansen, R (1988). Groupware: Computer Support for Business Teams. NewYaork, NY: The Free Press.

Junestrand, S., Tollmar, K. (1998). The Dwelling as a Place for Work.

Karp, I., Kendall, M. B., (1982). "Reflexivity in fieldwork" in Paul F. Second (ed.), Explaining social behaviour: Consciousness, Human Action, and Social Structure. Beverley Hills, CA: Sage. Pp. 249-73

Kaye, J., Vertesi, J., Avery, Sh., Dafoe. A., David, Sh., Onaga, L., Rosero, I., Pinch, T. (2006). To Have and to Hold: Exploring the Personal Archive. In *Proceeding of the Conference on Personal Information Management, (CH'06).* ACM Press, 22-27.

Kirk, D. S., Sellen, A., Rother, C. & Wood, K. (2006). Understanding Photowork. *Proc. CHI*, ACM, 761-770

Kirk, D., Sellen, A. (2010). On Human Remains: Excavating the Home Archive, Transactions on Computer-Human Interaction (TOCHI) , Volume 17 Issue 3. ACM Press.

Kim, J., Hwang, Y., Matthews, H. S., Park, K. (2004). Methodology forrecycling potential evaluation criterion of waste home appliances considering environmental and economic factor. Presented at the 2004 IEEE International Symposium on Electronicsand the Environment, Scottsdale, AZ, May 10-13

Kim, S.H., Chung, A., O.K, J.-H., Myung, I.-S., Kang, H. J., Woo, J.-K. & Kim, M. J. (2004). Communication enhancer—appliances for better communication in a family, *Personal and Ubiquitous Computing* **8,** 221 - 226.

Kim, S. W., Kim, M. C., Park, S. H., Jin, Y. K. & Choi, W. S. (2004). Gate reminder: a design case of a smart reminder, *In: DIS '04, Proceedings of the 5th conference on Designing Interactive Systems.* New York: ACM Press, 81-90.

Kim, S. W., Park, S. H., Lee, J., Jin, Y. K., Park, H., Chung, A., Choi, S. & Choi, W. S. (2004). Sensible appliances: applying context-awareness to appliance design", *Personal and Ubiquitous Computing* **8**, 184-191.

Kolko, B., Putnam, C., Rose, E., Johnson, E., (2011). "Reflection on research methodologies for ubicomp in developing contexts", Springer-Verlag London Limited 2011.

Kraut, R., Scherlis, W., Mukhopadhyay, T., Manning, J. & Kiesler, S. (1996). HomeNet: A Field Trial of Residential Internet Services, *In: CHI '96, Extended Abstracts on Human Factors in Computing Systems, Vancouver, Canada*. New York: ACM Press, 284-291.

Kraut, R. (2003). Applying social psychological theory to the problems of group work. In Carroll, J. M. (Eds.). *HCI models, theories and frameworks: Towards multidisciplinary science*. San Francisco, CA: Morgan Kaufmann Publishers.

Langer, S. (1953). Feeling and Form, A theory of Art. London. Routledge and Kegan Paul.

Lavenda, R. H.; Schultz, E. A. (2007). Anthropology: What Does It Mean to Be Human?Oxford: Oxford University.

Latour, B. (1993 b). 'Ethnography of a "high tech" case', in P. Lemonnier (ed), Technological choics. London: Routledge.

Lefebvre, H. (2008 [1947]) Critique of Everyday Life, Vol 1, London: Verso.

Leininger, M. M. (1985). Ethnography and ethnonursing: Models and modes of qualitative data analysis. In M. M. Leininger (Ed.), *Qualitative research methods in nursing* (pp. 33-72). Orlando, FL: Grune & Stratton.

Lie, M. (2003). Gender and ICT – New connections, in M. Lie, (Ed.) *He, She and IT Revisited*. Gyldendal Akademisk, Oslo, 9-33.

Lofland, J., & Lofland, L. H. (1995). Analyzing social settings: A guide to qualitative observation and analysis (3rd ed.). Belmont, CA: Wadsworth.

Mahrer, A. R. (1988). Discovery-oriented psychotherapy research. *American Psychologist, 43*(9), 694-702.

Malik, S., Ranjan, A. and Balakrishnan, R. (2005) Interacting with large displays from a distance with vision-tracked multi-finger gestural input. *Proc. UIST '05*. New York: ACM Press, 43-52.

Malinosowski, B. (1922). Argonauts of The Western Pacific. London: Routledge and Kegan Paul.

Malone, T. W., (1983). "How do People Organise Their Desks? Implications for the Desing of Office Information Systems", ACM Transactions on Office Information systems, vol 1.

Markopoulos, P., Romero, N., van Baren, J., IJsselsteijn W., de Ruyter, B, Farshchian, B. (2004) Keeping in touch with the family: home and away with the ASTRA awareness system. CHI Extended Abstracts 2004, ACM, 1351-1354.

Marcus, G. and M. Fischer [1986] 1999 *Anthropology as Cultural Critique: an Experimental Moment in the Human Sciences.* Chicago: University of Chicago Press.

Martin, P. Y., Turner., B., (1986). "Grounded Theory and Organisational Research", The Journal of Applied Behavioural Science, vol. 22, no 2, 141.

Marvin, S., Guy, S. & Chappells, H. (1997) *Smart Meters and Privatised Utilities*, Final Report to the Engineering and Physical Sciences Research Council (EPSRC), July.

Mateas, M., Salvador, T., Scholtz, J. & Sorensen, D. (1996). "Engineering ethnography in the home", *In: CHI '96, Extended Abstracts on Human Factors in Computing Systems, Vancouver, Canada.* New York: ACM Press, 283-284.

McNeill, D. (1992) *Hand and Mind: What Gestures Reveal about Thought*. University of Chicago Press.

Meyer, S. and Rakotonirainy, A. (2003). A Survey of Research on Context-Aware Homes," Proceedings of the 2003 Workshop on

Wearable, Invisible, Context-Aware, Ambient, Pervasive and Ubiquitous Computing, pp. 159-168.

Millen, D. R. (2000). "Rapid ethnography: time deepening strategies for HCI field research", DIS' 00 Proceedings of the 3rd conference on Designing interactive systems: processes, practices, methods and techniques, ACM New York, NY

Miller, D. (1997). Capitalism: An Ethnographic Approach. Oxford: Berg.

Miller, D. (1998). A Theory of Shopping. Cambridge: Polity

Miller, D. (2001). Home Possessions: Material Culture Behind Closed Doors. Oxford: Berg Publishers Ltd.

Moore, G., Croxford, B., Adams, M., Refaee, M., Cox, T., and Sharples, S., (2008). 'The photo-survey research method: capturing life in the city', Visual Studies, 23: 1, 50 — 62

Morley, D. (2003). What's 'home' got to do with it? Contradictory dynamics in the domestication of technology and the dislocation of domesticity, *European Journal of Cultural Studies* **6,** 435-458.

Morris, M.R., Huang, A., Paepcke, A. and Winograd, T. (2006) Cooperative gestures: Multi-user gestural interactions for co-located groupware. *Proc. CHI '06*. New York: ACM Press, 1201-1210.

Munn, N. (1986). The Fame of Gawa. Cambridge: Cambridge University Press.

Myers, B. A., (1998). A brief history of human-computer interaction technology, volume 5 issue 2, March/April 1998, ACM New York, NY, USA.

Mynatt, E. D., Douglas, B., Meera, B., MacIntyre, B., Mankoff, J., (1998). Augmenting home and office environments The 1998 3rd International ACM Conference on Assistive Technologies, ASSETS'98, USA, Apr. 1998. pp. 169-172.

Mynatt, E. D., Essa, I., and Rogers, W. (2000). Increasing the opportunities for aging in place. *Proceedings of the Conference on Universal Usability*. ACM Press, 65–71.

Nassala, H., Carr, D. A. (2003). Investigating Intra-Family Communications Using Photo Diaries, *In: Proceedings of HCI International 2003.* Springer-Verlag, 984-988.

Neustaedter, C. & Bernheim, B., A. J. (2006). LINC-ing" the family: the participatory design of an inkable family calendar", *In: CHI '06, Extended Abstracts on Human factors in Computing Systems, Montreal, Canada.* New York:ACM Press, 141–150.

Neustaedter, C., Brush, A. J. & Greenberg, S. (2007) "A digital family calendar in the home: lessons from field trials of LINC", *In: Graphics interface, Montreal, Canada.* New York: ACM Press, 199-20.

Nielsen, S., von Hellens, L., Greenhill, A., & Pringle, R. (1998, March 26-28). Conceptualising the influence of cultural and gender factors on students' perceptions of IT studies and careers. In *Proceedings of the 1998 ACM SIGCPR Computer Personnel Research Conference*, Boston (pp. 86-95).Nishi, T., Ohashi, T., Hiroshige, Y., Hirano, M., & Ueno, K. (1999). Study on TV recyclability. Proceedings of 1st International Symposium on Environmentally Conscious Design and Inverse Manufacturing, pp. 278– 280.

Norman, D. A. (1988). The Psychology of Everyday Things. New York: Basic Books.

Norman, D. A. (1993). Things That Make Us Smart. Reading, Mass: Addison-Wesley.

O'Brien, J. & Rodden, T. (1997). "Interactive systems in domestic environments", *In: DIS '97, Proceedings of the 2nd conference on Designing Interactive Systems*. New York: ACM Press, 247-259.

O'Brien, J., Rodden, T., Rouncefield, M. & Hughes, J. (2000). "At home with technology: an ethnographic study of a set-top-box trial", *ACM Transactions on Computer-Human Interaction (TOCHI)* **6,** 282-308.

O'Hara, K., Harper, R., Unger, A., Sharpe, B., Wilkes, J. and Jansen, M. (2005a): TxtBoard: from text-to-person to text-to-home. *Proceedings of CHI '05*, Portland, OR, USA, pp. 1705-1708.

O'Hara, K., Harper, R., Unger, A., Sharpe, B., Wilkes, J. and Jansen, M. (2005b): Text messaging to the home with TxtBoard. *Proceedings of HCII '05*, Las Vegas, USA.

Oakley, A. (1974) Housewife, London: Allen Lane.

Oakley, A. (1974) The Sociology of Housework, Oxford: Martin Robertson

Office for National Statistics. (2006). The Time Use Survey, 2005. Published with the permission of the Controller of Her Majesty's Stationery Office (HMSO) ISBN 1-85774-631-7

Olson, M. H., (1983). Remote office work: changing work patterns in space and time. Communication of ACM.

Packard, J., (2008). "I'm gonna show you what it's really like out here': the power and limitation of participatory visual methods', Visual Studies, 23: 1, 63 — 77

Park, R. and Burgess, E. (1921). Introduction to the science of sociology. Chicago: University of Chicago Press.

Park, S. H., Won, S. H., Lee, J. B., & Kim, S. W. Smart home – digitally engineered domestic life, *Personal and Ubiquitous Computing*, *7*, 3-4 (2003), 189-196.

Parker, L. (2005). "Photo-elicitation: An ethno-historical accounting and management research project". Paper presented at the 4th International Critical Management Studies Conference, Cambridge University, UK.

Perry, M., O'Hara, K., Sellen, A., Brown, B. (2001). Dealing with mobility: Understanding access anytime, anywhere, ACM Transaction on Computer-Human Interaction (TOCHI). Volume 8. New York, USA.

Perry, M. & Rachovides, D. (2007). "Entertaining situated messaging at home", *Journal of Computer Supported Cooperative Work (CSCW)***,** 99-128.

Petrelli, D., van den Hoven, E., & Whittaker, S. (2009). Making history: intentional capture of future memories. *Proc. of CHI*, ACM, 1723-1732.

Petrelli, D., Whittaker, S. & Brockmeier, J. (2008). Autotopography: What Can Physical Mementos Tell us about Digital Memories. *Proc.of CHI.* ACM, 53-62.

Pierce, J.& Paulos, E. (2010). Materializing energy. To appear in Proceedings of DIS Conference on Designing Interactive Systems. Arhus, Denmark. DIS '10. ACM Press, New York, NY.

Pierce, J., Paulos,E. (2011). A Phenomenology of human-electricity relations. CHI 2011, May 7–12, 2011, Vancouver, BC, Canada

Pierce, J., Paulos, E. (2011). Designing for emotional attachment to energy. Human- Computer Interaction Institute, Carnegie Mellon University. Pittsburgh, PA, USA.

Pink, S., (2001). " Doing visual ethnography". London: Sage.

Pink, S. (2004). Home truths:gender, domestic objects and everyday life. Oxford: Berg publishers Ltd.

Plomp, J., Tealdi, P. (2004). Ambient Intelligent Technologies for Wellbeing at Home. *Proceedings of the 2nd European Union symposium on Ambient intelligence EUSAI '04,* Vol. 84, 81 - 82**,** ACM Press.

Rachovides, D., Perry, M., (2006). "HCI Research in the home: lessons for empirical research and technology development", *Proceedings of BCS HCI'06*, QMW, University of London, 11-15 September, vol. 2, pp. 30-33.

Randall, D., Harper, R, & Rouncefield, M. (2007) *Fieldwork for Design: Theory and Practice* Kluwer.

Reed, D. J. (2005). Learning from Loseables: an exercise in critical reflection. Paper presented at the HOIT Home Oriented Informatics and Telematics, York.

Rekimoto, J. (2002) SmartSkin: An infrastructure for freehand manipulation on interactive surfaces. *Proc. CHI '02*. New York: ACM Press, 113-120.

Robinson, J., Godbey, G. (1997) Time for life: The Surprising Ways that Americans Use their Time. University Park: Pennsylvania State Press.

Rock, P. (1979). The Making of symbolic Interactionism. London. Macmillen.

Rock, P. (1990). Helping Victims of Crime. Oxford: The Clarendon Press.

Rock, P. (1998). After Homicide. Oxford: The Clarendon Press.

Rodden, K. & Wood, K. R. (2003). How do people manage their digital photographs? *Proc. of CHI*, ACM, 409-416.

Rodden, T., Crabtree, A.,Hemmings, T.,Koleva, B.,Humble, J., Akesson, K.-P., Andhansson, P. 2004. Between the dazzle of a new building and its eventual corpse: Assembling the ubiquitous home. *Proceedings of the Conference on Designing Interactive Systems, (DIS'04)*. ACM Press, 71–80.

Rothschild, M. L. and W. C. Gaidis (1981), "Behavioral Learning Theory: Its Relevance to Marketing and Promotions," Journal of Marketing, 45 (Spring), 70-78.

Ruchinskas, J. E., Steinfield, C. W., Svenning, L. L. (1980).Home computing: a vision in search of a marketplace: areas of needed research, *In: Proceedings of the May 19-22, 1980, National Computer Conference*, New York: ACM Press, 895-902.

Salazar, C. (2001) "Building boundaries and negotiating work at home", *In: Proceedings of the 2001 international ACM SIGGROUP Conference on Supporting Group Work, Boulder, Colorado.* New York:ACM Press, 162-170.

Salamon, D. (1984). Control and Observation of Neutral Systems. London: Pitman.

Sellen, A. J., Harper, R. (2002). The Myth of the Paperless Office. Cambridge, MA.: MIT Press.

Schwartz, D., (1989). Visual ethnography: Using Photography in Qualitative Research, Human science press,

Schmidt, B. L. (2000). You can go home again: successful telecommuting for the technical communicator.

Scott, S., (2009). Making Sense of Everyday Life, Polity Press, Cambridge.

Sharrock, W., Randell, D., (2004). Ethnography, ethnomethodology and the problem of generalisation in design, European Journal of Information Systems (2004), Volume: 13, Issue: 3, Publisher: Nature Publishing Group, Pages: 186-194.

Shklovski, I., Lindtner, S., Vertesi, J., Dourish, P. (2010). Transnational Times: Locality, Globality and Mobility in Technology Design and Use. *Ubicomp'10*, Denmark. ACM Press.

Shove, E. & Southerton, D. (1998) *Frozen in Time: Convenience and the Environment*, Paper presented to ISA Conference, Montreal, 26-30 July 1998.

Sigaut, F. (1994). 'Technology', in T. Ingold (ed.), Companion Encyclopedia of Anthropology. London: Routledge.

Sillar, B. (1996). 'The dead and the dying: techniques for transforming people and things in the Andes'. Journal of Material Culture, 1(3): 259-90.

Silverstone, R. And Hirsch, E. (Eds.) (1992). Consuming Technologies: Media and Information in domestic spaces, London: Routledge.

Silva, E. (2000). The cook, the cooker and the gendering of the kitchen, *The Sociological Review* 48, 612-628.

Slyke, C. V., Comunale, C. L., & Belanger, F. (2002). Gender differences in perceptions of Webbased shopping. *Communications of the ACM, 45*(7), 82-86.

Soanes, C., & Stevenson, A. (2003). Oxford dictionary of English. Oxford, UK: Oxford University Press.
Star, S. L. (Ed). (1995). *The cultures of computing.* Oxford: Blackwell Publishers.

Southerton, D. (2003) 'Squeezing time: allocating practices, co-ordinating networks and scheduling society', *Time and Society*, 12/1: 12-25

Stevens, M. M., Abowd, G. D. (2003). Truong, K. N. & Vollmer, F. Getting into the Living Memory Box: Family archives and holistic design. *Personal and Ubiquitous Computing*, 7, 210-216.

Stewart, A. (1998). The ethnographer's method. Thousand Oaks, CA: Sage.

Strauss, A., & Corbin, J. (1998). Basics of qualitative research: Techniques and procedures for developing grounded theory (2nd ed.). Thousand Oaks, CA: Sage.

Stockman, N., Bonney, N., Wuewen, S. (1995). Women's Work in East and West. London: Routledge.

Spender, D. (1995). *Nattering on the net: Women, power and cybespace*. North Melbourne, Victoria: Spinifex Press.

Spinellis, D. D. 2003. The information furnace: consolidated home control. *Pers. Ubiq. Comput. 7*, 53–69.

Spradley, J. (1979). *The ethnographic interview*. New York: Holt, Rinehart and Winston.
Suchman, L. (1987). Plans and Situated Action: the problem of human-machine communication. Cambridge, England: Cambridge University Press

Suchman, L. (1994). Working relations of technology production and use. *J. Comput.-Supp. Coop. Work 2*, 21–39.

Sullivan, O. (1996) Time co-ordination, the domestic division of labour and affective relations: time use and enjoyment of activities within couples, Sociology, vol. 30, no. 1, p.85.

Shove, E. (2003). Comfort, Cleanliness and Convenience. Oxford: Berg.

Swan, L. & Taylor, A. S. (2004) "An ethnography of lists in mothers' work", *In: CHI '04 FRINGE*, Extended Abstracts on Human Factors in Computing Systems, Vienna, Austria.

Swan, L. and Taylor, A.S. (2005): Notes on Fridge Surfaces. Proceedings of ACM CHI'05, pp. 1813- 1816.

Swan, L., Taylor, A. S., Harper, R. (2008). Making place for clutter and other ideas of home, *ACM Transactions on Computer-Human Interaction(TOCHI)*, 15*(2)*.

Taylor, S. J., & Bogdan, R. (1984). *Introduction to qualitative research methods: The search for meanings.* New York: John Wiley & Sons.

Taylor, A. S., & Harper, R. (2002). Switching on to switch off: An analysis of routine TV watching habits and their implications for electronic programme guide design.*usableiTV*, 1(3), 7-13.

Taylor, A. S., & Harper, R. (2003). The gift of the gab: a design oriented sociology of young people's use of mobiles. *Journal of Computer Supported Cooperative Work (JCSCW)*, 12(3), 267-296.

Taylor, A. S., Harper, R., Swan, L., Izadi, S., Sellen, A. & Perry, M. (2006). Homes that make us smart, *Personal and Ubiquitous Computing* 11, 383-393.

Taylor, A. S., Swan, L. & Durrant, A. (2007). Designing family photo displays, *In: ECSCW '07 Proceedings of the tenth European Conference on Computer-Supported Cooperative Work, Limerick, Ireland*. Springer, 79-98.

Taylor, A. S. (2009). Ethnography in Ubiquitous Computing. In J. Krumm (ed), *Ethnography in Ubiquitous Computing* (pp. 203-236). Chapman and Hall/CRC, Boca Raton, FL., USA.

Taylor, A. S. and Harper, R. (2003). Switching On to Switch Off. In *Inside the Smart Home*, Harper, R. Ed., Springer-Verlag, Berlin, Germany, 115–126.

Taylor, A. S. and Swan, L. (2005). Artful systems in the home. In *Proceedings of the Conference on Human Factors and Computing systems, (CHI'05)*. ACM Press, 641–650.

Thomas, W. I., Znaniecki, F. (1958). The Polish Peasant in Europe and America. New York: Dover Books (Originally published 1918-21).

Thrasher, F. (1927). The Gang. Chicago: University of Chicago Press.

Tilley, C. (1994). A Phenomenology of Landscape. Oxford: Berg.

Tilley, C. (1999). Metaphor and Material Culture. Oxford: Blackwell.

Tolmie, P., Pycock, J., Diggins, T., Maclean, A. & Karsenty, A. (2002). "Unremarkable computing", *In: CHI '02, Extended Abstracts on Human Factors in Computing Systems, Minneapolis, MN*. New York: ACM Press, 399-406.

Trauth, E.M. (2002). Odd girl out: An individual differences perspective on women in the IT profession, *Information Technology & People,* 15, 2, 98-118.

Trauth, E. M., & Quesenberry, J. L. (2005). Individual inequality: Women's responses in the IT profession. In G. Whitehouse (Ed.), *Proceedings of the Women, Work and IT Forum,* Brisbane, Queensland, Australia.

Trauth, E.M. (2006). Theorizing gender and information technology research, in E.M. Trauth (Ed.), *Encyclopedia of Gender and Information Technology*. Idea Group Publishing, Hershey, PA, 1154-1159.

Tse, E., Shen, C., Greenberg, S. and Forlines, C. (2006) Enabling interaction with single user applications through speech and gestures on a multi-user tabletop. *Proc. AVI '06*. New York: ACM Press, 336-343.

Venkatesh, A., Vitalari, N. P., Gronhaug, K. (1985). Computing in the Home: Shifts in the Time Allocation Patterns of Households, Project NOAH, Originally appeared as a chapter in Communications in the ACM, Vol. 28, No. 5, May 1985, 512-522.

Venkatesh, A. (1996). 'Computers and other Interactive Technologies for the Home' Communication of the ACM Vol 39 No 12.

Venkatesh, V., & Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and user behavior. *MIS Quarterly*, *24*(1), 115-139

Venkatesh, A., (2001). The Home of the Future: An Ethnographic Study of New Information Technologies in the Home, Advances in Consumer Research XXVIII, Mary Gilly & Joan Meyers-Levy (eds.), Valdosta, Georgia: Association for Consumer Research, 88-96

Vetere, F., Gibbs, M.R., Kjeldskov, J., Howard, S., Mueller, F., Pedell, S., Mecoles, K., and Bunyan, M. (2005): Mediating intimacy: designing technologies to support strong-tie relationships. *Proceedings of ACM CHI'05*, Portland, Oregon, USA. pp. 471-480.

Viller, S., Sommerville, I. (1999). Coherence: An Approach to Representing Ethnographic Analyses in Systems Design. Human Computer Interaction, Volume 14, pp. 9-41.

Viller, S., Sommerville, I., (2000). Ethnographically informed analysis for software engineers. Int. J. Human Computer Studies (2000) 53, 169-196.

von Hellens, L., Nielsen, S., & Trauth, E. M. (2001).Breaking and entering the male domain: Women in the IT industry. In *Proceedings of the 2001 ACM*

Wagner, J. (Ed.). (1979). “Image of Information: Still Photography in the Social Science. Beverley Hills, California: Sage.

Wajcman, J. (1991) Feminism Confronts Technology. University Park, Pennsylvania: Pennsylvania State University Press.

Wallman, S. (1984). Eight London Households. London: Tavistock Publications Ltd.

Wang, C.c., Cash, J.L., & Powers, L.S. 2000. Who knows the streets as well as the homeless? Promoting personal and community action through photovoice. Health Promotion Practice, 1(1): 81-89.

Wasserfall, R. R., (1997). “Reflexivity, feminism, and difference’, in Rosanna Hertz (ed.), Reflexivity and Voice. Thousand Oaks, CA: Sage.

Weber, R.P. (1990). *Basic Content Analysis*. Newbury Park, CA: Sage Publications.

Webster, J. (1996). Shaping women’s work: Gender, employment and information technology. London: Longman.

Wellner, P. (1993) Interacting with paper on the DigitalDesk. *Communications of the ACM 36* (7), 87-96.

Weilenmann, A., (2003) ”I can’t talk now, I’m in a fitting room”: Availability and Location in Mobile Phone Conversations, Environment and Planning A, special issue on Mobile Technologies and Space, (ed) E Laurier, vol. 35 (9), 1589 – 1605, Pion Ltd.

West, D., Quigley, A. & Kay, J. (2007). MEMENTO: a digital-physical scrapbook for memory sharing. *Personal and Ubiquitous Computing*. 11, 313-328.

Whittaker, S. and Hirschberg, J. (2001) The character, value, & management of personal paper archives. *ACM TOCHI, 8*,2, 150–17.

Widerberg, K. (2006) ‘Embodying modern times: investigating tiredness’, Time and Society, 15/1: 105-20.

Wilson, A.D. (2005) PlayAnywhere: A compact interactive tabletop projection-vision system. *Proc. UIST '05*. New York: ACM Press, 83-92.

Wobbrock, Jacob O., Meredith Ringel Morris, and Andrew D. Wilson. 2009. User-defined gestures for surface computing. In Proceedings of the 27th international conference on Human factors in computing systems. Boston, MA, USA: ACM

Woodley-Baker, R. (2009). 'Private and public experience captured: young women capture their everyday lives and dreams through photo-narratives', Visual Studies, 24: 1, 19 — 35

Wright, B.A. (1960/1983): Physical Disability - A Psychological Approach. Nueva York: Harper and Row.

Wright, R. J., Martland, J., Stafford, A. K., & Stanger, G. (2006). *Teaching Number: Advancing Children's Skills and Strategies* (2nd ed.). London: Paul Chapman Publishing.

Young, M. and Willmott, P. (1973) The Symmetrical Family, Harmondsworth: Penguin.

Zinn, K. L. (1981). What can be learned from arcade games and home computer applications? (A Panel Discussion): The case for considering games and home applications,

Appendix A: Study 1 Diary Photographs

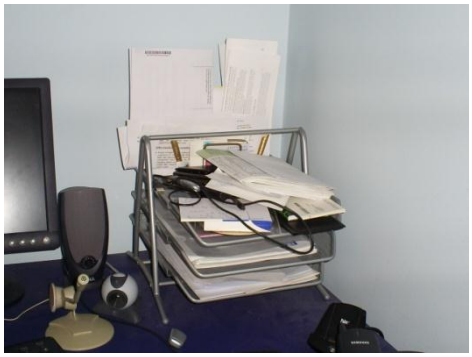
Family 1

The mother organizes her daily activities on the kitchen board.

The mother immediate storage on top of the microwave.

The mother keeps mixed objects on the kitchen surface to sort out later.

The daily posts come through the door and are picked up by the mother.



The father keeps his working papers on his filing tray. The pending papers on placed vertically to be acted on them.

The parents keep their children sentimental objects in these boxes.

Sentimental albums are stored tidy and neat by the mother.

Sentimental CDs are stacked on the shelf, and are
kept clean and dusted regularly by the mother.

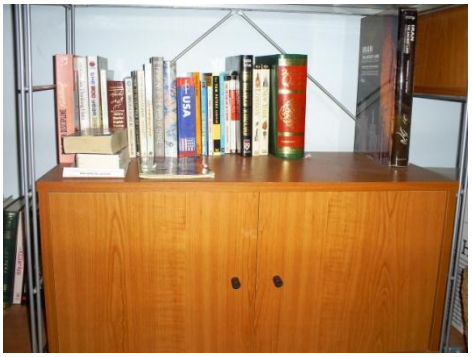
Children’s toys in the family room

Notes to put on the notice board

Mother spreading magazine on the table to read at spare time

Notes on the notice board in the kitchen in an easy to access place

A mother stores mix objects on top the microwave.



Storing sentimental books

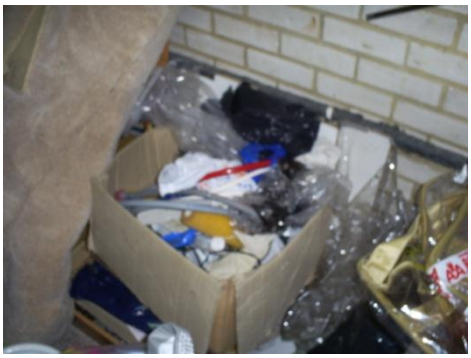
Storing sentimental books in a neat place

Keeping unique documents

Storing the receipt in the diary

Family 2 (Father)

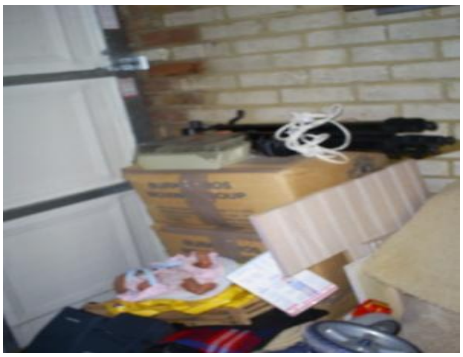
Storing mix objects in the garage



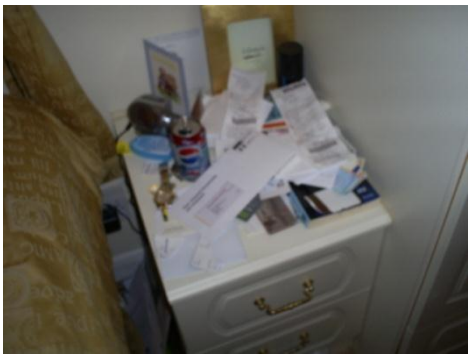
Storing mix DIY stuff in the garage for future use

Keeping the boxes in the garage from 5 years ago

Storing paint and DIY stuff together on shelves in the garage



Storing other objects on top of the boxes

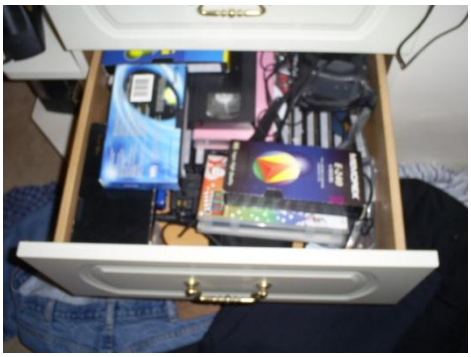


Using surfaces to leave the letters, watch, birthday card, etc.

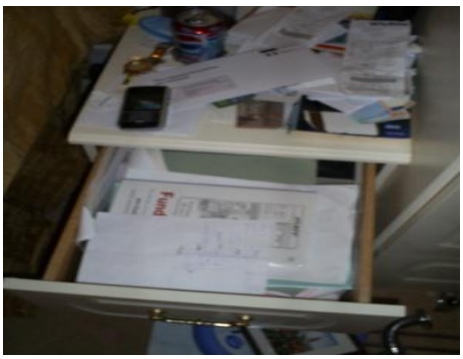
Using any available surface in the bedroom to store receipts for a short period of time

Leaving a letter, a pen, and a coin on top of TV in the bedroom

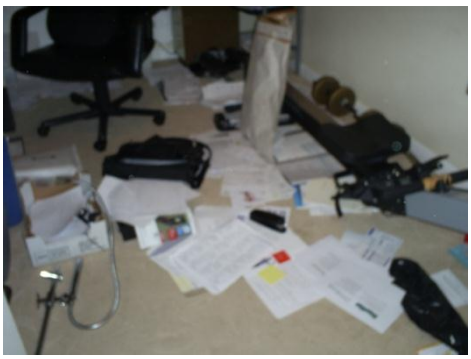
Keeping sentimental valued DVD and Video tapes



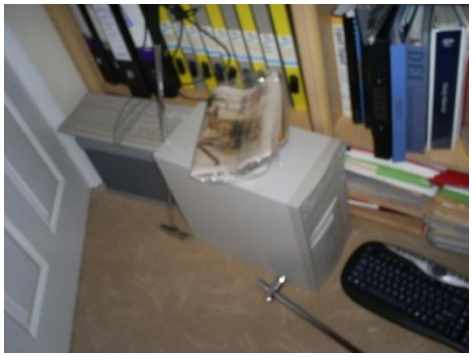
Keeping more DVD and Video tapes in the bedroom



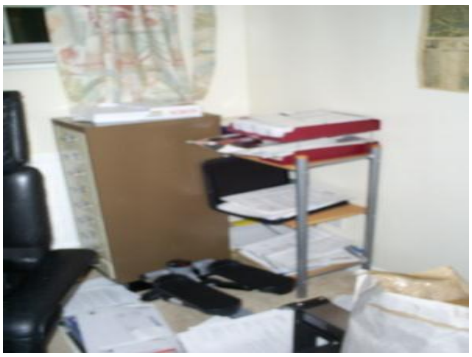
Spreading papers, mobile phone, a can of drink together on the bedside table



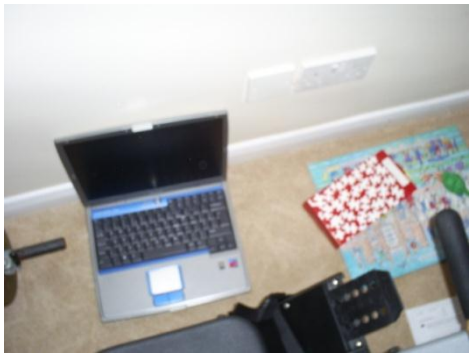
Spreading the papers on the floor in the office at home to categorise them



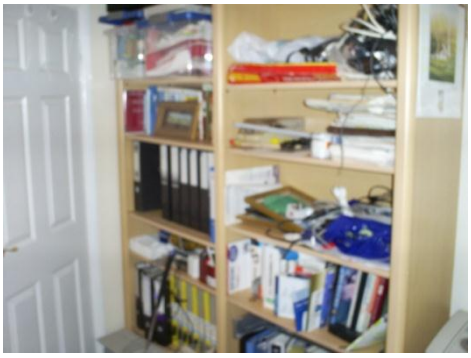
Keeping old computers in the hope of getting them repaired in the future.



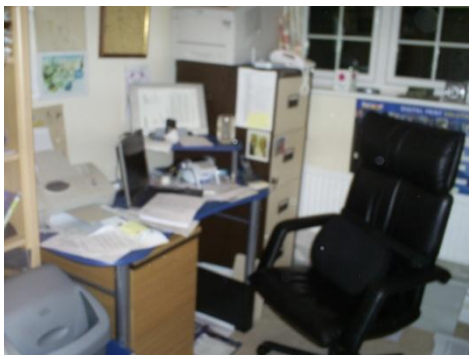
Papers lay on the floor, to be categorized on the filing shelves and the filing cabinet.



A broken laptop kept on the office floor at home.



Storing mix objects, different sizes and shapes together.

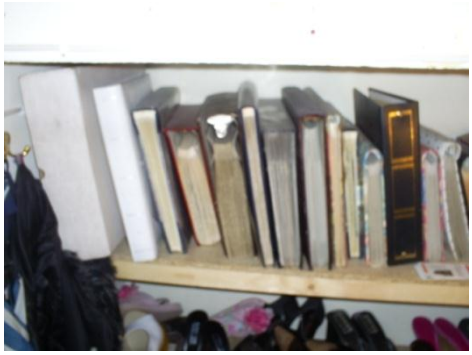


Layout of the office in a home, using easy to access surface to organsie the papers.

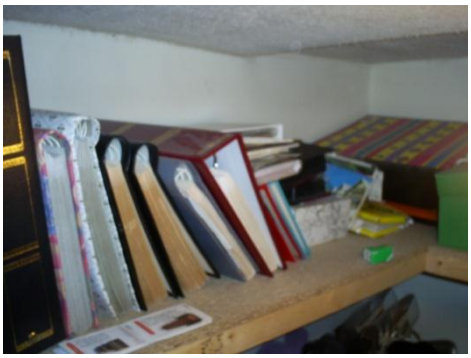
Sticking the calendar on the wall next to the chair (easy to access)

Very few papers in the cabinet, while the rest of them are laid on the floor to be sorted out.

Categorising work folders.

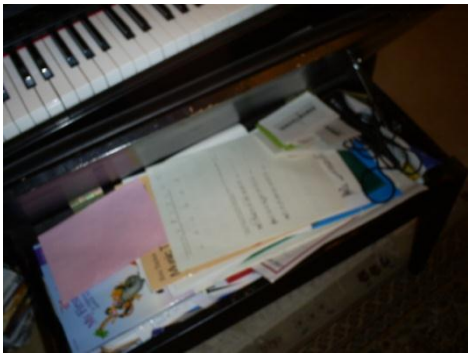


Keeping the photo album on the shelf under the stairs.



More albums on the shelves.

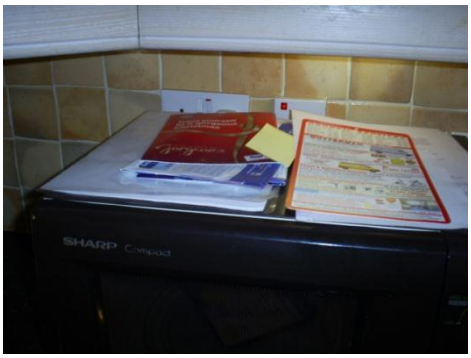
Keeping photoes in the shoe box , next to the albums on the shelf.



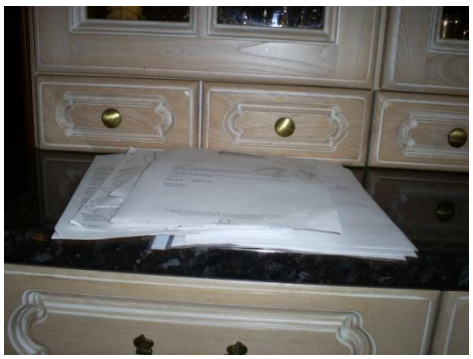
Keeping children music notes on the piano seat.

Family 2 (Mother)

The first point of entry of mail.



The mother keep her daily mail on top of the microwave.

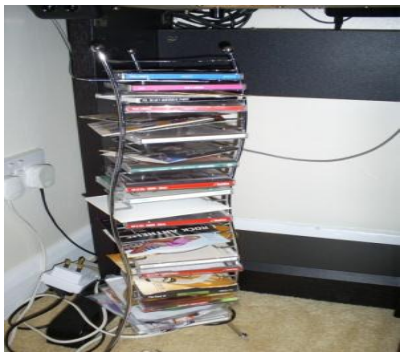


Children's school letters on kitchen's surface

Albums placed in a way on the shelf to use the maximum usage of the space.

More albums…

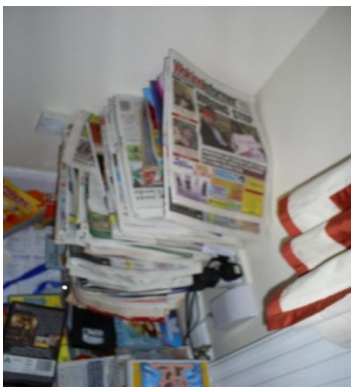
Stacks of CDs on top of the CD player.



CDs are not in use on the CD rack.

nearly empty filing cabinet in the house

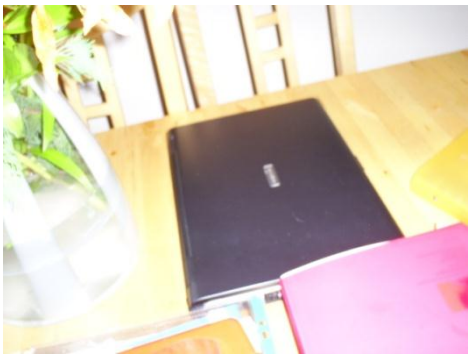
More than 10000 unread mails.



A stack of newspapers kept in the corner of the room to be passed to families and relatives.

Family 3

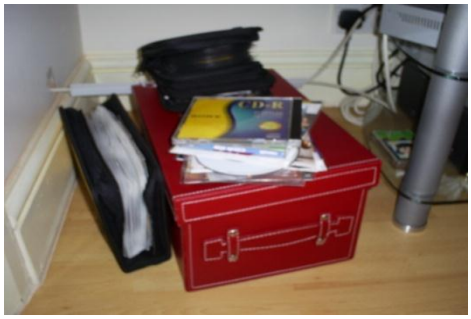
Keeping her study folder on the dining table



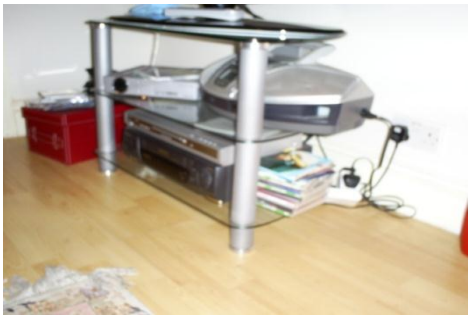
Using the dining table to place the laptop.

Keeping bankstatements on the table

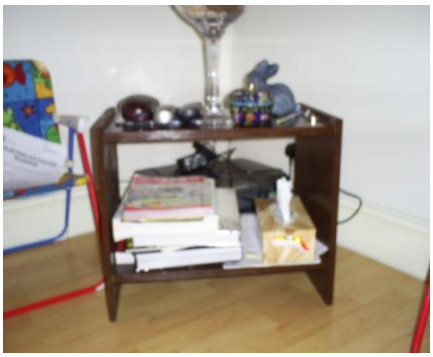
Using the fridge door to keep her letters.



Keeping CDs in the box, a CD bag and on top of the box.



TV area, using the most of the available surface.



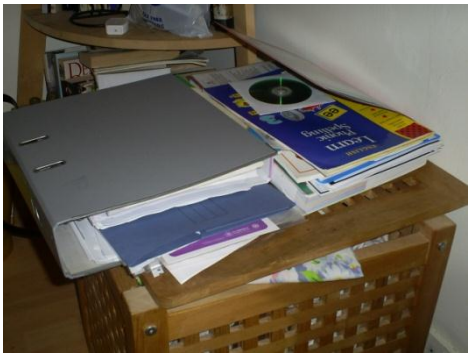
Using the surfaces of the table to store magazines, tissue box, ornament, etc.

Keeping more mix objects together

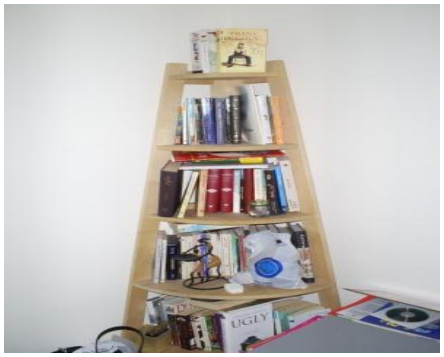
Keeping son's DVDs in the drawer.

DVDs and other objects are stored together.

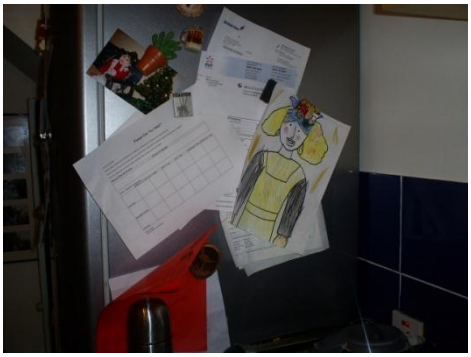
Using any easy-to-access surface to keep her stuff



More objects on the surfaces at home.

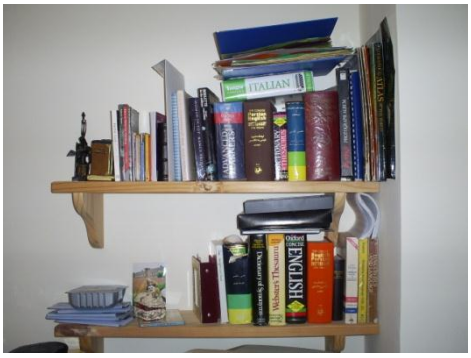


A book shelf to store books and ornament in the house.



Keeping magnets, son's drawing and bill together for a short period of time.

Using any available surface on the computer desk to keep her stuff.

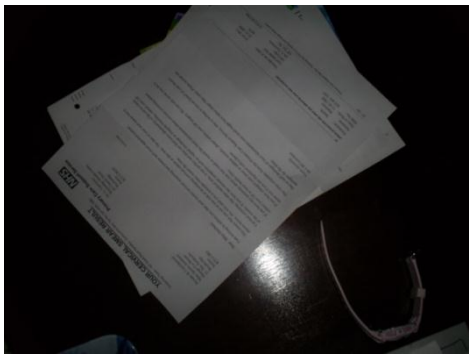


Books are stored vertically and horizonally on the surface.

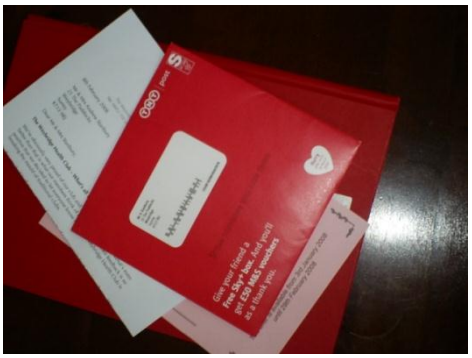
Family 4

A pile of letters moving around in the kitchen.

The mother claims that she does not get time to tidy up the house on a daily basis.

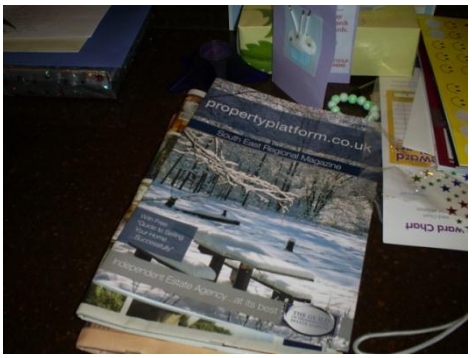


Bill and letters come to the kitchen.



More letters and bills on the kitchen's surface.

A storage box next to the sofa to keep children's toys



Keeping magazines on the bedside table.

More letters for her husband to sort out

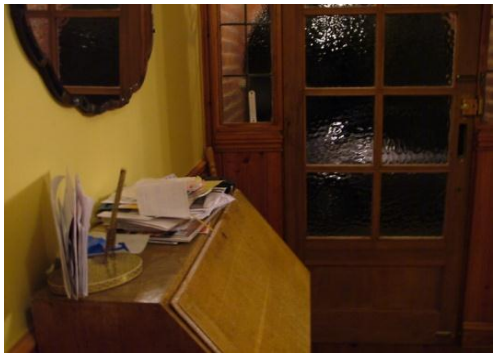
Keeping a magazine next to her bed.

Opening letters on pending for her husband to store away,

Family 5

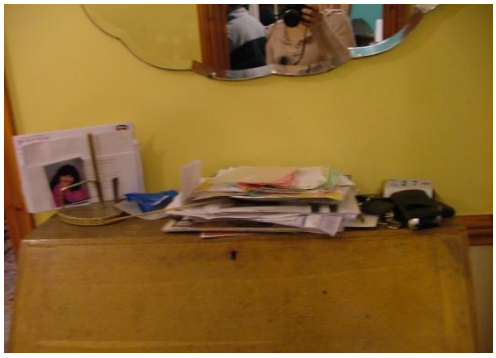
The mother keeps recycled stuff on the kitchen's surface.

The wife leaves her letters on the office desk for her husband to act on them.



The first point of entry of mail in the home.

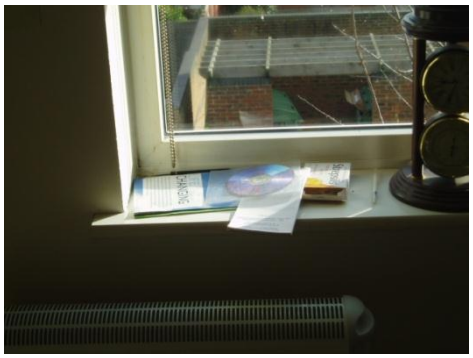
Keeping her letters on the kitchen's surface to read later.



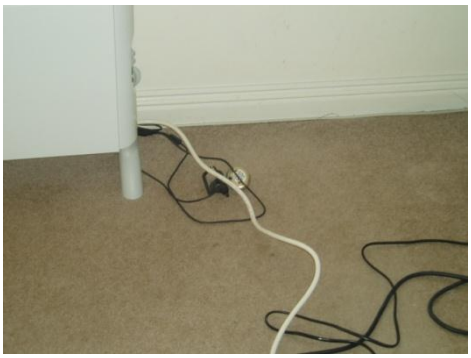
Keeping family letters on the first available surface (shoe box)

Children's play room.

Family 6



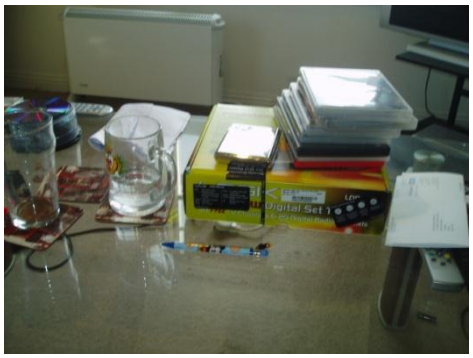
Using the surfaces of the window edge to keep CD and papers.



Running wires lay on the floor in the middle of the room.

Keeping a letter on top of remote controls, on top of the coffee table.

Keeping the games on top of a box.



Keeping mixed objects on the coffee table.

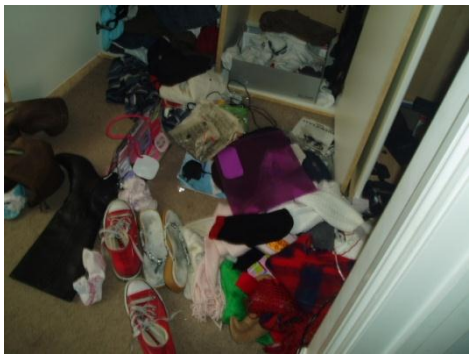
Keeping objects with different sizes and shapes together.

Keeping the CDs and a vase on the Window edge.

Storing all her photos on the desktop.

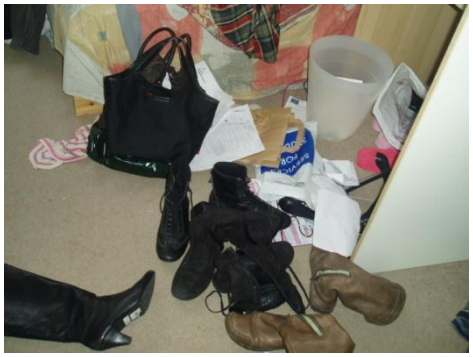
Keeping the magazines, mobile charger and CDs together on the shelf.

Keeping mixed objects on the shelves in her wardrobe.

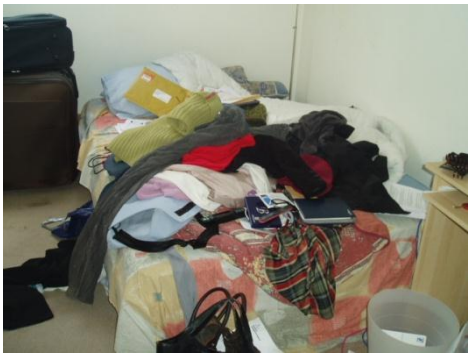


She decides not to tidy up at all.

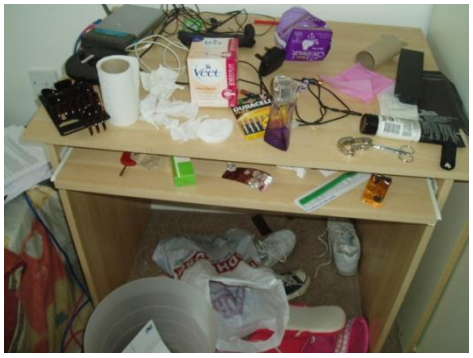
Keeping unused objects lay on the floor in the bedroom.



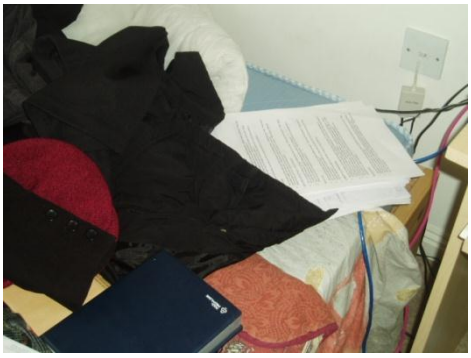
Leaving all her belongings on any available surface.



Keeping her clother, books, letters, etc on the bed which is used as a storage surface



She claims she never spent time tidying up, unless they expect a guest in their house.



Keeping her papers, book and clothes together.

Keeping her clothes and other belonging

She keeps her important documents in the suitcases.

Stacking unwanted objects, with different sizes and shapes on top of each other.

He keeps his belonging on his desk, such as hat, mobile phone, letters, etc.

Keeping mixed objects on the surface together.

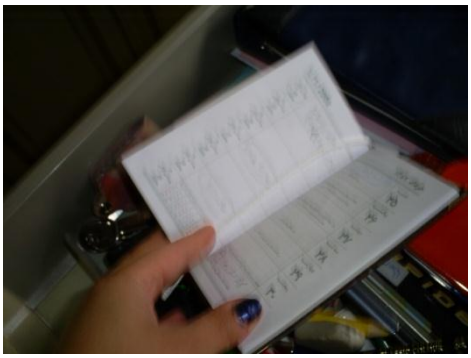
Keeping important documents and papers on the shelf, in the wardrobe.

Storing mixed object together on the shelf.

A pending letter on the heating.

Family 7

Keeping a box in the kitchen to store letters until the box becomes full.



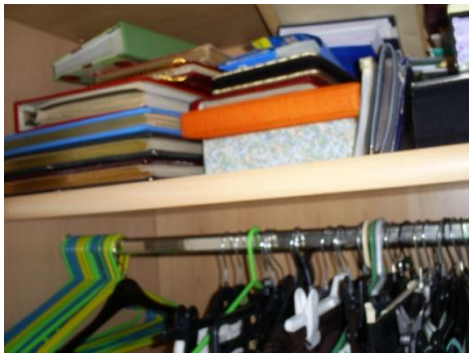
Examining the physical objects in the drawer in a kitchen.

Letters inside the box in the kitchen.

Keeping her important documents on the top shelf in the kitchen, and mixed objects on the lower shelf.

Inside the kitchen drawer.

Keeping business card together in a drawer

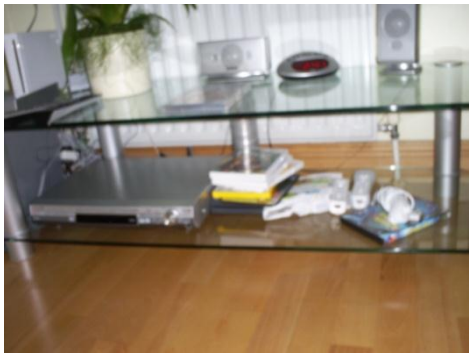


Keeping albums on the top shelf in the wardrobe.

Inside the children's wardrobe.

Keeping children's school letter on the side of the fridge.

Keeping books and other things stored together on the shelves.



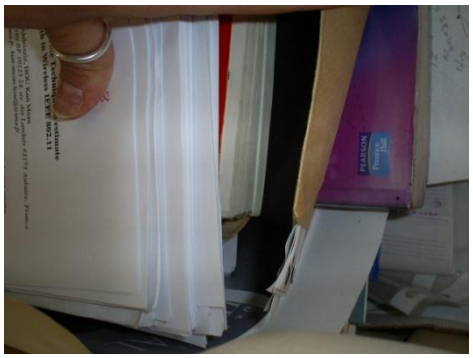
Used the surfaces of the TV stand to store different objects, such as a plant, speakers, DVD player, etc.

Storing objects with different sizes and shapes on the shelves together.

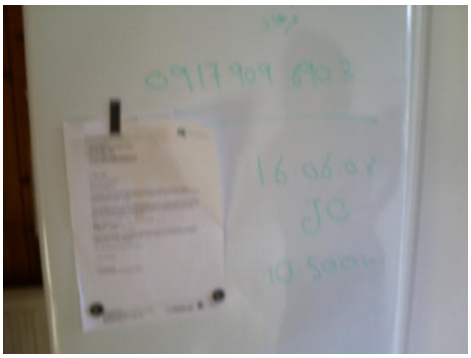
Family 8

Going through a stack of papers and objects next to a sofa.

Stacking mixed objects on top of each other.



Detailed look into the papers and objects in the stack.



Keeping an important letter on the board as well as important phone numbers.

Seperating recycle stuff in the corner of the room.

A bag full of books to be deleivered to a charity shop.

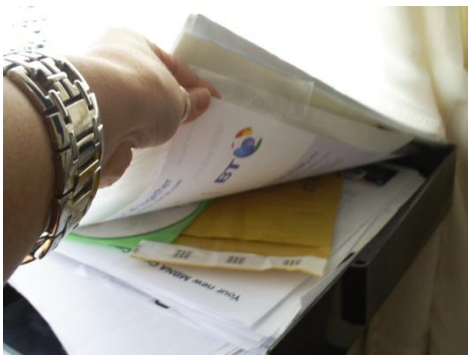
A calendar in the kitchen.

Her daughter's book shelves with mixed objects.

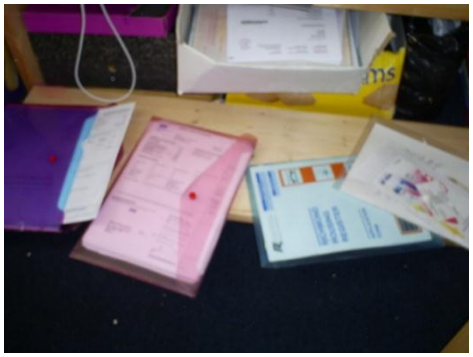
Storing books on the shelves vertically and horizontally.

Stacking a CD case on top of the books on the shelf.

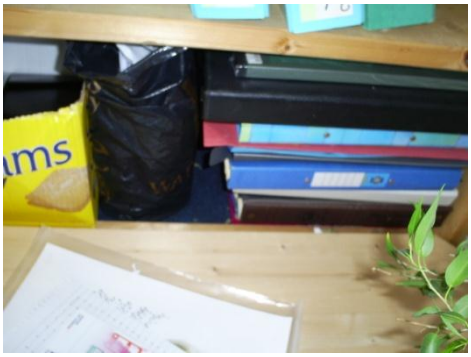
Using the surface of the printer to store more objects.



Pending letters to be categorized.



Categorising different documents.



Stack of folder, and a bag of mixed objects stored together on a shelf.

Using any available surface to store mixed objects.

Categorised materials.

Stacking the baskets of her daughter's belonging on top of a box in a cupboard.

Stacking more items on the baskets.

Family 9

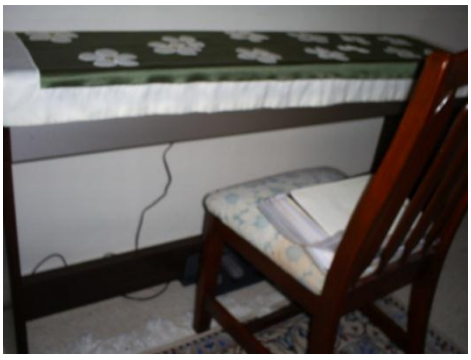
Storing relatives letters to pass them on.

Yellow pages and more magazines stacked under the table on the floor.

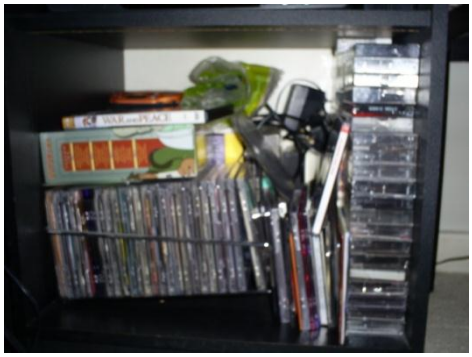
First point of entry of mail into the house.

Keeping more magazines in a basket.

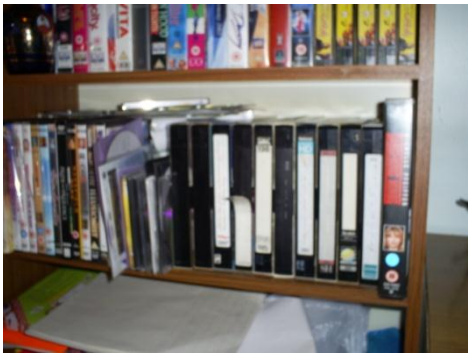
Taking this bag to work to sort out her letters inside the bag.



Leaving her music notes on the chair.

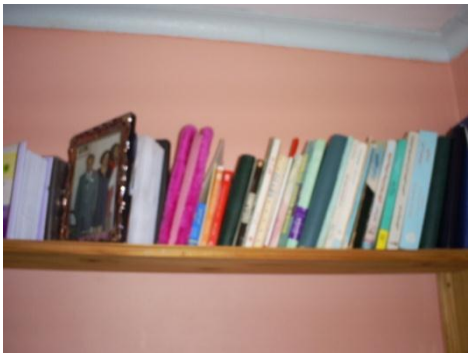


Keeping tapes and CDs together on a shelf.

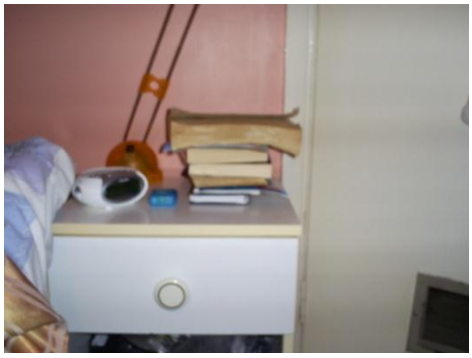


Video tapes and CDs are stored together.

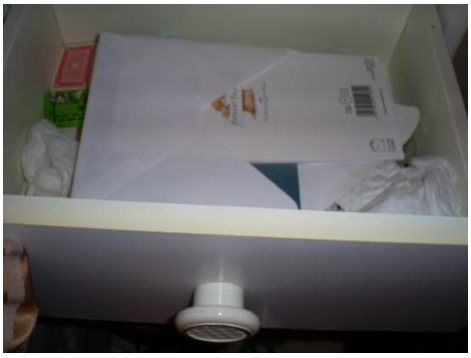
Keeping some papers on the bedside table.



Storing a family picture and books together on the shelf.

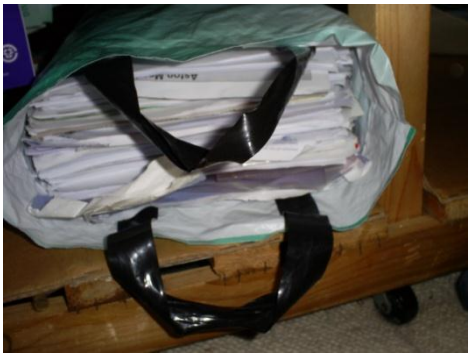


The books are stored on the bedside table for an easy-to-access purpose.



Storing some of sentimentally valued objects, such as birthday cards.

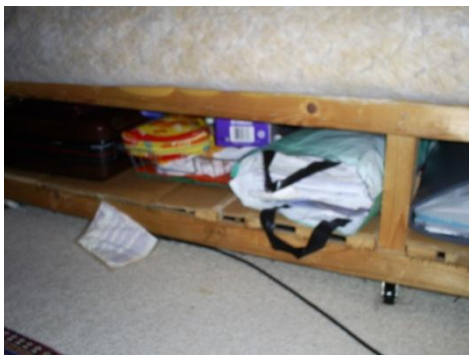
Wires lay on the floor.



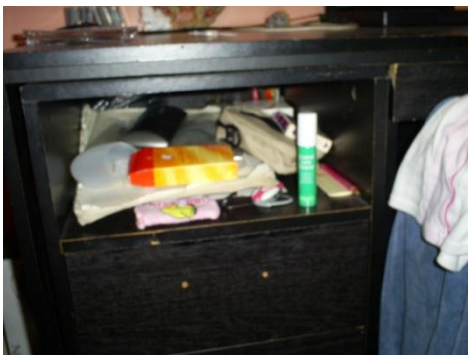
A bag of old bank statements.

She keeps her father's unique paper under her bed. (He lives abroad and often visits.)

Storing documents under her bed.



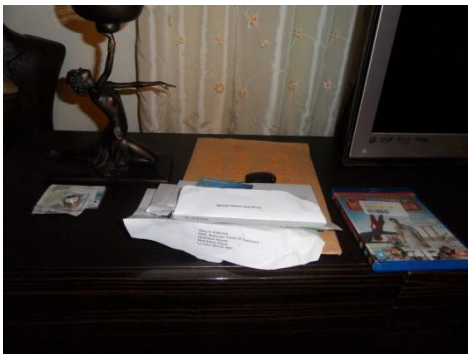
Storing her papers, sentimentally valued objects and other belonging under the bed.



The guest room's bedside table, mixed objects are stored together on the shelf.

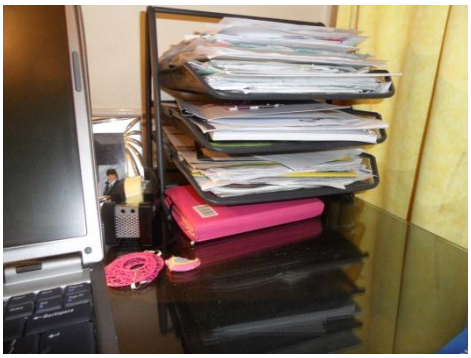
FAMILY 10

First entry points of the mail.



Using the surface on the TV cabinet to store objects for a short periof of time.

A stack of papers to be categorised.



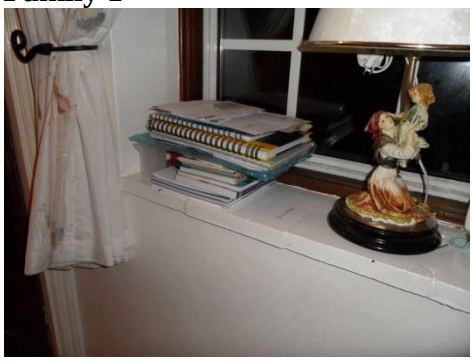
The filing tray full of papers to be stored permenantly.

The mother keeps her daughter's school letters on the fridge to remember the dates.

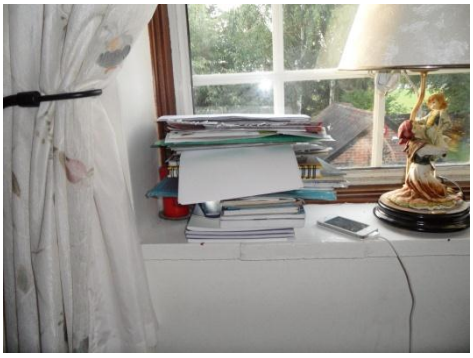
Stacking books ontop of the printer, which itself is placed ontop of the filing cabinet.

Appendix B: Study 2 Diary Photographs

Family 1

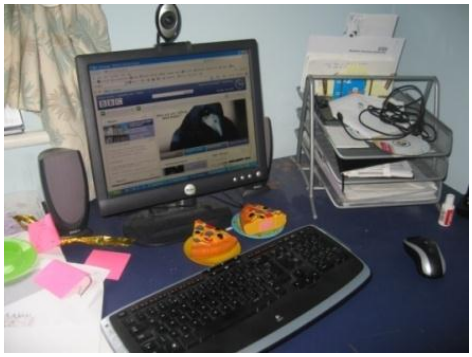


Sharing a surface to pile the books and documents.



More papers are added to the pile.

A mother and her child share the table.

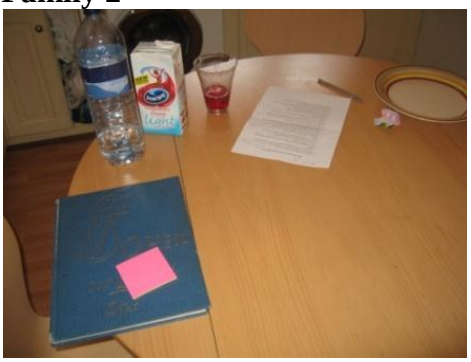


The computer is shared between the mother and her child.

Using the dining table to work on the laptop.

The mother used the dining table to keep her study notes.

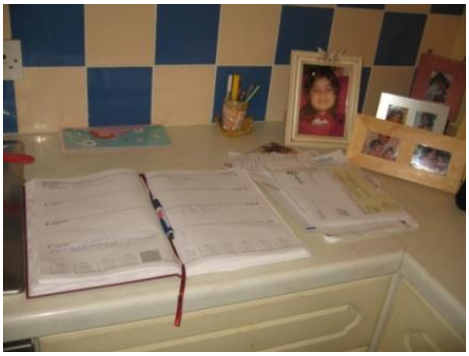
Family 2



The kitchen table is shared by all family members.

The mother divided the surface, by allocating a section to her children's painting.

The kitchen's surface is shared by a mother and her children.



The mother uses the kitchen's surface to lay her diary and organize her routine activities.

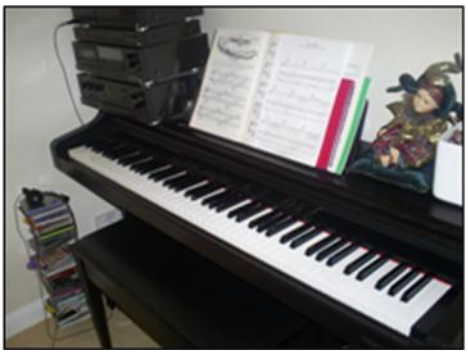
The mother uses the microwave to keep her children and her stuff on.

The mother uses the notice board to remember the dates and social activities.

Family 3

A stack of newspaper to be shared by family members and pass them to relatives when visiting.

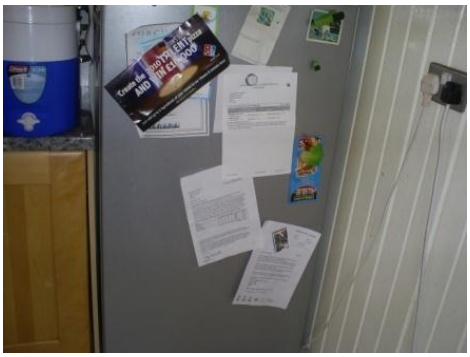
The kitchen's surface is shared to keep her children's school letter.



The piano is shared between her children.

A shared computer in the kitchen.

The mother uses the noticeboard in a kitchen.

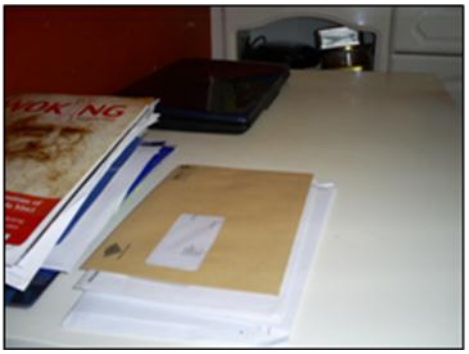


The mother keeps takeaway leaflet and important letters on the fridge door.

Family 4

The floor in the family room is shared to stack children's books, pens and papers.

The mother shares the fridge door, by dividing its surface into two sections: upper part belongs to the mother.
Lower part belongs to the children to use.



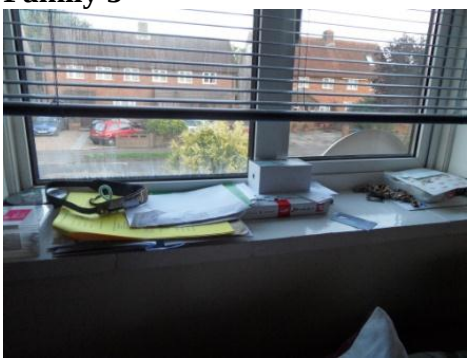
The mother keeps the mail on a small table in the kitchen.

The mother uses the surfaces to keep her letters and diary, as well as a CD player alongside other kitchenwares.

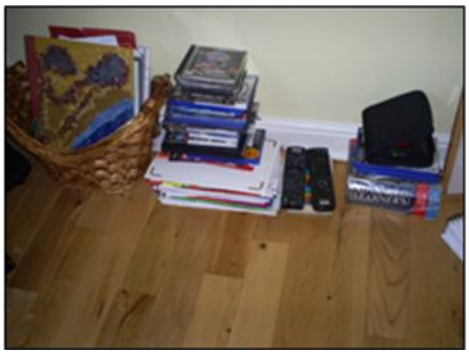
Sharing the kitchen's surface with her son

Using the kitchen's surface to store mixed objects together.

Family 5



Sharing the surfaces by the window to keep mixed objects.



Stacking papers, remote control, books, and a basket of children's artwork on the floor.

Picture frames on the floor to be stored permanently.

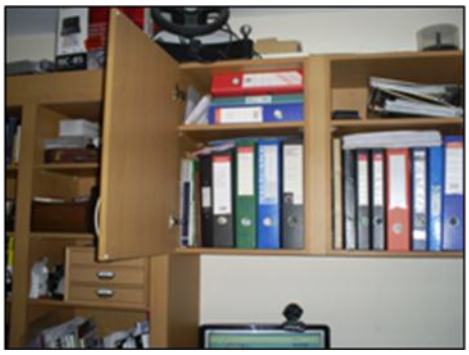
The family shares the table for various reasons. e.g. keeping a car key, ornament, magazine, photos, etc.

Books, albums and other objects are stored on the shelves.

The use of surfaces of the floor to accommodate more items.

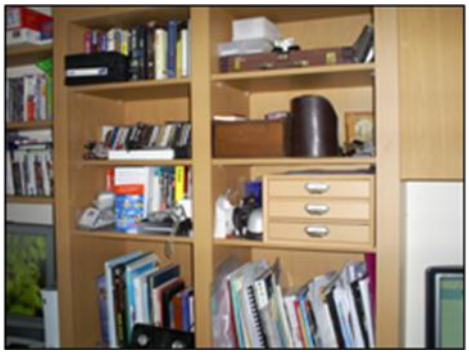
Family 6

The shared computer in a family room.

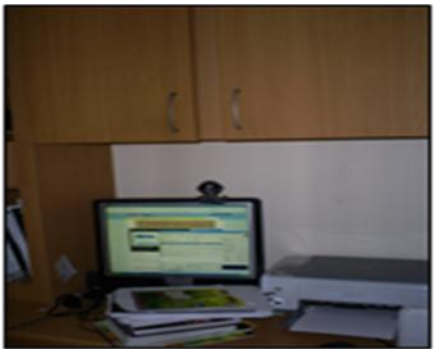


Storing relevant materials, such as house bill on the shelves above the computer.

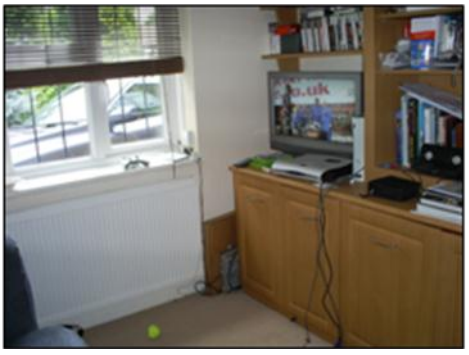
The father and the son sharing the kitchen table.



The shelves are shared by family members.



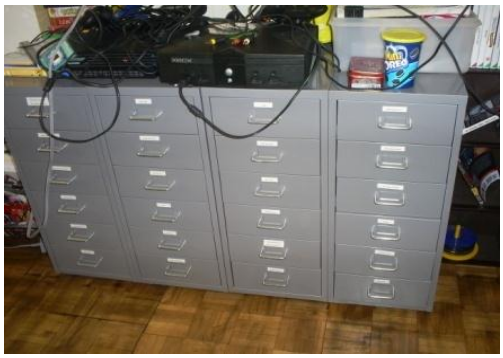
Children use the surface by the computer to do their computer related coursework.



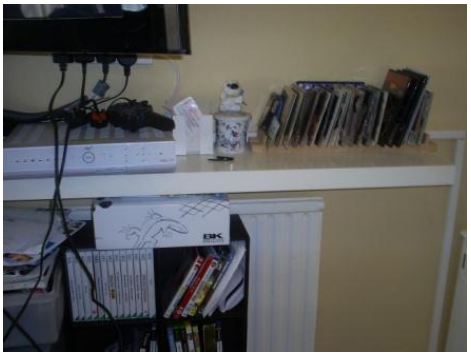
A TV, games and other stuff are shared in the family room.

Family 7

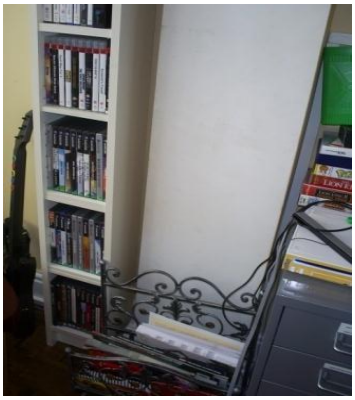
The room is shared by two teenagers.



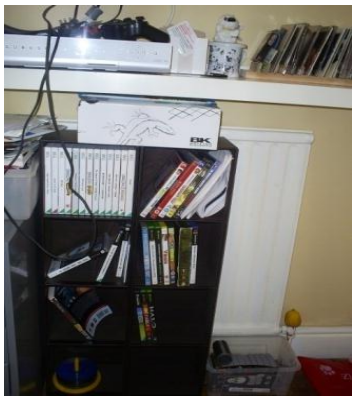
The filing cabinet is shared by parents.



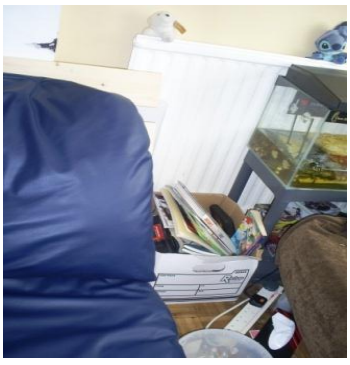
Mixed objects are stored and shared between her children.



DVD cabinet and magazines that are shared between her children.



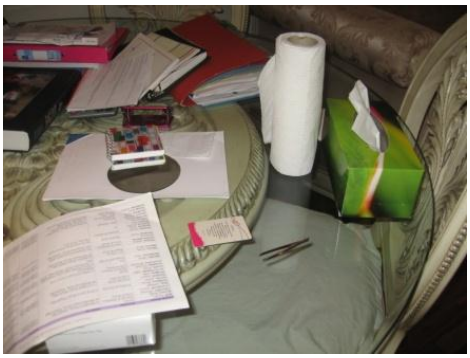
The shelves are shared between her children to keep their games, DVDs and other related materials.



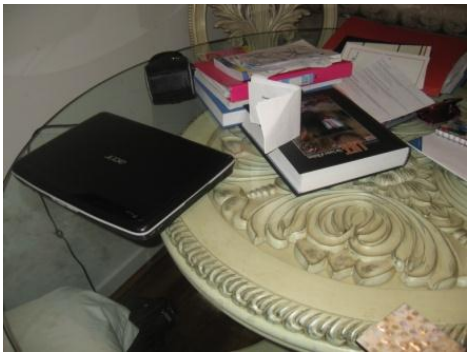
Keeping the mixed objects in a box in the corner of the room.

Family 8

The dining table is shared by family members.

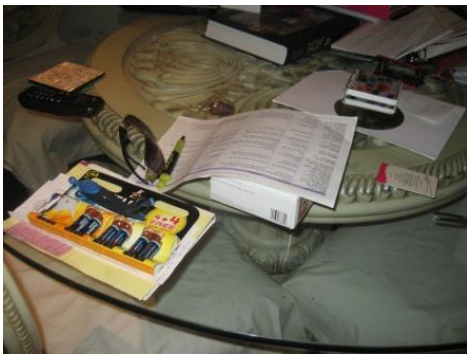


Sharing the dining table by keep objects with different shapes and sizes to be arranged and rearranged on the table on a daily basis.



Her husband shares the table, using his laptop.

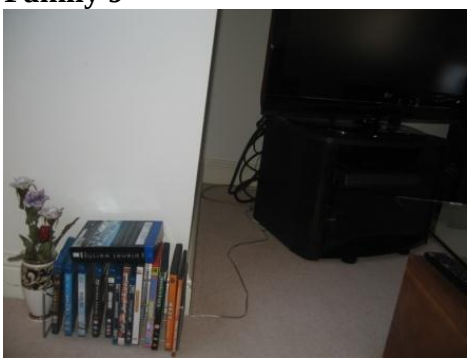
The shared table, with the mother's laptop on.



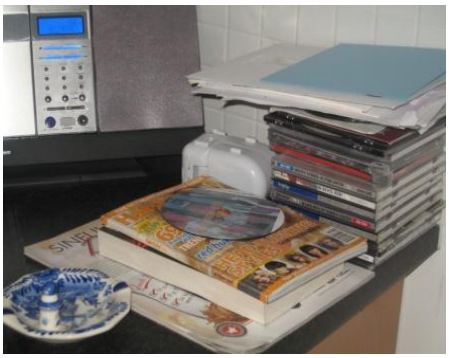
Objects on the table for a short period of time.

A cabinet, where its' surface is used to keep various objects.

Family 9



The DVDs and games are placed neatly, vertically and horizontally on the floor next to the TV.



The mother uses the kitchen's surface to keep her CD player, books and CDs.

The family room, where the TV is shared between a mum and her two children.

The chair's surface is used to be shared and stores various objects.

The kitchen's surface is used by a mother to keep her stuff on.

The chair her is again used to keep the clothes on.

Family 10

These bags are left on the floor to be delivered to a charity shop by the mother.

Sharing a table used by all family members for different reasons.

The father and his daughter sharing a dining table for different activities.

The table is shared by family members.

The surface of an us-used TV to keep the clothes for a short period of time.

The drawer used by the mother to keep various objects that are in daily use.

Appendix C: Guidance for photo diarists

Home Storage: From Tidying up to Storing and Retrieving

You have given a digital camera to use it over the next week to record your experience and ongoing practices of selection, organization, collation, display, storage, retrieval and disposal of information or things in your home. This is your photo diary. There are number of issues that I am interested in and as a photo diarist you can help me by providing photographs of the following matters.

1- What do you do with a new piece of information or thing that comes into the home?
2- What do you do with a new (non-food) thing that comes into the home that you aren't planning to use immediately?
3- How do you keep a unique paper? (legal documents, working notes,…)
4- How do you decide whether and how to categorize information?
5- What types of information or things are discarded in the home? (showing the value of certain pieces of information or thing has decreased and that once- valuable information is now superfluous; showing how an unread or unattended piece of information or thing can be discarded due to information overload)
6- How do you decide whether to keep incoming information available in your immediate shared space or store it away?
7- How do storing practices change in response to the growing amount of information available and the struggle to cope with ever-increasing accumulation of stuff?
8- When was the last time you cleared out any sort of collections? And why? e.g papers
9- How often do you access different type of storage at home?
10- When is the time to decide what to keep and what to throw away?

11- What are the devices for information flow in the home and family organization including notebooks, to-do lists,…?
12- How do you experience problems with information overload in the home?
13- How do you deal with the continuous pressure to keep the storage area (shared space) clear for documents?
14- What are the problems you experience in organizing and maintaining your personal storage?
15- How do you solve problems of storage and access wherever your personal space is located, be it a home study, kitchen, dining room, etc?
16- What makes paper valuable or unique in the home? (Does the paper include information to be processed in the next few days, information valuable for periods of weeks and months or an archival information such as long-term utility)
17- How do you retain papers? (Do you only keep frequently accessed information or thing? Do you only keep information that has proved useful in the past?)

If you think you are not using the camera as you should, please contact me. I would be happy to talk you through it.

Appendix D: Guidance for photo diarists

Social Interaction around Shared Resources

You have given a digital camera to use it over the next week to record your experience and ongoing practices and negotiations in sharing limited resources in your home. This is your photo diary. There are number of issues that I am interested in and as a photo diarist you can help me by providing photographs of the following matters.

1- What sort of things do you share at home?
2- How do you manage sharing a car? With regarding to children, how do you agree to someone be driven somewhere? How you deal with the conflict?
3- When something is coming to the house, how do you know whose they are?
4- How do you decide how to share things at home?
5- How do you share limited stuffs at home? For example use of TV, tables,…
6- How does sharing practice change? Why?
7- How often do you access different shared stuffs at home?
8- When is the time to decide who can use a shared thing at home? For example use of kitchen surface, table*, It's not fair,…*
9- Whose responsibility is to allow limited shared stuffs to be shared at home? How did you decide this?
10- How do you experience problems with sharing?
11- How do you deal with the pressure to keep the shared surface clear?
12- What are the problems you experience in negotiating the use of shared stuffs?
13- How do you agree that something might be yours for a reason or a period of time?
14- What is private? How do you decide that?

15- How do you solve problems of sharing and owning?
16- What makes surfaces important at home?
17- When is the time to decide who can use a shared thing?
18- When was the last time you used a shared thing? Why? How long for?
19- How shared stuff are managed at home?
20- Whose responsibility is to manage the use of shared things?