Artful Systems:

Investigating everyday practices of family life to inform the design of information technology for the home

Thesis submitted for the degree of
Doctor of Philosophy
in Department of Information Systems, Computing and Mathematics
Brunel University

by
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9 December 2010

Table of Contents

List of Figures and Tables

Inclusion of Published Work

The empirical chapters in this thesis (chapters 4 to 7) include materials published in conference proceedings and journal articles. These publications are derived from the empirical research contributing, solely, to this PhD. In all the empirical chapters, the materials have been extended and modified from any previous publication to develop the thesis' overall narrative.

The publications are as follows:

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

Swan, L. & Taylor, A. S. (2008) "*Photo displays in the home*" *In: DIS '08, Proceedings of the 7th conference on Designing Interactive Systems*. New York: ACM Press, 261-270.

Taylor, A. S., Harper, R., Swan, L., Izadi, S., Sellen, A., & Perry, M. (2007) "Homes that make us smart", *Personal and Ubiquitous Computing* **11,** 383-393.

Swan, L., Taylor, A. S., Izadi, S., & Harper, R. (2007) "Containing family clutter", *In: HOIT 2007, The 2007 Home Oriented Informatics and Telematics Conference.* Kluwer, 171-184.

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., Swan, L., & Randall, D. (2007) "Listening with indifference", *In: EPIC, 3rd Ethnographic Practice in Industry Conference, Keystone, Colorado*. Chicago: American Anthropological Association, 239-250.

Taylor, A. S., Izadi, S., Swan, L., Harper, R., & Buxton, B. (2006) "Building bowls for miscellaneous media", *In: Physicality '06, Proceedings of First International Workshop on Physicality.* Swinton, UK: British Computer Society.

Taylor, A. S., Swan, L., Eardley, R., Hodges, S., Regan, T., Sellen, A., & Wood, K. R. (2006) "Augmenting refrigerator magnets: why less is sometimes more", *In: Nordichi '06, Fourth Nordic Conference on Human-Computer Interaction*. New York: ACM Press, 115-124.

Swan, L., Izadi, S., Sellen, A., Taylor, A. S., Harper, R., & Perry, M. (2006) "Rethinking the 'smart' home", *In: Proceedings of the International Symposium on Intelligent Environments, Cambridge, UK.*

Taylor, A. S. & Swan, L. (2005) "Artful systems in the home" *In: CHI '05, Extended Abstracts on Human Factors in Computing Systems*, *Portland, Oregon.* New York: ACM Press, 641-650.

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Eardley, R., Swan, L., Sellen, A., Taylor, A. S., Hodges, S., Wood, K. R., & Williams, L. (2005) "Designing Augmented Refrigerator Magnets", *In: Ubicomp 2005: 7th International Conference on Ubiquitous Computing, Tokyo, Japan, Posters Session.* Heidelberg: Springer.

Taylor, A. S. & Swan, L. (2004) "List making in the home", *In: CSCW '04, Proceedings of the 2004 ACM Conference on Computer Supported Cooperative Work, Chicago, Illinois.* New York: ACM Press, 542-545.

Swan, L. & Taylor, A. S. (2004) “A short note on design troubles & enlisting critical reflection”, *In: CHI '04, Extended Abstracts on Human Factors in Computing Systems, Reflective HCI Workshop, Vienna, Austria.*

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.* New York: ACM Press.

Abstract

The research in this thesis was motivated by an interest in understanding the work and effort that goes into organising family homes, with the aim of informing the design of novel information technology for the home. It was undertaken to address a notable absence of in-depth research into domestic information and communication technology in the fields of Human Computer Interaction (HCI) and Computer Supported Cooperative Work (CSCW).

To that end, this thesis presents an ethnographic study of everyday routines in thirteen family homes. Following an established tradition within HCI and CSCW, the study applies qualitative fieldwork methods as a means to investigate and interpret the empirical materials. Periods of extended observation and semi-structured interviews with the thirteen families over a three-year period form the basis of the empirical material. The materials are analysed using a hybrid perspective composed of a combination of influences from the study of material culture, to interaction analysis and ethnography.

The hybrid analytical perspective draws out insights regarding the families' mundane practices and the artfully devised solutions they use to organise daily life. Four household activities and artefacts are given specific focus: (i) household list making, (ii) the display qualities of refrigerator doors, (iii) the organisation of household clutter, and (iv) the devising of bespoke solutions in organising home life. Broader findings include the observations that people tailor solutions to meet their needs, that optimum efficiency is not the pre-eminent determinant in what method or artefact people choose to organise themselves and their homes, and that homes determine their individual characters in part by how everyday tasks and organisation are accomplished. In short, the personal qualities of these mundane practices are part of what makes a home a home.

These findings are used to elicit implications for information technology design, with the aim of encouraging designers of domestic technology to be aware of and respectful towards the idiosyncratic nature of the home, and, wherever possible, to design in such a way as to allow the technology to be appropriated for families' bespoke tailoring. To evaluate and address this point,

two design projects, one on augmented magnets and another on a “media bowl”, are used to develop and test out this approach. Both projects are critically examined to reflect on the efficacy of the design approach and what lessons might be learnt for future studies and design exercises. The combination of detailed ethnographic fieldwork on family homes combined with the development of experimental design projects is intended to deepen the understanding of the mundane behaviours and everyday routines of family homes, in order to better inform the design of information technology for the home.

Acknowledgements

This thesis owes much to my long suffering supervisor, Mark Perry, for his steadfast guidance and his endless patience in accommodating the delays in this thesis being completed. Many thanks also to my external supervisor, Alex Taylor, for his inspirational advice and unfailing support. Also thanks to members of the Computer Mediated Living Group at Microsoft Research Cambridge, in particular Richard Harper, Abi Sellen, Shahram Izadi, Ken Wood, Tim Regan, Steve Hodges and Richard Banks. Thanks to Steve Love for his role as a secondary supervisor. Thanks also to Anthony Dunne, for his patience in my finishing up whilst working in his department. Thank you to my sister for her encouragement and my brother for his helpfulness in dealing with family matters whilst this thesis was taking shape. Finally, although in many ways first and foremostly, thank you to my patient family, my husband Olivier and my daughters Chloe and Imogen, who initially inspired this research and who are thrilled that there are no other dissertations I need to submit.

This thesis is dedicated to my parents, Dean and Julie Swan.

1. Introduction

1.1 Original Motivation

This research came about in what might be considered a somewhat organic manner. In 2002, I had recently finished a Masters of Science degree in Human Computer Interaction (HCI), and was working part time on a research project for my former university department. However, I was working in a very part time capacity, as I had recently had my second child, my first child was four years old, and I had minimal child care. So mostly I was at home, looking after children and doing what felt like endless loads of laundry. While doing this, I would sometimes think about the research project I was connected to. One day, sitting on the kitchen floor surrounded by the myriad loads of laundry, I couldn't help but reflect on how unrelated and far away the world of information technology felt to my everyday existence. Although I was certainly surrounded by various forms of technology which were integral to my everyday routines, such as the washing machine, the dishwasher, the microwave, and the refrigerator and so on, it felt like those were all old technologies, which had been sequestered to the domestic realm and didn't belong to the new world of information technology.

I also got to thinking about the various duties that staying home with children entailed for me and the other mothers I knew. There were the obvious demands of caring for a baby whilst attending to an occasionally jealous four year old, but it was the other less explicit aspects of my existence that I found more challenging; keeping the refrigerator stocked, planning meals, paying bills, scheduling nap times, keeping track of health related issues for the baby, waiting for repairmen, getting the older one to and from nursery school, arranging playtimes with other children, figuring out how to get a crabby toddler to the dentist's, and making sure the baby didn't spend all its time in the car en route to somewhere for the older child. It usually seemed like I was hopping between a multitude of disparate competing demands. I knew from

spending most of my free time with other stay at home mothers that my experience was hardly unique; indeed, it seemed to be the norm.

One afternoon, instead of ruminating about the project I was connected to, I was actually thinking about someone else's research project; a (larger, better funded) project running concurrently at the university which was examining new markets for existing technology, including in particular Personal Digital Assistants (PDAs). I had overheard a discussion some days before between some people on that project, discussing who might be an ideal user for a PDA. In my previous career, I had been a database programmer working primarily on relational databases. It seemed to me that the relational database functions of the PDA were its strong suit, and that these might actually be well suited to encapsulating the various roles that I, as a carer in the home, was attempting to juggle. Because some of the activities were quite unrelated to each other (sourcing a part for a broken dryer vs. trying to diagnose whether the baby's swollen cheek was a new tooth or something more sinister), it felt odd to group them together, yet I usually needed to think about both of them, and often in combination (could I swing by the hardware store on the way to the doctors but before I have to pick up my other child? If so, what would be the best route and timing?). I thought a well designed relational database might be able to keep track of all of the myriad information in distinct categories, whilst interleaving them when necessary, and possibly in interesting ways. The more I thought about it, the more well suited it appeared, and I decided to mention my idea to some of the people working on that project.

When I suggested to the researchers in the other group that an ideal user of a PDA might be a mother, the idea was greeted with something not far off astonishment. There was an embarrassed silence, then someone mentioned to a visiting researcher that I had recently had a baby and they all laughed, as if to suggest that my lack of critical reasoning was due to excessive hormones. No one was willing to discuss it, and the conversation went elsewhere. In hindsight, the other groups' reaction wasn't completely surprising to me; even I had felt slightly uncomfortable suggesting the idea, partly because the other group were all male and partly because the topic involved housework. I didn't expect it to be dismissed out of hand so completely however.

It was both the groups reaction and my own hesitation that made me wonder why the domestic realm was so out of bounds for information technology, and what made it so clearly an unsuitable domain. There were tasks, schedules, activities, addresses and phone numbers, all sorts of information which might be tracked on a PDA, for example, as well as a relatively unstudied population. All types of populations had been deemed worthy of study, from the ubiquitous air-traffic controllers (Mackay, 1999; Harper et al., 1990; Bentley et al., 1992) to bank customers (Hughes et al., 1999, Bowers and Martin, 2000) to graphic designers (Murray, 1993). Why not carers of people in the home? I wondered what it was about both the activities and the participants that were incongruous with information technology, so much so that it could be offhandedly dismissed. Why was it an embarrassing topic, and why was it not worthy of discussion? Why didn't the sort of work done in the home seem to qualify as 'real' work, even though at times it felt quite demanding? Was it because it was unpaid? Not proper work? Yet there were numerous studies on gaming (Headon and Curwen, 2002; Stromberg et al., 2002) and gambling (Neumann, 1996; Shelat and Egger, 2002; Griffiths and Park, 2002) which was neither work nor paid and no one seemed to find this problematic.

A few weeks after the PDA incident, it happened that the head of my former department asked me if I would be interested in pursuing a PhD. Prior to this, I hadn't particularly considered doing a doctorate, primarily because I couldn't imagine a topic that I found interesting enough to devote several years study to. I had actually somewhat gone off HCI by the end of my masters degree, in part due to my department's particular approach, which could be summed up as an ardent and explicit desire to turn HCI into an applied science, on par with engineering. Thanks to this, much effort had been expended to try to standardise and systematise the various elements involved in designing information systems. Thus, after two years, it felt like Human Computer Interaction was mostly about computers, with humans being a pesky attribute that needed to be accounted for when designing systems. Although I loved studying humans and technology and in particular the unusual ways humans used technology, I didn't enjoy trying to reduce human behaviour to its least bothersome representation.

However, the more I thought about it, the more this topic of household organisational work seemed to have real potential, as well as possibly being interesting to study, enough even for a PhD. There were all sorts of constraints that needed to be taken into account, making it fairly unusual. For example, the work had to be accomplished in short time frames subject to frequent interruption, due to the nature of looking after inquisitive children. Users needed to be mobile and the tasks and activities involved a fair degree of variety, ranging from composing grocery lists to scheduling naps to researching various childhood illnesses. There was the added characteristic of the odd hours many mothers keep, due to breastfeeding or nursing ill children as well as the multitasking nature of the work; several mothers I knew had mastered vacuuming whilst breastfeeding, which gives some sense of the need to accomplish a multitude of tasks simultaneously. In addition, this was a population that wasn't heavily utilising computers for household organisation (particularly in 2001) which suggested it had the potential of informing novel design for an untapped market. It had some intriguing study-of-work type questions, such as what exactly makes up household organisational work and what features and characteristics define and constrain the work. Perhaps most interesting to me were all those other aspects to consider, such as why was household work so hidden? Why was it seen as not serious, not real work? Why did even mothers seem embarrassed to discuss it, except in the company of other mothers? I knew these weren't typical HCI concerns, and possibly not an obvious focus for an HCI thesis, but I thought I might get a glimpse into them in the process of conducting the research. All of these characteristics added up, I thought, to a varied and interesting user population which was practically crying out to be studied.

In contrast to this, the department head's idea was that I would join an existing project already underway in the department, concerned with requirements engineering. As I wasn't remotely interested in this project, I thanked him politely and declined. On impulse, I decided to tell him about what I would really like to study. The head of the department listened carefully to my proposal, and then, after a moments pause, exclaimed "But my dear, there's simply no place for that in HCI!" His remark became the starting point

for my research; I decided to find out if there was really no place for this sort of research in HCI, and if so, why not.

1.2 Thesis Overview

No doubt like most PhD theses, this one has changed and evolved over time. Thus, what began roughly as a query as to why wasn't household organisational work represented in HCI ended up being an attempt to represent a small cross section of household routines and domestic behaviours, with an emphasis on the embodied practices surrounding a small selection of artefacts, as a means of informing the design of novel technology. Below is a brief summary of the nine chapters.

1.2.1 Chapter Summaries

Chapter 2 is a review of the various literatures used to inform this research. Initially, it appeared the discipline of Gender Studies would be better suited to researching the topic of household organisation and thus considerable time was spent reading various work from that discipline concerned with housework, housewives, women and technology. A discussion of the particularly relevant works in that field forms the first part of the chapter. After an explanation as to switching from Gender Studies back to HCI, the second part of the chapter examines the (somewhat slimmer) body of literature on technology in the domestic realm that was available circa 2003. Although there were several notable studies in this area detailing a variety of different approaches, a predominant paradigm in the literature of that period was that of the 'smart home'. A reaction to the smart home therefore became, almost by accident, a driving force for this thesis. In many ways, the focus became to articulate a vision of the home that offered a contrast to the smart home and, perhaps more importantly, a compelling vision for computer scientists and HCI practitioners to draw upon.

Chapter 3 is a discussion of the methods used in this thesis. Ethnographic observation and fieldwork seemed especially well suited to

capturing everyday routines and mundane activities, there being a strong tradition of this within the literature. Harper et al., 1991; Heath and Luff, 1993; Bowers et al., 1995;Anderson, 1994; and Button, 2000 are but a few of the authors who have used this approach within HCI and CSCW. During the course of studying various types of ethnographic approaches, I was particularly taken with Clifford Geertz's work, especially *The Interpretation of Culture* (1973). The method chapter therefore gives a brief overview of the concept of ethnographic fieldwork, and the emergence of its practice within HCI and CSCW. I then discuss the analytical framework I adopted, which drew upon several approaches. Those approaches were respectively: loosely ethnomethodologically informed ethnography, embodied practice, materiality and functionalism. A brief discussion of each of these approaches is followed by a section concerning the more functional aspects of the data collection. This section details issues such as the data collection, the choice of participants, the time period of the data collection and the data collection methods. The chapter ends with a section concerning some more theoretical concerns of the functional aspects of the data collection, with sections relating to objectivity, validity and the issue of gender.

Chapters 4, 5, 6 and 7 are the empirical chapters of the thesis, a subsection of approximately three years of fieldwork with thirteen families. They concern the
range of artefacts that I ended up studying, with a chapter devoted to each grouping.

Chapter 4 is concerned with paper lists and how they were used in some of the households studied. It examines the different types of lists people created, the purposes they were created for and how people in the various households used them. It then discusses the pros and cons of paper based lists, drawing upon the research on the affordances of paper (Sellen and Harper, 2002) and attempts to distinguish some of the characteristic features that might play for and against a digital artefact of this sort. More broadly, it considers how the easy availability, absence of technological overhead and mundane understandings of how to jot things down on paper all contribute to making lists one of the most ubiquitous household informational artefacts.

Chapter 5 is about refrigerator doors, and their display properties within the home. It examines some of the different materials found displayed on refrigerator doors, how the displays are fashioned and what these fashionings accomplish. It also discusses some of the ways these displays are entwined within family's routines and relationships and how they can become part and parcel of a family's social order. Again, the emphasis is on how it is the very simplicity, the everydayness and mundanity of families posting things on refrigerators doors, that makes them such an advantageous display surface for the home.

Chapter 6 focuses on clutter, a topic that arose out of the fieldwork for refrigerator doors. It examines three families' clutter receptacles, their methods for containing clutter and how these clutter containers function (or don't) within the household organisation scheme. By examining some of the minutia of clutter bowls and drawers, an argument is made that clutter containers are playing a very specific role in family households. Elaborating upon this idea, the chapter discusses the larger significance of clutter within households, drawing upon work by the sociologist Emile Durkheim and the anthropologist Mary Douglas, respectively, related to the sacred and profane, and considers how grappling with clutter is an integral part of delineating a home.

Chapter 7 draws on ideas from the preceding three chapters, to think about household arrangements in a larger sense; in particular the idea of self created or appropriated artefacts which is referred to in the paper as 'artful systems'. The chapter details a collection of diverse artefacts that families have fashioned to help organise themselves. The common thread amongst all these artefacts and their larger 'systems', is the combination of careful thought and the hand crafted, sometimes very idiosyncratic, bespoke nature of them. Looking at these artefacts and systems helps to illuminate some of the effort and ingenuity that families exhibit to maintain their everyday existences. The chapter ends with some broad suggestions for how this sort of ethos might be translated into technology design.

Chapter 8 works to pull the preceding four empirical chapters together, as a means of reflecting on their larger themes, their interconnectedness and what this might mean for the design of novel information technology. This is

followed by a description of two design projects based on selected fieldwork from this thesis, specifically that on display qualities of refrigerator doors and clutter, respectively. Both projects were exploratory in scope, intended more to test out some of the ideas generated by this study than to produce potentially viable technology. As such, they function as an interesting experiment and provide insight into some of the challenges and difficulties with implementing these design sensibilities.

Chapter 9 is the conclusion, which ties together the various strands of the thesis. It discusses how this research might be further developed, and the shape this research might take in the future. It considers, as well, the questions this research has inadvertently uncovered, the areas not answered or not addressed.

2. Disparate literatures

2.1 Introduction

The following chapter is a discussion of the various influences that informed this research, as well as an analysis concerning the place this research has within the niche of domestic technology, and within HCI and CSCW as a whole. The initial section considers literature from several disciplines, but is principally focused on material related to Gender Studies, with a brief discussion of relevant literature from the Material Culture corpus. This is concluded with an explanation as to why I switched from pursuing a doctorate in Gender Studies, back to pursuing this research from within HCI. The second section begins with a description of the shift in popularity of the home as a topic of study since 2004, and the subsequent proliferation and evolution of studies on the home, with a coda explaining how this research benefited from the timing of this shift. Using an argument of research verisimilitude, a survey of the extant literature on homes, families and all things domestic in HCI and CSCW circa 2004 is presented. This is divided, somewhat speciously, into "Early, Middle and Late" periods, reminiscent of the conventions used in discussing ancient history because in some sense, in terms of HCI and CSCW research on the home, this *is* ancient history. Of course, this is rather subjective and of questionable accuracy; other categorisation schemes could be devised with equal if not superior merit. It was more the way I came to think of the literature and as such functions as an organisational device. The penultimate section concerns smart homes, which has been an important and motivating inspiration of this research, (if largely in reaction to as opposed to in support of), followed by a summary of the chapter.

2.2 Gender Studies Literature

Initially, I was none too sure myself that there was a place for this sort of research in HCI, and consequently began my research by looking further afield.

Several disciplines have studies on housework and household management, including sociology, psychology, history, cultural studies, anthropology, politics, and economics. However, by far the majority of the literature concerned with these topics is found in what is broadly known as Gender Studies. Gender Studies is an interdisciplinary field of study that focuses on the phenomenon of gender, and issues seen as particularly pertinent to it, such as class, race, ethnicity and sexuality, amongst others. Below I offer an overview of work on housework that is drawn on in gender studies.

2.2.1 Historical Accounts of housework

Because housekeeping and housework has been an established part of women's lives for a very long time, it is mentioned in a large proportion of the Gender Studies literature. Discussion of the role of housework in women's lives is found in overviews of the field of Gender Studies (Jackson and Jones, 1998; Visvanathan et al., 1997; Gould, 1997) as well as several groundbreaking classics (Freidan, 1963; De Beauvoir, 1952). It is within the historical gender studies literature where housework really comes into its own, however. There are several works focused on the evolution of housework and its relation to women's status within society, most notably Susan Strasser's "Never Done" (1982) concerning housework in America, and Caroline Davidson's "A Woman's Work is Never Done" (1986) concerning the same topic but in a British setting. Besides providing chronological overviews of how housework has changed in relation to other aspects of society, both books provide engaging details about little known aspects of housework over the past several centuries. Various other accounts of the changing nature of housework include Oakley (1976), Bose (1979), Baxter, (2000), Smallshaw (1949), Bittman et al (2004), and Vicinus (1972). There is also considerable work on how housework is divided between the sexes, (Coverman, 1985; Hantrais and Letablier, 1997; Marini and Shelton, 1993; Abdel-Ghany and Nickols, 1983; Berardo et al, 1987).

The majority of these works adhere, in varying degrees, to what might be considered a prototypical Gender Studies approach; that is, the account is structured in such a way as to focus on the topic of gender, and primarily on the

disadvantaged role of women in society. Interestingly, the historical accounts are the least likely to explicitly take this focus, perhaps this is because their topic of study illustrates those particular points so well. Housework through the ages has been a gruelling physical activity, and reading about the endless drudgery involved in activities such as washing clothes, cleaning house and preparing food in pre-industrial society brings home, as it were, how arduous it truly was. An account that takes a more economically analytical approach (Adams, 1952) discusses the idea that due to a lack of mechanisation, women's domestic work had more value in these earlier periods. This in turn suggests, almost paradoxically, that women were in some ways more fortunate in spite of their obvious drudgery, because the lack of mechanisation gave their work a higher status in the economic ecology.

The history of the technological transformation of household work is an important topic within Gender Studies, both on a theoretical and a functional level. Christina Hardyment's "From Mangle to Microwave, The Mechanisation of Household Work" (1988) details the changing nature of housework in Britain against the backdrop of changes in British society overall during the industrial revolution, examining the parallel upsurges of industrialisation in both mercantile and domestic settings. Work by Wright (1960) and Rothschild (1983) also explores the topic of technological transformation of domestic work. However, the seminal work in this field is Ruth Schwartz Cowan's "More Work for Mother".

Published in 1983, Schwartz Cowan's work is a thoughtful and lucid analysis of both the introduction of domestic technologies, and the lack thereof, within the domestic realm in American society. The social, historical and economic ramifications of this provide an illuminating reorientation of the whole idea of technological progress. A major contribution of Schwartz Cowan's is her questioning of the assumption that the introduction of technology into the household resulted in a lightening of the female workload. She describes in detail how the uptake of certain sorts of technology resulted in higher expectations of household cleanliness within society as a whole, resulting in 'more work for mother' (hence the title of the book), which is in stark contrast to the commonly held notion that a housewife's lot improved

dramatically during this period thanks to technology. Other authors who have added to this research include Kline (1997), Murcott (1984) and Vanek (1984). Although Schwartz Cowan's work does an impressive job of detailing the social history of the technologisation of housework, she does not specifically address information technology, no doubt largely due to the lack thereof in 1983.

2.2.2 Feminism and technology

There is a considerable body of work on the larger themes of the relations between women and technology, notably, of course, Donna Haraway (1991, 1997), but also Terry and Calvert (1997), Wacjman (1991), Rakow (1988), Jackson (1998), and Lerman et al. (2003). A wide variety of topics have been examined, ranging from reproduction to female representation and identity in virtual worlds. Whilst fascinating, a comprehensive description of the breadth of scholarship is beyond the scope of this PhD. One work related to this oeuvre that was particularly personally inspiring however is MacKenzie and Wajcman's anthology "The Social Shaping of Technology" (1999). This collection of essays examining the social context of the development of various technologies and the associated ramifications does an excellent job of articulating the often overlooked socially constituted aspects of technology use, overturning many commonly held preconceptions. It also served to bring to my attention several authors whose work had a significant impact on my research, two in particular being Cynthia Cockburn and Anne-Jorun Berg.

Coming from a strongly feminist standpoint, Cockburn examines the gendering of technology in its mechanical instantiations. A book she co-edited with Dilic, "Bringing Technology Home; Gender and Technology in a Changing Europe" is unusual, not least in that the collection of studies in the book are from a group of European authors who began life as a 'women's group' (Cockburn and Dilic, 1994). Several of the studies seem remarkably prescient, particularly for having been written in 1994. Chabaud-Rychter's examination of the industrial design process of a food robot is fascinating for it's (dis)regard for the eventual intended female user, and her deconstruction of

the social implications of aspects of the design process seem particularly pertinent in light of the recent upsurge in robotics innovation.

Anne-Jorun Berg's piece "A Gendered Socio-Technical Construction; The Smart Home" (1999) was particularly inspiring. In it, she visits three smart homes, two owned by industrial concerns (Honeywell and the National Association of Home Builders) and one by a group of private investors. Berg's approach to examining smart homes hinged on asking the designers of the smart homes two central questions: 'How much time and work was involved in housework?' and 'Who will ultimately do that housework?' (p. 165) The answers were fascinating, if not wholly surprising. She found that on the whole, housework was largely ignored. Literature pertaining to the smart homes claimed "the house will take care of you" and "the house will do the job for you" (p. 167) but upon careful inspection, there was scant evidence that the house would do much beyond turning the lights on and off and adjusting the room temperature, (as will be discussed later in this chapter, these two areas remain persistent foci of smart home designers today). She recounts conversations with smart homes creators, highlighting the lack of women consulted in the design process; apparently, the smart home creators found the concept of consulting women "an interesting idea" (p. 175). Overall, a fascinating study which is still very pertinent fourteen years later.

2.2.3 Material culture

Beyond Gender Studies (although in some areas connected), another area of research that considers the home, and one that has had a significant impact on this research, is Material Culture. Material Culture is, again, a somewhat hybrid research area, and one that has gained popularity in recent years. A remnant of anthropology and archaeology, its origins lie in the antiquarian practice of collecting and cataloguing ancient artefacts. (Buchli, 2002). To the antiquarians, the artefacts provided a means to study remote and sometimes extinct cultures. Collections of vessels, instruments, armoury, remains and so on brought back from a region would be examined to piece together how a society lived, fought and died. The material was treated as a means to investigate culture.

By the turn of the 20th century however, Material Culture had lost favour. The uptake of ethnography, especially in anthropology, lessened the emphasis on studying a culture through its materials alone. Ethnography was seen as offering validity to cultural research by enabling a strategy for direct observation, in contrast to the mere speculation provided by studying artefacts. The resurgence of material culture emerged from the combined efforts of archaeology and anthropology and owes much to its uptake in the department of anthropology at University College London (Buchli, 2002). Proponents of the rejuvenated Materials Culture movement have demonstrated that the mindset of material culture, if not the specific empirical practices, could be incorporated into ethnography, allowing cultures to be examined through their use of specific materials. The material culture perspective gave a new means of investigating contemporary culture, resulting in a broad array of research on for example fashion, commoditisation, transnationalism, etc. (Miller,1998; Buchli, 2004).

Of particular relevance to the research in this thesis are investigations undertaken in the everyday domestic realm. A corpus of interesting and thoughtful work considers the concept of 'home' and what that has meant in a physical sense. Floyd's "Coming out of the Kitchen" (2004) and Silva's (2000) work on the gendering of the kitchen analyse how kitchens and their arrangements have to come to represent gendered notions of work (see also Llewellyn, 2004). Gonzales (2005) ruminates on how the home can become both a physical and evocative place of contradictory emotions. Taylor's work on the West Room in House Life, Space Place and Family in Europe (1999) reflects upon the particular arrangements that come to make up domestic spaces, whilst Arnold and Graesch (2002) take an ethnoarchaeological approach to how families express their sense of identity through their household arrangements. Morley (2003) argues that due to communication technology, the domesticity of the home has been dislocated, resulting in a place that is no longer 'home'. Cohen (2005) deconstructs the relationship between home and housewife, using the constructed media image of Martha Stewart as a rhetorical device.

A main proponent and leading light within Material Culture is Daniel Miller, at University College London. Miller's work, *Home Possessions*, is a

collection of studies focusing on different aspects and artefacts of a variety of homes in different cultures and 'how a home and its inhabitants transform each other' (Miller, 2001; p. 2). The similarities between what comprises a home in different cultures are often unexpected, as are many of the differences. As a whole, the book makes a compelling argument for the material agency of the home and the artefacts within it, and how the development and production of family relationships are profoundly influenced by those artefacts. Miller's work and the related Material Culture corpus were influential to my research, elucidating, in particular, the way that social relations unfold within the material world and how material artefacts are inextricably bound within those relations. Material Cultures specific focus on artefacts was helpful in providing a grounding in conducting my research, as well as an analytical lens with which to approach my data.

2.2.4 A change of direction

In the initial stages of reviewing this broad body of literature, I was fairly convinced that this research would best be pursued from a Gender Studies perspective, and had gone so far as to apply for and be accepted into a Gender Studies doctoral program. However, the more I engaged with the Gender Studies rhetoric and became immersed in the literature, the more uncertain I became as to whether Gender Studies was the right discipline within which to pursue this line of inquiry. My overriding concern was a sense of foregone conclusions; that is, I became apprehensive I could predict the answers to the various questions I was interested in regarding household work and information technology, and that these answers would be along the lines of extant arguments concerning the genderisation of technology and the suppression of the female identity. My main worry was that in trying to pursue this research question from a heavily theorised perspective (as is common practice in Gender Studies), it would be difficult to address what I was truly interested in, which was exploring some of the features of the intersection of household work and technology in an empirical fashion, and examining its relationship to the larger social context of the home.

After a lot of thought, I decided that a field like HCI and its related fields of CSCW and Computer Science might provide a better setting for pursuing my PhD. Whilst certainly not 'gender neutral' as has been well documented by many authors (Wajcman, 1991; Cockburn, 1988; Cockburn and Ormrod, 1993; and Haraway, 1997 amongst others), HCI, CSCW, Computer Science and technology studies in general might better be thought of as more 'gender disinterested' or possibly even 'gender oblivious', so focused are these disciplines on overcoming technological difficulties or optimising user performance. Thus, it seemed that whilst the HCI community might not be especially welcoming, sympathetic or even particularly interested in the sort of research I wanted to pursue, at least there wouldn't be expectations as to how it should be pursued or what conclusions should be reached.

Moreover, the relative absence of research into the world of domesticity within HCI and CSCW (circa 2004) seemed both an opportunity and a challenge. Unlike in Gender Studies, where the debates appeared to be caught up in the subtleties of theory, the applied fields of CSCW and HCI had scope to benefit from some of the broader ideas I have noted above. In short, it seemed the potential of my work could be greater and, perhaps ambitiously, that it might have some impact, if only indirectly, on the design of real-world things. And so, in light of these points, I decided to pursue this research within CSCW and HCI.

2.3 Literature concerning the home in HCI and CSCW

2.3.1 The rise of the Home in HCI and CSCW

Prior to 2004, it seemed that HCI and CSCW were really only just beginning to consider the home as its own entity, with its own concerns, practices, routines and flavours. Using the keywords "home" "domestic" and "family" to search the Association of Computing Machinery (ACM) digital library in 2003 yielded scant results. There were only a handful of papers that actually addressed the home as a place of study; indeed, there were more studies examining "home pages" than the home itself.

Since then, things have changed dramatically, and a succession of significant studies (Graves Peterson, 2005; Neustaedter et al., 2006; Palen and Aaløkke, 2006; Shklovski et al., 2006; Elliot et al., 2007; Stringer et al., 2006; Plaisant et al., 2006; Bernhaupt et al., 2008; Perry and Rachovides 2007; Gaver et al., 2008, to name but a few) have added much towards articulating the essential nature of the home. There has been work detailing all sorts of domestically related topics, from domestic soundscapes (Oleksik et al., 2008) to the recreational vehicle as homes for the elderly (Zafiroglu and Chang, 2007). Studies concerning the home and families are now a common feature in a far-ranging assortment of journals and conferences, including EPIC, Pervasive Computing, MultiMedia, Intelligent User Interfaces, Mobility, GROUP, DUX, Creativity and Cognition, as well as many with a traditionally more technical agenda, such as Ubicomp, UIST and Human Robotic Interaction.

In this literature review chapter, I have specifically chosen to focus on the HCI and CSCW related literature that was available prior to 2004. This is not to in any way suggest that subsequent research in these disciplines does not merit discussion; if anything, the opposite is true, thanks to the breadth and depth of topics. Instead, this is being done as an attempt at some form of methodological verisimilitude, as opposed to arbitrary literary convention, lack of thoroughness or just plain laziness. Parts of the research presented in this thesis was first published in 2004 (Taylor and Swan, 2004). The fundamental change in the amount, variety and depth of the literature available on the topic between 2004 and 2008, and the differing reception to papers of this sort has significantly altered the landscape of research into the home and domestic settings. To use an oft worn phrase, *things were different then,* but they were, and substantially so. Including a comprehensive review of the current state of literature concerning domestic themes in HCI and its related fields would be misrepresenting, in some fundamental way, where this PhD originated from in that it would mask how very little attention was being paid to this area.

In retrospect, it has become evident to me that the research detailed in this thesis benefited greatly from advantageous timing; that is, being in the right place at the right time. This is because it was developed (and mostly published in conference proceedings) just before the topics of domestic settings

and the home took off. One of the early authors on the home, noticing the sudden convergence of interest towards this topic in relation to its prior relative lack of popularity, referred to the sudden increase in papers on the home as 'jumping on the digital home band wagon' (Mainwaring, 2005). Typing 'home', 'domestic' or 'family' into the ACM digital library in 2010 attests to this, in that it brings up pages of titles, exploring in depth a huge variety of topics. The home and family related research corpus of Microsoft Research Cambridge, of which the research in this thesis was an early component, numbers over 90 publications alone.[1] But this was not the case in 2004. Therefore, although it would in many ways be much easier, richer and more interesting to include all the work related to the home subsequent to 2004, (if only because the majority of the work on the home has been done since then), I have chosen not to in the interests of giving a more grounded and authentic representation of the origins of this research.

The literature described is very loosely chronologically divided into 'Early, Middle and Late' periods. As there was no program of purposeful, sequential development of information technology for the home, this attempt at a historical taxonomy is not robust, and some studies will not fit neatly into their allotted historical period. However, by suggesting a trajectory and a chronology of sorts, the hope is to give some sense of how innovative and uncommon that early work actually was.

2.3.2 Early Period

Prehistory

There have been visions of computers in the home dating back to the infancy of personal computing; as early as 1962, Gordon Moore speculated about the suitability of PCs for storing recipes (Adams and Lowood, 1995). In 1965, Honeywell developed the Model 316 Kitchen Computer, complete with 4k of memory and a built in cutting board, which was featured on the cover of the Neiman Marcus catalogue (Frauenfelder, 2005). (No sales were generated

1 To add further credence to this argument, the research on lists detailed in this thesis is the earliest work mentioned on the publications website for the Microsoft Research's Computer Mediated Living Group, dating from 2004.

however). Interestingly, the computer as a recipe database and kitchen tool has remained an enduring vision, if not necessarily a particularly popular one, commercially. It has resurfaced every few years in some incarnation, some of the most recent being MIT's kitchen work (Bonanni et al., 2005; Lee et al., 2006) and the 'cooking navi' (Hamada et al., 2005), as well as countless smart homes (Bradbury et al., 2004; Chi et al., 2007; Yamakata et al., 2009) and technology appliances designed specifically for recipes and the kitchen, including 3Com's 'Audrey' and Balmer's 'Kitchen Sync'.

Early research in the 1980s in HCI and CSCW concerning information technologies in the home was limited, as personal computers (PCs) were still gaining a foothold in offices, and were relatively rare in homes. This was due to a combination of factors, the main one being, as is so often the case, cost. Arguably the first comprehensive attempt to consider information technology within the domestic realm was Venkatesh et al.,'s early work. This work, which covered several papers beginning in 1985, pointed out the rather impressive range of barriers relating to the adoption, or lack thereof, of information technologies within the home. These included primitive software for home use, unfamiliarity and low level computer skills among the general public, the view that computers were a job-oriented technology, not a domestic one, lack of links to other technologies in the home (such as VCRs), gender bias, and a lack of defined physical or social space within the home.

In an article from 1996,Venkatesh revisited his work and found that some of the obstacles listed no longer held true. By then, a fair amount of software developed solely for home use was available, many people used computers in their work and children were beginning to be taught computer skills as part of their school curriculum. Various technologies, such as digital cameras and MP3 players, had come to rely on the computer to function effectively. However, the PC still had not made the expected inroads into the home. A critical finding in Venkatesh's original research from the 1980's was the idea that "computers were not viewed as essential to running the household. There were more strategic technologies in the home – the telephone, the refrigerator and the automobile – that households felt they could not do without." (1996).

Because the majority of research about human computer interaction with personal computers had been gleaned in an office environment or a workplace setting, some early research framed the home in relation to the office. Work by Olson (1983, 1989) and Bailyn (1989) considered the challenges and issues of using computers to work from home. This work continued into the next decade, with research studies considering how the home functioned as a workplace or extension to the office (Junestrand and Tollmar, 1998; Mynatt et al., 1998; Flynn, 2000). Other studies focused on how the boundaries between the home and office were becoming blurred, allowing work to spill over into the home. (Salazar, 2001; Frissen, 2000; Nippert-Eng 1996; Schmidt, 2000). These studies suggest that information technology, and in particular the PC, were seen primarily as tools for work productivity and effectiveness, and whose presence in the home was in order to further those aims.

Other early research in the field, the pioneers, as it were, seemed in some ways like lone voices in the wilderness. Isolated papers seemed to pop up as a sole entity in some conference session or workshop, often disappearing just as quickly. There were a variety of studies with some connection to the home (Ruchinskas et al., 1980; Zinn, 1981; Frenkel, 1989; Gray, 1990) comprising a miscellaneous collection of assorted work, mostly of a speculative nature, which seemed to have little connection to each other, either chronologically or thematically. There was still little in the way of a unified study of the home as a place for information technology and, presumably, little encouragement to develop one.

2.3.4 Middle Period

By the mid to late 1990s, in what might be thought of as the Middle period, research concerning technology in the home began to consolidate somewhat. This is not to suggest there was a unified voice extolling one approach over another, rather that there was an increasing awareness of computing in the home in general and some discussion of its potential. For example, in 1996, a paper from Mateas et al. (1996) built on some of Venkatesh's research into home life and PC adoption. Notable for being one of the first ethnographic

forays into the home, Mateas et al.'s study was also distinctive for its relaxed approach to investigation, particularly in comparison to most technology studies at that time. The opening sentences of the paper's method section give a sense of this:

> Two of us went on each home visit. We arrived around dinnertime, bringing a pizza dinner with us. The meal provided an opportunity for the family to grow more comfortable with us and for us to unobtrusively gather background information.

In those few sentences, they provide a succinct description and explanation for their actions. Noticeable is the absence of any methodological rationales; they seem unaware of any need to justify their approach or their method. In a sociological or anthropological study, their casualness would be unremarkable, but within the HCI literature, particularly from that period, it seems singular. There were several other innovative aspects of their study but perhaps the most remarked upon was the 'flannel board' which was a device to elicit participants input, a technique that was replicated by Rode et al. (2004).

Kraut et al.'s Home Net trial (1996, 1998) was, for all intents and purposes, the first large scale study to explore internet usage at home. Using longitudinal data gathered from 50 families, Kraut and his colleagues used their results to suggest guidelines for the design of new online tools. One of their main findings was that "social demographics—generation, race, and gender—rather than socioeconomic factors—income and education—and psychological factors—like social extraversion and attitudes toward computing—were major influences on use." (Kraut et al., 1996 p. 1). This idea, as well as their suggestion that teenagers were driving internet usage in the home, was relatively radical for the time. Other findings are interesting to consider in hindsight; for example, they write "A major finding is that, in this group, Interpersonal communication (email), rather than broadcast information (the Web), is the main motivation of further use."(Kraut et al., 1996 p.1). Whilst no doubt true at the time, it is hard not to reflect on how this may have changed.

Communication within the home became a focus of several studies done during this period. Hindus et al.'s Casablanca study (1999, 2001) was one of the

more influential. Focused on communication specifically in the context of the home, the Casablanca study from 2001 used various prototypes to explore how digital technology could be used to facilitate communication within and between households. Fleuriot's work on family diaries (Fleuriot et al., 1998) also considered the issues of family communication, while Hutchinson et al.'s (2003) use of technology probes, as a means of inspiring the design of several prototypes, built upon Hindus's work.

Since then, several systems have been proposed which focus on family communication. Go et al.'s (2000) Familyware was a hypothetical set of communication tools designed specifically for families, as was Itoh et al.'s (2002) 'TSUNAGARI' communication system and Markopoulos et al.'s (2004) ASTRA system. Vroubel et al.'s (2001) design of a home messaging appliance is also concerned with enhancing families' means of communication, the prototype harking back to the DigitalDesk (Wellner, 1991). Mavrommati et al. (2004) proposed a network of end user designed components, specifically designed to appeal to families and in doing so, to enable family communication.

2.3.5 Late Period - Movement towards Home

In retrospect, it appears that around about this time (early 2000's), a movement towards studying the home was beginning to emerge. This decade saw a marked increase in the number of PCs in family homes, as well as potential applications for non-work activities. More prospects for technology-enabled homes were evident and along with Weiser's vision of a ubiquitous computing (1991), the idea of the smart home was establishing itself (more of which I will discuss below).

Several studies from this period that were significant for the research presented in this thesis. O'Brien et al.'s study "At home with technology" (1999) was an early entry into the ethnomethodologically oriented ethnography of the home. Using the example of control of the television, the authors describe how the ownership of domestic spaces can influence technology use within the home. Their findings show how household members had a sense of the ordering of the television use based on household routines, and that they respected these

orderings. The configuration of the television lent itself to being appropriated by various family members at different times, a flexibility which made it well suited for the home.

Tolmie et al.'s "Unremarkable Computing" (2002), was notable for its simplicity and understated elegance in articulating some of the organisational aspects of daily life. Using as one of their empirical examples the daily routine of two women meeting outside their house before going to pick up children from school, they examine how routines become an integral part of what they refer to as the "glue of domestic life" (Tolmie et al., 2002, p. 399). By analysing specific mundane details of everyday life, Tolmie et al. make a case for the importance of the unremarkable aspects of routines, and suggest that integrating awareness of these details into technology design presents a major challenge to the Ubiquitous Computing agenda. Edward and Grinter's "At Home with Ubiquitous Computing: Seven Challenges" (2001) outlined several barriers to adoption that new technology for the home would conceivably face. These included the fact that information technologies (especially prior to 2001) were designed for use within offices, and that most homes were not designed to accommodate technology particularly well. They put forth the idea of the 'accidentally smart home' and 'piecemeal adoption', where households gradually accrue bits of technology which may then need to work in unison. This has turned out to be a much more realistic portrayal of current technology adoption (circa 2010) within households than the various visions of the 'smart home' that has been prevalent in the literature.

Crabtree and various co-authors have produced an extensive corpus using an ethnomethodological approach to investigating the home. Papers such as "Domestic Routines and Design for the Home" (Crabtree and Rodden, 2004) and "Coordinate Displays in the Home" (Crabtree et al., 2002) do a exemplary job of mapping out the physical characteristics as well as capturing how mundane activities could contribute to the social organisation of household spaces. Of particular note is the first data excerpt in "Informing the Development of Calendar Systems for Domestic Use", (Crabtree et al., 2003) where the authors have managed to capture a couple rowing, which has a very realistic ring to it. Crabtree and his various co-authors deserve full credit for

being the first to consistently and systematically unpack the home, particularly from an ethnomethodological perspective. Although I found this work impressive, both for its comprehensive examination and its attention to detail, I also found it strangely lacking a certain verisimilitude. The authors describe domestic arrangements and behaviours in minute detail, often focusing on interesting and unlikely examples and behaviours, yet the analysis somehow fails to capture the sense of how a home is different from other environments. Their descriptions often lack the sense of what makes the home a distinct setting and at times it feels as if they could be describing air traffic control. Although very influential and important to the overall movement of articulating the home as a setting for technology, the absence of some sense of the essence of home gave me further impetus to pursue this research, in an attempt to rectify this.

A parallel body of work developing at roughly the same time was concerned with exploring technology in the context of design oriented issues. Research such as Alahuhta and Heinonen's "Ambient Intelligence in Everyday Life (2003) and work done by Tollmar et al. (2000) as well as several others (Nassla, 2001; Nassla and Carr, 2003; Plomp and Tealdi, 2004; Battarbee et al., 2004; Hoefnagels et al., 2004; Buur et al., 2004) were particularly interested in human centred and participatory design practices, and much of this work took place in the home. Other work such as and Svensson et al.'s 'Social Navigation of Food Recipes' (2001) took everyday practices as starting points for design. Less interested in unpacking the essential character of the home, this work nonetheless captured some of the more unseen aspects of daily home life, frequently in a Scandinavian context.

Another body of research draws upon objects and furniture as a starting point, exploring the interplay between tangibility and digital media. This included work such as Stevens et al.'s "Living Memory Box", (2003) Siio et al.'s 'Peek-a-drawer (2002) and Mynatt et al.'s Digital Photo Frames (2001), Frohlich and Murphy's "Memory Box"(2000). Wensveen et al.'s (2000) ruminations on alarm clocks is another example, while Graves Petersen et al. explored augmenting floors with ubiquitous technology (2005). The various incarnations of Gaver's forays into domestic objects (Gaver et al., 2004; Strong and Gaver,

1996) took a less pragmatic approach, interested in exploring what might be thought of as non-functional aspects of the home. Although this work was not necessarily interested in specifically articulating the home, by describing the contexts of use for their proposed artefacts, they offer glimpses into what augmented households might look like.

The notable characteristics of the Late period were, then, a refinement of the research into home life alongside a growing diversity of technological solutions envisioned for the home. A small number of social scientists, often under the auspices of ethnomethodology and HCI research, were venturing into the home and reflecting on the attendant practices of its inhabitants. What they reported on was a place that raised some unique challenges for human-computer interactions. Running in parallel to this work, (and sometimes appearing to ignore it), was what could be thought of as more technologically driven research, in that the focus appeared to be more based around building new technology than understanding the home. This diverse collection of work ranged from projects that singled out specific objects to be augmented (e.g the Memory Box), to large scale visions of extensive technology-enabled homes. The former were, if thought of collectively, occasional ventures into using technology for some aspect of non-working life and typically did not consider the home as a broader theme. It is the latter, however, that I wish to give further attention to in the penultimate section. As we shall see, a vision of the home in which technology was everywhere, a smart home, had a significant impact on the imaginations of technology manufacturers, developers and indeed the public.

2.3.6 Smart Homes

Smart Homes have been an enduring vision, both in popular culture as well as technology research. Disney's 'Monsanto House of the Future', General Motors 'Futurama' and the Jetsons cartoons of the 1960's are all examples of the popular fascination with a highly technologised home. Several research organisations and universities have or have had smart homes, among them Samsung, Orange, NICT, Georgia Tech, MIT, University of Colorado and

Microsoft. Various incarnations of smart homes have been commercially available for years, becoming increasingly popular in the past decade. There is even a "Smart Homes Association" which states "the best definition of the smart home is the integration of technology and services through home networking for a better quality of living." (http://www.tiresias.org/research/guidelines/smart_home.htm). A smart home typically consists of a structure, representing a home, filled with various bits of 'intelligent' technology to assist its occupants in conducting their daily lives.

Smart Homes have been a regular and recurring topic within CS, HCI and to a lesser extent CSCW research, spawning a considerable number of studies. The majority of these studies as of 2004 tended to centre on a fairly narrow range of topics. These were respectively; the use of sensors (Mungiatapia et al., 2004; Huebscher and McCann, 2004) networked appliances (Chung et al., 2003; Lea et al., 2000); networks to run those networked appliances, (Loeser et al., 2003) home automation (Spinellis, 2003; Casimiro et al., 2004) and monitoring, either for security (Covington et al., 2001) or of the health of a home's inhabitants (Mynatt et al., 2000). Researchers at Samsung Corporation wrote extensively about various smart home prototype technologies, including a 'gate reminder', a system to help remember things such as umbrellas when leaving a house, an augmented breadbox-type device which conveys messages from parents to children when returning home from school and reaching for a snack (Kim et al., 2004) and a pillow that reads bedtime stories (Park et al., 2003).

In many ways, it makes sense that the possibilities of technologically augmenting the home would capture many researchers imaginations, as it represents relatively virgin territory. The smart home has several problematic issues, however. First off, by presenting a very specific view of the home, one that relies heavily on various augmented devices and 'smart' systems to control these devices, the smart home may be at odds with how many people picture a homely setting. Additionally, by introducing technology laden solutions into domestic settings, the overhead in time and effort in managing them runs the risk of overwhelming its potential utility. Perhaps the most important drawback in my opinion is that these visions fail to capture so many essential aspects

which give home life its unique quality. These include things such as sentiment, negotiation, artfulness, cooperation, messiness; in short, the very personal nature of how a house becomes a home. In many ways, the smart home acted as an inspiration for this research, in the hope of elucidating other aspects of the home and home life than the vision put forth by technologists.

2.4 Conclusion

The work presented in this thesis has been influenced in many ways by the broad range of literature described above. The following is a brief summary of the broad areas that were the most significant for me in undertaking this research.

1. The social shaping of technology

The gender studies literature provided a compelling argument regarding the interplay between technology and women's roles in the home. Work by authors such as Wajcman, Cockburn and Schwartz Cowan brought into relief the nuanced relationship between social life and technology use. Whilst simplistic to assert that technology design shapes social practice, it is also oversimplifying to assert its converse, that is, that social practice guides technology design. Rather, the continuous interleaving of the influences of both determines how technology comes to be used.

2. The empirical lens of material things

Both the literature from Gender Studies and Material Culture focused my attention towards the power of investigating social practice through material interaction. These two occasionally interconnected bodies of work gave a means to investigate a household's practical everyday doings in detail. By examining mundane material things, such as a household's laundry or a family's heirlooms, a means of seeing can be enabled, and an empirical lens is brought into focus.

3. (Re-)Introducing Domestic technology to CS and HCI/CSCW

Computer science (CS), HCI and CSCW provided a promising area in which to study home life, in spite of the fact that little research had been done on the topic when I embarked on this PhD. My impression was that, unlike Gender Studies and other related areas of social science investigating home life, there was room in CS, HCI and CSCW to develop some small but new contributions to the research. The social sciences appeared to be rehearsing many of the themes raised in earlier work, for example those found in "More Work for Mother" (Schwartz Cowan, 1983), or were largely embroiled in working out the subtleties of theory. In contrast, CS, HCI and CSCW offered a space where many of established arguments were relatively novel and, more importantly, had the potential to be utilised for the practical purpose of design.

4. A foil to the smart home

Although there had been a few exceptions prior to 2004, the largely technology-led research in CS, HCI and CSCW had come to envision an often oversimplified and naive (as well as occasionally bizarre) idea of domestic life in articulating the 'smart home'. It seemed to me that if technologies were to be designed and built to be useful and meaningful to people in their domestic settings, home life demanded more detailed investigation. The effort that members of families, (and in particular mothers), put into managing a home, retaining some semblance of order, and keeping it a place safe for family members needed to be articulated in order to be taken into account.

In summary, these four general points acted as the broad motivations for the research in this thesis. Both intellectually and personally, they gave me initial direction when embarking on this PhD and over the course of my research, influenced the perspectives I took and where I chose to place emphasis. I realise there are many other trajectories that could have been followed which would have led to different outcomes. At the time I was undertaking this work, however, it was these ideas that most clearly explored and articulated my own sense of what was involved in making and living in a home.

3. Analytical Framework and Method

3.1 Introduction

The following is a description of how the research in this thesis was undertaken. The first section discusses the technique chosen to pursue this research, that is, ethnographic fieldwork, and some of its history, both within anthropology and HCI and CSCW. The second section considers the analytical framework used, which might best be described as combining a loose interpretation of ethnomethodologically informed ethnography with a focus on embodied practices. The third section details the actual mechanics of the fieldwork; the when, who, where and how of the study, as well as elaborating on some of the issues encountered whilst doing the fieldwork, both practical and epistemological. These include practical contingencies, as well as issues of objectivity, validity and gender.

3.2 Ethnographic Fieldwork

3.2.1 Choice of Ethnography

As stated in the preceding chapters, one of my goals in pursuing this research was to find a sense of home that was missing from the HCI and CSCW literature, something that more closely approximated the homes I knew. The few homes portrayed in that literature seemed for the most part either heavily technocentric and slickly futuristic, or bleakly functional and oddly detached. As I was particularly interested in examining the work that goes into organising the daily routines of families, my choice of method was most heavily predicated on finding something that could convey some of the real things that people do and think about in their homes, the human details of everyday living and the mundane routines that make up domestic life.

In casting about for a method, I began by ruling several out. Certain methods, such as controlled experiments, seemed artificial and uncomfortable in the domestic setting. When reading studies which set up controlled experiments to investigate everyday household activities, (Tran et al., 2005) it was all too easy to imagine a participant for whom the experiment hadn't been designed but who were often part of family households, such as a five year old boy, a teenage girl or the family dog. It isn't difficult to picture such a participant wreaking havoc on any semblance of control, making concepts such as reproducible results problematic. Another approach might have been to devise a survey or questionnaire to collect information about the organisational work that goes on in the home. However, because I was interested in recovering a sense of the hidden or invisible nature of that type of work, it seemed debatable whether questionnaires would have been successful at elucidating those characteristics. As noted later in this chapter, it became apparent during the fieldwork that many of the participants had never discussed some of the ways they organised their homes, and as such were somewhat unaware of what they actually did. Having them successfully describe practices that they had never articulated, and were possibly unaware of, seemed unlikely using these techniques.

Another consideration in using questionnaires or surveys was a general sense of unease on the part of the participants as to whether their routines and practices were 'normal'. Most of the participants made apologetic remarks about the way they did things and the state of their household, which would suggest that answers to questionnaires or surveys might have been subject to a sort of idealised response, a known limitation of these methods (Padgett, 2008). This is not to suggest, however, that quantitative methods as a whole are unsuitable for the domestic environment, more that the types of questions I was interested in didn't lend themselves to those sorts of methods. The methods described above are well suited to narrowing the focus of enquiry, and I was hoping to open up the topic of the home and the work that goes into organising it.

Because of this, it seemed that a qualitative, and specifically a naturalistic, method might be better suited for those questions. Aware of and

impressed by the growing corpus of studies ethnographic fieldwork within HCI and CSCW (Suchman, 1987; Heath and Luff, 1991; Harper, 1991; Murray, 1993; Bowers et al., 1995; Button and Dourish, 1996; Hughes et al., 1992; Anderson, 1997; to name but a few), it seemed that this approach might be well suited to exploring a domestic setting. Much has been written about the use and suitability of naturalistic methods in HCI and CSCW as a means of informing design (Hughes et al., 1997; Button and Dourish, 1996; Martin and Sommerville, 2004; Dourish, 2006; Crabtree et al., 2009), and the debate concerning their efficacy in this realm is far from resolved. However, as one of my principal aims in undertaking this research was to explicate a sense of the domestic setting, the narrative and descriptive aspects of ethnographic fieldwork appeared to offer the best opportunities for that.

A particularly strong influence on the method chosen for this thesis was the work of the anthropologist Clifford Geertz, perhaps best exemplified in his book *The Interpretation of Cultures* (1973). Geertz's calls his method of ethnographic interpretation "thick description", an idea which he writes he borrowed from Gilbert Ryle (Geertz, p. 13). Thick description attempts to convey not only a particular behaviour, but also the context surrounding that behaviour, which in turn gives rise to how the behaviour comes to have meaning within a particular setting and society. In keeping with this interest in thick description, a main concern for this thesis was that the written fieldwork and analysis have a certain verity, a realism that would seem familiar to people who had experienced living in a family home, rather than trying to attest with any certainty to assertions along the lines of "families do X". In order to do this, I endeavoured to describe the settings in the way that people who lived in those settings described their experiences to me, and to capture what I observed happening in those settings. Geertz description in *The Interpretation of Cultures* gives a good sense of this (Geertz, p.15):

> The famous anthropological absorption with the (to us) exotic Berber horsemen, Jewish peddlers, French Legionnaires—is, thus, essentially a device for displacing the dulling sense of familiarity with which the mysteriousness of our own ability to relate perceptively to one another is concealed from us. Looking at the ordinary in places where it takes unaccustomed forms brings out not, as has so often been claimed, the

> arbitrariness of human behavior (there is nothing especially arbitrary about taking sheep theft for insolence in Morocco), but the degree to which its meaning varies according to the pattern of life by, which it is informed. Understanding a people's culture exposes their normalness without reducing their particularity.
>
> What it means is that descriptions of Berber, Jewish or French culture must be cast in terms of the constructions we imagine Berbers, Jews or Frenchmen to place upon what they live through, the formulae they use to define what happens to them.

3.2.2 Ethnographic fieldwork

The following section gives a very brief overview of ethnography, and its tradition within HCI and CSCW. Given the numerous studies considering the position of ethnography in HCI and CSCW and more particularly ethnography's relation to design (Hughes et al., 1992,1997, 2000; Salvatore and Mateas, 1997; Button and Dourish, 1996; Dourish, 2006), the aim here is not to attempt to provide a comprehensive explanation of ethnography, either within or outside of HCI, but rather to give a brief description of some of its origins, practices and some of the ways it has been used within HCI.

Ethnography can be characterised as a series of techniques for collecting and interpreting data, with the emphasis placed on analysing human behaviour, often in terms of culture. Based around observation and written interpretations of fieldwork, the ethnographic method has been described as having its antecedents in travel writing and colonial reports (Peacock, 2001). The advance of various empires during the 17th, 18th and 19th centuries spawned much material describing faraway lands and their inhabitants, as well as exotic cultures and practices. Although both travel writing and colonial reports had definitive aims (for example, amongst other things, entertainment , revenue generation and governmental administration) and were not always expressly interested in gaining a better understanding of a community, these reports offered insights into little known cultures and laid the foundations for the comparative interpretive tradition of ethnography. However, these antecedents are in themselves problematic, particularly the colonial administrative reports, as they confer an implicit hierarchy of superiority within the 'us' and 'them',

and anthropology has struggled with this heritage ever since (see Asad, 1973; Pels, 1997; Clifford and Marcus, 1986; Lewis, 2004).

In spite of this burdensome history, ethnography has come to be the basis for much of the research undertaken in cultural and social anthropology, as well as a variety of other disciplines. Malinoski's pioneering work detailing the rituals of Trobriand Islanders, (Malinowski, 1922) besides being one of the earliest attempts at ethnography, also established many of the basic precepts of ethnographic practice today. Other seminal works from the early age of anthropology include *The Nuer* (1940) by E. Evans Pritchard, *The Gift.* (1997) by Marcel Mauss and *Coming of Age in Samoa* (1928) by Margaret Mead.

Ethnographic fieldwork, in the classical anthropological sense, consists of spending an extended period of time immersed in a particular setting, with a native culture, *in the field,* as it were. This fieldwork is typically based around 'participant observation', which involves the ethnographer engaging in the various practices and rituals of the daily life of their participants whilst also observing them, in hopes of gaining an emic[2] perspective of the participants lives. The hope is that through participant observation, a close examination and better understanding of the situated, social activity of a community can be achieved.

Anthropologists, sociologists and more recently a variety of other disciplines (geographers, economists, psychologists and archaeologists, to name but a few) have used the ethnographic method as a means of representing the social arrangements and relationships within specific cultures and communities. These disciplines' approach to fieldwork is generally less stringent about the amount of time spent in the field, with the foci being more on the kinds of interactions that are observable in a setting as opposed to broader cultural themes, such as class, gender, kinship and so on (Peacock, 2001).

A particularly noteworthy assemblage was the Chicago School, a group of sociologists associated with the University of Chicago in the first half of the twentieth century. As opposed to looking into more exotic communities further afield, these sociologists studied communities closer to home, specifically

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2 relating to or denoting an approach to the study or description of a particular language or culture in terms of its internal elements and their functioning rather than in terms of any existing external scheme.

several within the Chicago area itself. The Chicago School's brand of urban sociology focused on the intersection of physical environment, social structures and human behaviour and examined the situated ways in which aspects of daily life, such as work and recreation, were accomplished. Using a variety of both quantitative and qualitative methods, the Chicago School produced several noteworthy studies, on topics as diverse as hobos (Anderson, 1998), dance halls (Cressey, 2008) and juvenile delinquency (Reckless and Smith, 1932). Since then, other studies in a similar vein have examined a wide assortment of topics, ranging from what it takes to be a medical student (Becker, 1977) to how cigar smokers rationalise smoking (DeSantis, 2003) to the secret life of waitresses (Rose, 2001) and how people share car rides (Laurier et al., 2008).

3.2.3 The Emergence of Ethnography within HCI and CSCW

The Chicago School's ethnographic focus on the situated practices of work and everyday life provided the foundations for studies of work within HCI and CSCW. Two industrial research labs, Xerox PARC and EuroPARC, were instrumental in helping to establish ethnography's popularity in HCI and CSCW. A number of well known studies were produced by members of these labs during the 1980's and 90s (Suchman, 1987; Heath and Luff ,1991; Button and Dourish, 1996; Anderson, 1997; Harper, 1991). Arguably the canonical work concerning ethnography from PARC is Lucy Suchman's monograph *Plans and Situated Actions* (1987). Using ethnographic field work techniques, as well as an ethnomethodological framework, she challenged some of the then underlying assumptions of HCI, particularly those concerning how people use plans in the real world. Her work demonstrated how naturalistic field studies of specific situations could contribute a much richer picture of people's practical actions, which in turn could contribute to informing the design of new technology.

Since the publication of *Plans and Situated Actions*, ethnography and more particularly, the use of fieldwork, has gradually become an accepted practice within HCI and CSCW, although not without (sometimes heated) opposition. Part of this is due to the general scepticism that any qualitative method engenders within scientific disciplines, but the reliance on narrative and

interpretation within ethnographic practice seems to particularly raise ontological hackles. However, thanks to the influence of several highly regarded studies which draw upon ethnography and fieldwork, it has for the most part, become part of the roster of methods employed by researchers.

Interestingly, within HCI and CSCW, a rather particular approach to using ethnography and fieldwork has emerged, sometimes referred to as *ethnomethodologically informed ethnography* (Crabtree et al., 2000). This approach has been employed with some success, notably by Taylor and Harper, 2003; Heath and Luff, 1991, 1993; Crabtree et al., 2003; Hughes et al., 1999; Button, 1996. These studies differ from what might be thought of as the prototypical anthropological, ethnographic field study in two significant ways. First, from a practical standpoint, they are typically considerably shorter and focused on specific activities, with an eye towards informing technology design. Second, they draw upon—as the awkward nomenclature suggests—an analytical framework known as ethnomethodology, which will be discussed in the next section.

3.3 Analytical Framework

3.3.1 (Loosely) ethnomethodologically informed ethnography

Ethnomethodology is notoriously obtuse and the debate as to its right and proper application, both within HCI and CSCW and elsewhere, is ongoing. (Crabtree et al., 2009). A thorough and thoughtful discussion as to its various attributes, strengths and weaknesses is well beyond the scope of this thesis. Rather than attempt a thorough and comprehensive description of ethnomethodology, I have instead opted to focus on ethnomethodologically informed ethnography, with a specific emphasis on aspects of that perspective that were of use to me in developing an analytical framework. Although this limited approach feels somewhat unsatisfactory, to do the topic justice would be difficult to achieve using the thesis in its entirety.

Ethnomethodology is a branch of sociology dating from 1954. The name, (coined by Harold Garfinkel and meaning literally 'the study of a people's methods') is concerned with how members of a group create social order, although there is some debate as to whether that was indeed what Garfinkel had in mind (Heritage, 1984). Garfinkel's approach is based on his interpretation of various concepts of traditional sociology, including the work of Durkheim and Weber, Wittgenstein's linguistic philosophy as well as the phenomenological theories of Husserl, Heidegger and Merleau-Ponty, amongst others. The ideas detailed in his book *Studies in Ethnomethodology* (Garfinkel, 1967) form the foundation of the discipline.

Ethnomethodology distinguishes itself from traditional sociology in its understanding of 'social order'. Whereby much of traditional sociology relies on the fundamental assumption that the world is an orderly place, ethnomethodology contends that individuals ('social actors') construct a sense of order based on the behaviours and patterns they perceive in a given situation. Another critical difference between ethnomethodology and other branches of sociology is in the description of people's behaviours and settings. Thus ethnomethodology strives to represent peoples' (members') practices and activities in particular settings in the same way that the people themselves describe them. This is in marked contrast with many branches of sociology, where peoples' behaviour is interpreted through a variety of beliefs and structures (Hendry, 1999; Peacock, 2001).

Two of the key tenets of ethnomethodology are the ideas of indexicality and reflexivity. Indexicality is based around the idea that meaning is a contextually derived phenomena, and that there can be no absolute, definitive understanding of a word or concept because meaning is derived by its relationship to both the context and the other words being used in the context. Garfinkel's well known breaching experiment, in which he instructed his students to constantly ask "What do you mean?" throughout a conversation was a particularly compelling example of the illusory nature of meaning, as well as illustrating how certain rules in conversation are expected to be followed, or 'taken-for-granted'. Reflexivity refers to the idea that people create their sense

of social order through their talk. In describing how they perceive the world, they are in fact creating that world.

In HCI and CSCW, ethnomethodology has been taken on as a means to examine in detail the unfolding actions in a setting (Suchman, 1987; Button, 1993). That is, the detail gleaned from field studies of various settings have been examined to recover how actions were accomplished by the members of a particular group in that specific setting. In common with ethnomethodology's origins, a central tenet has been to understand how members do things and order themselves moment-by-moment, as a local achievement. An important distinction between this body of work and the ethnomethodology practiced in the social sciences is that the ethnomethodology in HCI and CSCW has been oriented to design, and arguably, as a consequence, some analytical strictness has been sacrificed. For example, in the ethnomethodologically informed ethnographies of CSCW and HCI, attention is drawn by the researcher to an object or topic, not because of any member's actions, but because of the 'design/problem space' the research had set out to examine. This means that, to some extent, the researcher is directed by factors external to the setting under study. For example, numerous ethnomethodolgical studies of air traffic controllers (Bentley et al., 1992; Harper et al., 1991; Mackay, 1999) have been oriented around divided attention and paper strips which may or may not always be a foci for air traffic controllers themselves.

In the research detailed in this thesis, ethnomethodologically informed ethnography provided an analytical basis for my field research. It offered a starting point to examine what I was observing and hearing; for example, when talking to family members about their refrigerators, the orientation helped me to seek out the family members' accounts of what they were doing and how they made sense of it. I attempted to keep my analysis focused on what was inherent in the data, and not to take on ethnography's 'problems' (i.e. grand themes, such as power and gender) as they are taken on in anthropology and sociology. In doing this, I hoped to build on a notion of an ethnography for design, which works to find the balance between description and analytic concerns, with distinct foci and particular tropes (Randall et al., 2007; Taylor et al., 2007).

In spite of the fact that much of fieldwork undertaken for this thesis drew upon ethnomethodology in a similar way to the previously mentioned studies in HCI and CSCW, my analytical position is not wholly committed to ethnomethodology (or at least not in a form many ethnomethodological purists would condone). Rather than being simply equivocal, I consider this lack of commitment to a strict ethnomethodological interpretation to reflect the ongoing debate within HCI and CSCW as to what extent the precepts of ethnomethodology should be adhered to. My concern with a strict ethnomethodological interpretation is the concomitant rigidity which so often accompanies the fastidious and precise application of its tenets. This sort of practice and approach comes to resemble the grand theories of sociology and anthropology that ethnomethodology went to such lengths to eschew. I also am not convinced as to how useful a strict interpretation of ethnomethodology is to HCI and CSCW in general, and in particular to design.

Because of this, over the course of my fieldwork, two other theoretical influences came to influence my analytical stance. The first was the idea of embodied practices which, as noted earlier, was inspired largely by research in material culture. The second, a type of vague structuralism, arose as the fieldwork unfolded. That is, I repeatedly began to see how the everyday routines that made up home life also served to produce its recognisable social order. The taken for granted comings, goings and doings of the homes being studied were the very things that appeared to constitute the social structure of the families. In this sense, I found myself drawing upon ideas of structuralism once popularised in anthropology and sociology. Before addressing some of the more practical obstacles I ran into in my fieldwork, I want to develop these two ideas in a little more detail.

3.3.2 Embodied practices, Materiality and Functionalism

As noted in the previous chapter, I found the focus on material practices in the Material Cultures literature a particularly compelling means of investigating a setting. Using artefacts and the practices associated with them as a means of interrogating an empirical site, by considering the detail and the taken-for-

granted features, appeared an eminently sensible approach. Moreover, the wisdom in starting with something physical or tangible, and then working one's way out to incorporate the associated social aspects, seemed especially appropriate for studying the home. The litany of actual objects used to manage and organise the home lends itself to such a perspective, and the focus on tangibility looked to be particularly useful as a means of informing design. The empirical research in this thesis therefore adopts this emphasis on material artefacts, and the physical or embodied practices associated with them.

As with ethnography, various theoretical and epistemological positions have been developed around both embodied practices and materiality. Perhaps the most influential have been those associated with phenomenology. Phenomenology, which means literally the study of phenomenon, rose to prominence in the beginning of the 20th century. Edmund Husserl, Martin Heidegger, Jean Paul Sartre, and Maurice Merleau Ponty, amongst others, were interested in how the perception of phenomena shapes the experience of that phenomena, and how meaning is derived from the combined experience and perception. The trajectory of the development of phenomenology is quite varied, influencing a diverse range of philosophical movements including existentialism, postmodernism and poststructuralism, all of which are beyond the scope of this thesis.

Within HCI and CSCW, phenomenology has been used as a basis for a better understanding of user experience. Work by Dourish (2001) and Chalmers and MacColl (2003) amongst others, has helped it to gain traction as a means toward studying the lived experience of users of technology, and thus informing technology design. Certain aspects of phenomenology were particularly appealing to me in explicating the everyday use of mundane objects in the home. Two concepts that had a particular impact on my thinking were the ideas of 'ready-to-hand' and 'seamfulness'. The features of an artefact being ready-to-hand—that is, an unconscious extension of the body in action—was an important aspect of developing the work on lists and listmaking, for example. The ways that lists were composed on the fly, and discarded without thought when finished, as well as the materials used, i.e. backs of envelopes, were all illustrations of virtually unthought about ways these items were used and

appropriated. As for seamfulness, the way household members made use of the visibility of their processes, the 'seams' as it were, was integral to the work on artful systems. Besides being useful as a lens to observe how people got on with their daily affairs, these two concepts also helped provide both a starting point and a focus when doing the analysis and a further resource when making sense of what was available in the fieldwork.

For the most part, then, the ideas of materiality and embodied practices I have chosen to draw upon are based on what I think of as a pragmatic perspective. Rather than derive my position from a particular theory, the aim has been to allow the fieldwork participants to present their own 'theories'. In other words, rather than hoist a method or theory of social practice onto my participants, I preferred for them to demonstrate and inform me of their materially bound practices, and for me to base my analysis on a combination of that and what I observed. Focusing on various artefacts within the home, I found that these allowed the participants to construct their own accounts of what they did and how they did it, and in doing so, enabled me to understand how the larger organisation of their homes took place.

My interest and subsequent adoption of a structuralist (or more precisely structural-functionalist) slant to my analysis came about from this focus on material practices. Repeatedly, I came to see that the way the families organised and managed the things in their daily lives also worked to produce the social organisation of their homes. In other words, I found the organisation of material things to be tightly bound up with the social order of the families. The analysis of the fieldwork on clutter is a particularly apt example. Here I found that the ways that families ordered the material artefacts of their households worked, at the same time, to instil some notion of the home; marking out the social spaces in the home, the distinction between inside and out, and the safety of home from the messiness of the world "out there".

Alongside the use of certain ideas around materialism, and specifically phenomenology, I therefore also drew on ideas of structural functionalist perspectives. These perspectives originated in Emile Durkheim's sociology (2001) and were taken on by anthropologists in Oxford between the 1930s to 1960s, such as Edward Evans-Pritchard (1939; 1940) and Mary Douglas (1991;

2002). Durkheim and Evans-Pritchard provided a source of inspiration for thinking about the role of material things in social order, whilst Douglas' explicit dealings with homes offered a means of informing how I applied such a structural functionalism in my own research.

3.4 Data Collection and Discussion

The following describes various aspects of the data collection for this thesis. Interwoven throughout the description of the functional aspects of the data collection is a reflection on various epistemological issues that arose from the both the methods and approach I chose. This has been done partly to address possible issues of validity and scholarship that ought to be addressed in a doctoral thesis but more pertinently as a means of considering some of the problematic aspects of undertaking a qualitative and specifically ethnographic piece of research within the auspices of a discipline that tends towards (or at least tended in the recent past towards) more quantitative methods.

3.4.1 Participants and Time Frame

The data presented in this thesis were drawn from an ethnographic study of family life involving twelve households living in London, UK. The fieldwork concerning the data presented in this thesis took place over approximately two years, from the end of 2003 to the beginning of 2006. The study continued beyond that time and examined other topics, in particular family photo displays (see Taylor et al., 2007; Swan and Taylor, 2008) but that work is not included in this thesis due to considerations of length.

In terms of participation, the study began with somewhat formal criteria for participant inclusion. At the onset of the fieldwork, I had decided to recruit only families who met particular requirements. As the study, and my thinking, evolved, this formal approach was replaced by a more relaxed one. The original selection criteria, as well as the change in thinking, is discussed in the fourth section of this chapter, section 3.5.1 under the subheading 'Objectivity'. In the

end, the main criterion for inclusion in the study was that participants be part of a family; that is, be living amongst adults and children in the same household.

The twelve families came from a range of social and economic backgrounds (see Table 1). Eleven of the twelve families were two parent families (one home was comprised of an elderly widow living with her two grandchildren). Seven of the twelve families had one or more parent working in a white-collar profession such as law, banking, journalism or commerce. The fathers in two families worked in design, one in graphic design and the other in fashion. In one household, the father worked as a window cleaner and the mother as an office cleaner (working evening shifts). Eight of the mothers were stay-at-home carers; none of the fathers were, although some adopted flexible working hours to increase their contribution to child- and home-care. All of the families had from one to three children living with them. Half the families had two children living with them, five of the families had three children and one family had one child. The ages of the children ranged from a nine month old to a thirteen year old.

Eleven of the twelve families lived in London, one family lived in Cambridge. The first four families I recruited had children who attended the same nursery school in London. The subsequent eight families who participated became part of the study in a variety of ways, most often by being referred by a participating family, but sometimes by other methods. These selection methods, along with some of the socio-economic and geographical considerations in the choice of participants, will be discussed in more detail, under the subsection entitled 'Validity' in section 3.5.2.

3.4.2 Collection Methods

I visited the participating families' homes on a semi-regular basis over the two year period. Four families in particular became the core group of the study, a development which is also discussed in the subsequent section. The other families' involvement varied in length, depending on the topics under investigation and the families' ability or interest in continuing to be part of the study. My time in their households was spent in a combination of activities;

observing, talking, interviewing (unstructured), filming and taking part in everyday family routines such as dinner preparation, playing with children and the school run.

With no specific agenda (other than studying home and family life), a range of topics emerged from this period in the field, including list making, the use of fridge surfaces, photo arrangement, general household organisation and more. The majority of these topics were brought up by the families themselves as being significant or figuring largely in their everyday arrangements. For example, when interviewing one of the mothers about what was on the door of the family refrigerator, she began discussing what she claimed was the bane of her existence, clutter. She said some of the items on the refrigerator were a form of clutter that was being displayed vertically, as opposed to where it would normally reside, which in this family's case, was in a collection of bowls. Thus, in the process of trying to understand the litany of materials attached to fridges, she directed my attention to how things like bowls can act as containers of a household's miscellany, both in a social and material sense.

All of the interviews and much of the observation were recorded using video and audio equipment and field notes were made during observations. Alongside this, photographs were taken of the materials discussed, e.g., lists, calendars, diaries, and containers of clutter. Several families used digital and still cameras to photograph items or arrangements they found interesting or pertinent. Two families used video to record themselves whilst I wasn't present, and then discussed the video with me afterwards. Portions of the audio and video tapes were transcribed, depending on the relevance to the topic being examined.

3.5 Issues concerning the Data Collection

3.5.1 Objectivity

Initially, I had somewhat formal ideas of what sort of participants should take part in my study. Although I knew that ethnographic research did not adhere to

comparative samples, at first I had a hard time letting go of this feature of quantitative methods and attempted to enlist a sample of mothers who fit a particular profile. Thus, I decided that all participants should have more than one child, and that one of those children should be pre-school age and at home. This was based on the assumption that more children require more logistical planning, and that small children at home demand more attention than children who are at school for part of the day. I had also noticed a considerable difference in the level of chaos in single child families versus multiple child families and being interested in how parents manage that chaos, I decided to exclude single child families.

The fact that I had a pre-school child with an older sister in school also played a part, somewhat because I had first hand knowledge of this arrangement, but mostly that I knew several families like this and therefore had a good range of participants to recruit. Thus, the original three families participating at the start of the research are summarised in the table below (Table 1):

Family 1	**Family 2**	**Family 3**
Girl, 7	Boy 4	Girl 5
Boy 4	Girl 18 month	Girl 3
Girl 18 month	Mother expecting in 4 months	Mother expecting in 2 months

Table 1. Participant details.

The four and five year old children were friends with my daughter, but none of them were a particularly 'special' friend, and I didn't know any of the parents beyond passing acquaintance. I had made a point of not using families I knew well, as I was worried that any prior knowledge of their home lives might bias my research. In hindsight, it seems interestingly inconsistent that I didn't consider the fact that I was also a mother, a resident of London, a human being, etc. as presenting a form of prior knowledge. At the time, this consideration of using families who were acquaintances as opposed to friends seemed valuable but in practice presented several problems, the main one being awkwardness. Because I didn't know any of the families well, they were somewhat

uncomfortable with me in their living spaces, asking multitudes of question and taking notes, and being human and inexperienced, I was uncomfortable as well.

Besides awkwardness, a lack of access to their daily lives and activities was also a problem. Whilst observing these initial families, I frequently noticed the participants doing things which contradicted what they said they did. Mentioning this resulted in interesting discussions, bringing home to me how much more insightful and rich long term observation would be in terms of unaccounted for behaviours and routines. However, because I didn't know these families well, asking for this was essentially a social favour to which I didn't have rights. Offering compensation wasn't particularly viable, in part because the families were well off, which left me in a bit of a bind, as there was only so much time I could spend with them before it became intrusive.

Soon after this, due to some unforeseen contingencies regarding a conference paper deadline and a lack of participants who fit my non-explicit profile, I reneged on my commitment against using families I knew well and asked two close friends with families to participate. Although worried about abandoning my pretence of objectivity, this change made a major difference. Because I knew these women well, there was less pretence on their part towards maintaining some idealised image of a good mother and housekeeper. It also meant that the respective families were unbothered about my spending long stretches of time with them, asking strange questions about how they managed their daily routines. One of them, in explaining to her husband as to why I was filming her refrigerator, described it as my 'odd hobby' which summed up how they saw my research; essentially as an eccentric pastime.

This change of participants was extremely helpful in the initial phases of getting a handle on fieldwork; by having subjects who were relatively unbothered by my presence and fairly open about their household routines, the resultant data was much more genuine and true to life, as well as more unusual and idiosyncratic than that of the original families. The fieldwork became much more naturalistic, in that it encompassed various family members doing all manner of things, as opposed to being primarily interviews with mothers. I was also able to continue using these families for extensive periods of fieldwork, and in the end, these families became, along with two others, the core group of the

study. Indeed, my asking them about and filming mundane household activities became an almost commonplace feature of our relationship. An additional benefit of using families I knew well was that because I was more comfortable, I could experiment with different observational and interview techniques, such as trying to not interrupt so much, and to steady my shaky filming.[3] The benefit of forgiving participants was an invaluable part of my fieldwork apprenticeship and I am greatly indebted to them.

I include the above account as an illustration of how adapting to real world contingencies, in this sort of setting, made for richer fieldwork and in a larger sense, fundamentally altered my approach to fieldwork. The value of long term observation and familiar interaction within a participant community is hardly new, and is well documented within the anthropological corpus (Hendry, 1999; Peacock, 2001). However, due to the time constraints of corporate and academic projects, spending several years living with participants is neither expected nor viable within the tradition of studies of work within HCI and CSCW. Comprehending and making sense of participants behaviour in a fieldwork setting takes a particular skill and ingenuity, of which I had neither when I began my data collection. As I discovered, familiarity can be hugely helpful, and no doubt this was a reason that ethnographers of yore spent years in the field. The moral of this is not to say that first time fieldworkers should perforce recruit their friends. Rather it is to stress the value of taking whatever opportunities come along, and perhaps to suggest the possible danger of hanging onto an experimental conditions mindset in the name of scientific credibility, at the expense of relying upon one's own sensibilities.

3.5.2 Validity

Due this is being an empirical study, I am obliged to discuss the issue of validity. Validity of qualitative research within HCI and CSCW, particularly ethnographic fieldwork, is neither a clearly delineated nor easily determined

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3 I once saw a talk by an ethnomethodologist who maintained that her shaky camera work was testimony to the depth of her attention to what her participants were saying and doing, thus using it a point of credibility. If that is the case, I have been deeply attentive to my participants.

concept, with many more august minds than mine weighing in on the topic. I leave the larger issues of whether any ethnographic fieldwork can ever be considered scientifically valid to another thesis, and instead focus on several considerations that seemed particularly pertinent.

Concerning the issue of ecological validity, using Brewer's [4] (2000) definition, I would argue that the initial fieldwork *was* ecologically valid, in that it reflected the reality for those particular households, i.e. that the mothers were primarily responsible for the organisation of their household matters. This is not to say that all mothers are responsible for all household organisation, or that most families have stay at home mothers with fathers working long hours, or that mothers being in charge of household organisation is better or indeed to make any pronouncement at all. Rather, it is to say that in this particular setting, for this particular group of families, this was the arrangement, and that therefore, in that sense, the research was ecologically valid.

Because the initial participants were schoolmates of my daughter, this meant that the families lived in London and at least one of their children attended a private nursery school. This fact immediately lends itself to assumptions about socio-economic status which, initially at least, in this case were reasonable. The first few families recruited in the study were indeed middle class, well-educated, and white. Importantly, however, they weren't recruited upon that basis; rather, they were chosen for being in some sense typical or un-extraordinary families, a description which is immediately problematic because of course, when one dug deeper, they had some atypical, even extraordinary, characteristics about them, as is true, arguably, of any family. The point being, they weren't chosen as representative of a particular sample, or as representative of anything at all except being families taking part in family-like activities.

As the research progressed, families were added in a variety of ways; some were suggested, some volunteered themselves, and some were stumbled upon. Families would refer other families to me, often based on a topic under

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4 In order for an experiment to possess ecological validity, the methods, materials and setting of the experiment must approximate the real-life situation that is under study.

discussion. For example, one of the mothers, in the course of discussing refrigerator doors, arranged for me to visit her friend, in a different part of London, because she had felt that this family's refrigerator had a particularly interesting array of stuff on it. Another family was added, again to the refrigerator study, because when picking up my daughter from a visit, I noticed that their refrigerator door seemed very purposefully organised, which was different than the haphazard displays I saw in many families.

Over time however, it did seem that perhaps this was getting to be a study which could be entitled "How a group of mostly middle class white English families organise their home life". And although I had nothing fundamentally against examining middle class white families, at the same time, it had not been my original intention, and it did seem that other types of families might have other types of practices and behaviours which might be just as interesting. In light of this, a conscious effort was made to recruit other families who did not fit this profile. Thus, ultimately, twelve families of varying racial, religious and socio-economic status with a few differing family structures took part in the study (a fuller description of the families participating in the research can be found in appendix A). The notion of what constituted a family was extended, and other participants were encouraged. In the end, fathers, children, grandparents and even neighbours took part, were observed and interviewed.

It is important to note, however that this wasn't done in order to lay claim to having a 'balanced' study nor any sort of representational sample. Rather, the inclusion of different families occurred in a fairly organic manner. Even the previously mentioned example of purposefully looking for dissimilar families was done because it seemed to fit the nature of the study and happily was in keeping with various interpretations of the ethnographic tradition (Atkinson et al., 2001). Although this method of 'emergent grouping' (Spradley, 1980) is considered reasonable within anthropological and sociological disciplines, it has been less sanctioned within the CHI community, and as such, has often required explanation and justification in HCI venues. This approach, combined with my disinterest in attempting to generalise my data set to the larger population, preferring rather to focus on what insights could be gained

by examining my data in more depth, has been problematic on more than one occasion. At times I have thought that perhaps the research should come with the following statement emblazoned upon it, similar to the warnings on packs of cigarettes: "Warning: this is simply a description of what *a few* families do to organise *some* of their activities and their homes. This is not the definitive nor universal and final truth on how *all* families organise *all* their activities and their homes." In spite of this, I believe a qualitative approach such as this has much to contribute towards our understanding of the organisation of family life, and adds another layer, as well as a counterbalance, to quantitative studies of family life.

3.5.3 The issue of Gender

Originally, I thought the focus ought to be on mothers, partly because that was who was taking part in the fieldwork, and also partly because, as noted in the introductory chapter, it seemed like something no one in the CHI community talked about. The initial fieldwork went into a paper called 'Mothers Work' which was rejected from the main program at ACM CHI 2004. The reviewers found the paper highly controversial, not so much for the particularities of what it said, but rather because of the focus on mothers, and the suggestion that mothers were often responsible for the organising of household work. Although well aware of the gender issues surrounding my topic, the fieldwork participants did not discuss themselves or their lives in terms of gender issues, and therefore, neither did I. Based on my own convictions and invoking (perhaps conveniently) the concept of ethnomethodological indifference (Lynch, 1999), it didn't seem right to overlay ideological concerns onto the participants discussions and descriptions.

Nonetheless, I found the reviewers' concerns valid and the issue of gender problematic. Although I was highly sympathetic to the Gender Studies agenda, I was reluctant to be sucked into the quagmire surrounding its authority, and to have the empirical material become secondary. I wasn't interested in looking for evidence to support or prove the assertion that mothers do the lion's share of the work, as I was more interested in how the

work got done, rather than debating the status of which family member was doing it, and the accompanying moral and ethical implications of that status, (or lack thereof).

One evening after presenting a talk on the fieldwork, I had a small epiphany; this research (which at that point didn't particularly have a name) was actually about how *families* handled household organisation. It just happened that in the families I was observing, the mothers were doing most of this work. This may sound like a rather arbitrary and hair-splitting distinction, as well as possibly a means of ducking out of an ideological conflict, but I found it deeply significant, as it allowed me the theoretical freedom to continue my fieldwork observing families, without having to weigh in on the heated, and in my opinion largely intractable, debate around gender. I could describe the fieldwork as I saw it, without having to sanitise, balance or in any other way ameliorate my description to satisfy some theoretical perspective. That is, if mothers did most of the organisation in the families I observed, that was something for the reader to ponder, and to possibly reflect upon, and my primary concern was as to whether he or she found the account to sound real.

Aiding in this was the decision to focus on the material artefacts that families used, and the practices and behaviours surrounding them that they used to organise themselves. Although the gender overtones of artefacts is well documented in other disciplines (Douglas,1991; Pink, 2004; Miller, 2001), discussing lists and refrigerator doors seemed to raise less ire amongst the CHI community. This approach, besides lending itself to informing design, offered a means of gathering insights about daily lives in family households, without making any grand statements about who does what, or more importantly, who *should* be doing what.

3.6 Conclusion

The next four chapters form the empirical basis of this thesis, outlining fieldwork done with thirteen families over the period of almost three years. The chapters are ordered by artefacts and the practices associated with those artefacts, with a chapter devoted to each grouping. They are respectively, lists

and listmaking, the display properties of refrigerator doors, the management of household clutter and the creation of 'artful systems', that is, bespoke handmade systems that householders devise to manage and organise their everyday lives. The analysis of the empirical material draws upon a combination of the different analytical approaches outlined in this chapter, that is, a loosely ethnomethodologically informed ethnography, with an emphasis on embodied practices and materiality. The intent, above all, has been to try to capture some of the everyday routines and mundane practices that family households engage in, in a way that rings true to the participants own perspectives and narrative descriptions of their lived experiences.

4. Lists and Listmaking

4.1. Introduction

This chapter discusses the use of lists and listmaking in the home. The first section is a brief discussion about how this choice of topic came about and why I decided to study it in depth. The second section examines a variety of ways that lists were being used in the homes participating in the fieldwork. The third section is a discussion of the findings, followed by a conclusion.

4.1.1 Why lists?

The perhaps unlikely topic of lists emerged out of data gathered from observations and interviews with families during my initial forays into fieldwork. Following an established tradition within ethnographic fieldwork (e.g. Geertz, 1973), I had embarked on this research none too sure what I was looking for. I wanted to find out how families kept track of the myriad arrangements and little details that seemed to accompany having children, organising a family and running a household. Figuring out things like which trainers are needed for school, when the make-up ballet class is whilst simultaneously devising meals based around one child's eczema and another's dislike of cheese struck me as an amazing amount of disparate little bits to remember and organise, and I was interested as to how people did this as a practical accomplishment.

In the process of gathering information related to organising family matters in households, I noticed that the people primarily responsible for this sort of organisation seemed to rely heavily on writing things down. This may seem an obvious or trivial observation, but it was that very ordinariness that made it so analytically interesting. Unpacking this most mundane and unnoteworthy activity offered the opportunity to understand how household organisation takes form, and how that organisation gets translated into

practical action. It emerged that all of households I began the study with used some form of recording that could loosely be thought of as a list, albeit using a wide-ranging definition of that term. There were the expected sort of lists such as telephone lists, shopping lists and laundry lists, but there were also lists that involved more complexity; timelines, scheduling whom has to be where when and for how long, and spatial maps, detailing various errands to be accomplished in a particular order.

The fact that all of the lists I saw were paper based was also intriguing; none were even remotely technologically augmented; rather they were written in books, jotted in pads of papers and even scribbled on the proverbial back of an envelope. Here were families with computers, mobile phones, and presumably the disposable income to afford PDAs and yet the method of choice was this age-old technique. Were they just old fashioned, or even vaguely Luddite? Or was there something inherent about paper lists that lent themselves particularly well to home organisation? Because I had set out to study household organisation with an eye towards informing the design of novel technology, trying to figure out the appeal of the humble paper list seemed a good place to start.

4.2. Kinds of Lists

4.2.1 Loose Taxonomy of lists

The rest of the chapter examines five specific examples of lists that participants in the fieldwork made use of to organise their daily lives. These first three of the lists take the form of, respectively, a timeline, a spatial map and a grocery list, with the final two lists being part of a book combining work lists and home lists. The chapter is divided into sections discussing these examples, as well as some of their auxiliary aspects. Examining closely how each list is composed and used, we discover that these lists, although appearing to be primarily functional artifacts meant for a particular purpose, are often doing much more than the might appear.

4.2.2 Lists as Timelines

The first type of list discussed is a sort of timeline, devised by the mother of a family. The household in this case is composed of Claire, the mother, Tom, the father and their three children, aged 6, 3 and 15 months. Tom is a tax analyst who works long hours and is consequently rarely around during the fieldwork sessions. Claire had worked as an architect but has stopped working to raise her three children. Two of the three children are in different schools in different areas of London, which means that Claire needs to plan her school drop-offs and pick-ups and any consequent events with some precision.

During the fieldwork session, Claire discusses the everyday logistics of getting her children to their various destinations. In her kitchen, she has a heavily annotated monthly calendar as well as a schedule detailing the various recurring activities for a particular school term, with items such as 'gymnastics lesson', 'toddler play group' and 'music lesson' inscribed. She explains that she typically keeps track of many of the children's activities in her head, but will briefly glance at both the monthly calendar and the recurring schedule throughout any given day, to see if she's forgotten anything. She says that she also relies on writing things down as they come up, as a means of keeping track of various items that don't fit in either the monthly calendar or the recurring schedule. She shows various examples in several notebooks of these sorts of lists.

Claire explains that complicated days which require the planning and coordination of multiple people, activities and tasks, necessitate the making of what she calls a 'day list' (see Fig. 4.1):

> When days get very complicated I will do a day list, just how I'm going to get everybody in the right place... So this is Tuesday. What I'm doing [points to left column], what Ella's doing [points to right column] and who has to be picked up when. This was one day [points to the left-hand side and talks us through the items]. This was Jessica's school trip so I had to take the train to school rather than the car because I had nowhere to leave the car for 4 hours. I had to meet Mrs Anderson,

Jessica's teacher, at 10 past 8. Then I went on the school trip. Then, I had a whole lot of stuff that I wanted to do that I was taking with me with the phone and I was going to hang out and phone people and do all the bits and pieces in a café outside the school. Then I was going to pick up Jessica and we were all meeting on this recipe book we're making at school for her class to raise money. And then I needed to get Jessy to her extra English lesson in Canonbury and I was working at the timing and I had to wait outside so I needed stuff to do for me.

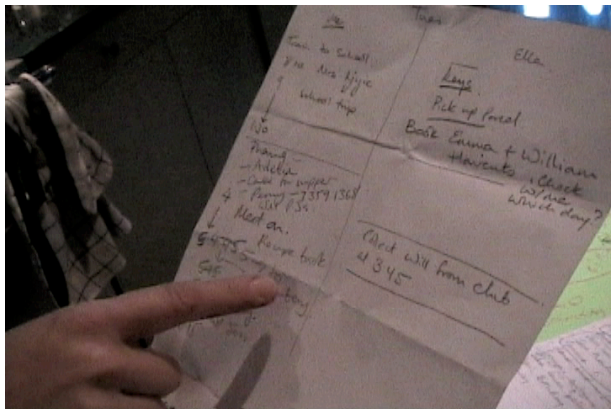

Figure 4.1. Claire's "Day list".

From this excerpt, we see that Claire's list takes shape in a fairly typical form, where the temporal ordering of tasks and activities to be done are marked out in a linear sequence, albeit with several people's activities and movements arranged in parallel form. In talking through the list, Claire conveys the considerable effort she has been put into arranging what might seem to be, at first glance, simply ordinary routines of home-related activities. Through her discussion, we see that a good deal of forethought can be necessary to get her daughters and son to school and to their respective activities on this particular day. The list captures how her children's movements must be coordinated with her own household and personal "bits and pieces," and arranged in such a way that they can both be systematically accomplished.

It is interesting to note how the list's items are broken up to refer to different times in the day and the different family members' activities. Claire's own timeline is juxtaposed with those of her daughters and son but ordered in such a way so that the children's movements and activities take precedence. From this we see the particular properties of paper lists that allow the items to have been arranged and divided in this way. Specifically, the free-form structure

(or lack of any structure) afforded by the paper list, rather than the imposition of fixed system of entry, allows Claire to arrange her tasks and activities in a way that suits her needs; the inherent properties of the paper list allow it to be used opportunistically (for a thorough discussion of the affordances of paper see Sellen and Harper, 2002).

4.2.3 Lists as Spatial Maps

The second example illustrates that this sort of opportunism is not confined to juggling multiple people and their temporal relations. Jane and Simon are the parents of two boys, Henry aged 8 and Andrew, aged 3. Below, Jane describes a list that she has scrawled onto the back of an envelope that reflects the spatial character one day of her tasks and activities (Fig. 4.2):

> ok, well I had a morning where I had lots of little things that I needed to do. Cause I was working, I thought I'll have one morning where I'm going to get all these little things done, silly little things. And it was things like, I had photocopy documents cause I had to get the residents parking permit and things like that and I also had cheques that I needed to take to the bank. So there were kind of little itty bitty jobs like that and I wanted to get as many done as possible and I had a limited amount of time so I did a list and I did the list in a kind of geographical order. I worked out where I needed to go to first so I could do everything and then come back and be back at the right place to get to pick up Henry from school. I had to go to a bank, to the NatWest, because I had to bank the money from the cake stall because once a week I have to bank the money from the cake stall from school and then I had to go to the post office... [the list continues]

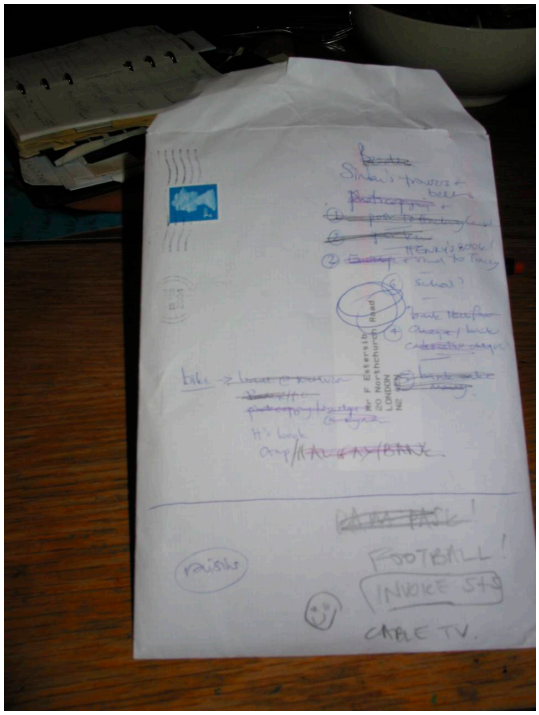

Figure 4.2. Jane's list on envelope.

In the excerpt above, Jane reveals how the list is 'done' to reflect her work and specifically, to coordinate the spatial and temporal constraints she finds herself operating within. Her explanation shows that her list is ordered to embody her sequential movement through her day's tasks, whilst allowing her to pick up her son, Henry, on time. Jane's numbering scheme from 1 to 6, refers to the tasks she needs to do and the order in which she plans to do them, based on where the location of each task is in relation to the one before it. Writing her list up as such transforms it into a marker guiding her progress in terms of geography, time and the tasks she needs to do. Each of the hand-written items inscribed onto the front of the envelope thus serves as a referent to the geographical movements necessary while the list, as a whole, delimits what is to be done before picking Henry up from school. In this way, the list is a tangible and embodied instantiation not only of the work that must be done, but also artfully and simply expresses how it should be accomplished under particular terms. Furthermore a paper list lends itself to systems like Jane's because it is something that can be kept at-hand: carried, referred to, and further marked-up and presumably discarded after tracing one's way through the listed items.

Jane's list is of a different nature than Claire's; whereas Claire's is a type of multi-person schedule, Jane's list functions more as a map through time and space. It would be simplistic to conjecture at this point however, that 'paper lists in the home do x or y' in some sort of taxonomic fashion, because paper lists can take a multitude of permutations, no doubt far more than could be comprehensively recorded. Rather, what we can say is that paper lists allow their authors to fashion them into a variety of forms to suit their needs, allowing for opportunistic systems of organising tasks and activities relating to household organisation. The examples of Jane and Claire's lists illustrate how there can be an artfulness in creating these systems, and that because of some of the affordances of paper, lists can be invented and continually refashioned to handle disparate tasks and activities.

4.2.4 Wish Lists

This sense of both opportunism and artfulness, as well as the importance of the material features of paper, is illustrated in the next example. Luci's household—made up of her husband, Simon, and her three boys, 8 and 5 years, and 6 months, uses a type of collective list. What is different from 4.2.3 and 4.2.4 in this arrangement is the more explicit sense of cooperative involvement and notably, how the system not only embodies an order to certain tasks and activities, but also an overall family order; i.e. it shapes and is shaped by the practical organisational structure of the family.

Luci's family keeps a communal notebook, specifically placed at one end of the kitchen table, that contains an ongoing log of to- dos, shopping lists, and other household jottings spread over a number of pages. In discussing this notebook with Luci, a number of intriguing collaborative aspects related to its use emerge. The most obvious of these is that all of the lists contained in the book are designed to be shared—either between the entire household or between specific members. What is less apparent, however, is that all but the first of the lists were jointly authored. To consider this point further, let us examine one of the lists from the communal notebook because it presents a particularly interesting example of how lists can be authored collaboratively,

and how this can come to reflect the arrangements of the family. Below, Luci explains the workings of what she calls the household's 'shopping list' (Fig. 4.3) and her reasons for putting the system in place:

> So I try to make it so that there's a shared responsibility. The other thing is we have people staying here a lot and we're lucky to have a spare bedroom, and so we often have other people in the house, and so things get finished and the sort of rule is that you can eat anything or finish anything but you have to put whatever it is on the shopping list so that I know to replace it. Cause I don't mind anyone eating anything but I find it really really annoying when there's no — I just find it really irritating when something gets finished and nobody's — as if I'm meant to monitor what everyone else is eating and using and somehow know that we need more.

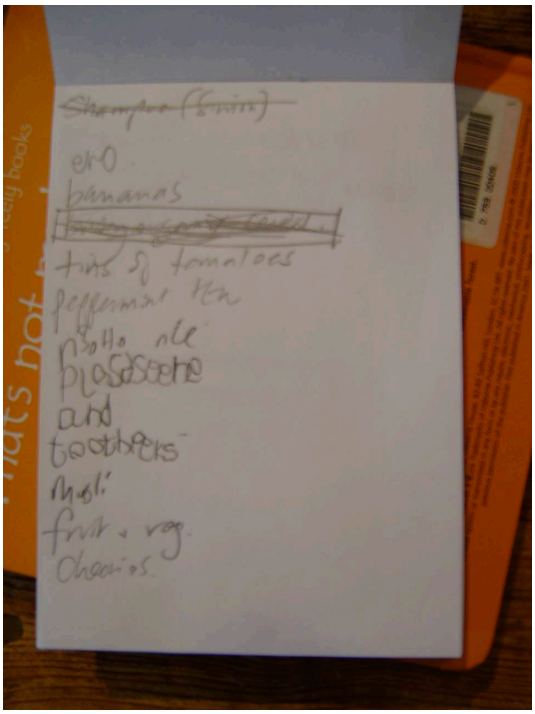

Figure 4.3. Luci's family grocery list.

Luci's explanation suggests that from one perspective, the work of keeping track of what needs to be replaced has been delegated to the shopping list. Because of the system Luci has adopted, her hope is that the responsibility is distributed amongst all those in the household, as opposed to being hers solely. The list is assigned the role of an intermediary because it is through the list that responsibility is devolved. As Luci talks us through the list's items,

however, we find that this devolved system is neither as simple nor straightforward as one might imagine.

> And the boys add to — that's 'ero', that's an Aero bar [laughs] and this one is Plasticene and toothpicks because Oscar wants to make some more models. So it can end up being slightly random and also it can end up with things that I refuse to buy and the boys really want and so sometimes there are things on here to do with, umm, meat — we have a completely vegetarian household — meat sometimes creeps onto the list, and there was an extended period where chewing gum was on the list.

We see that by refusing to buy things such as meat and chewing gum, Luci is exerting her right to parental authority. Relevant here is the fact that the list is enrolled to facilitate this system and it is the system that gives rise to a mechanism for the children to systematically test out their rights and privileges (e.g., through their extended acts of attrition for the right to chew gum). By inscribing their choices onto the list themselves, her sons are thus offered a degree of responsibility whilst at the same time being inculcated with Luci's, and presumably Simon's, system of values—vegetarianism and non-gum-chewing. Thus we see that Luci's list is doing more than simply noting what needs to be replaced; due to its designated collaborative features, it is also quietly enforcing specific family values.

4.2.5 Multiple Worlds, Multiple Lists

The previous examples have focused on how lists can be mobilised to arrange household activities and how features of paper lists, in particular, enable the opportunistic design of systems for managing various tasks and activities. Sometimes however, there is not a discrete separation between domestic and other types of activities, and the effort involved in crafting systems for organising different activities can extend beyond domestic confines. The increasing prevalence of home-based work and specifically, the significant increase in working mothers, contributes to a further level of complexity that is the focus of the next example.

In the following excerpt, Luci describes how she has designed a system to organise both her personal and work related activities. She talks about how she has a notebook for her work-based activities as part of an art collective and explains how she has been experimenting with a way to incorporate household arrangements into the book. She does this by adding personal to-dos and notes to one half of the book, then flipping the book over and upside down for items related to her work. Her description evokes the tension in having to enforce a system of separation onto the different elements of her everyday life:

> I've started actually working on the other side of the book but I've done this before and it's really really irritating [laughs], because you're then invariably turning the book around and trying to divide your life up so that one's upside down and one's the right way round — it's a really lousy system I have to say and it will fail and what I will do is I'll add, without any doubt I will add — so it's a lousy system because I have to remember which way my book is when I've got which hat on and what I've done in the past is [laughs], fail to do that. So then I have to like rip pages out from this side of the book and then turn them round and then stick them in later. It just makes a real mess of my book. It would be fine if I thought a little bit and opened the book the right way up at the right moment, but invariably I seem to create a system and then not quite stick to it.

Luci's description evokes the difficulty in separating out the various tasks between her work and personal worlds, and encapsulating and assigning them in a useful way. Her account gives us a sense of how the material properties of her notebook—having no clear indication which side is 'up' or which side is 'down'—do not afford the neat assignments within the dual roles she plays. The underlying subtext to what she says, however, reveals there is somewhat more to this problem. For Luci it is the system, and not only the material features of the book that fail her. The system requires 'a little bit' of thought to ensure that the right role corresponds to the right side and to avoid having her life, itself, turn upside down. A plausible interpretation of Luci's confusion is that her separation system is not all that good and, in fact, it may not always be clear to her which side of the book her tasks and activities should be listed. The separation between Luci's personal life and work life is not a natural consequence of their innate characteristics but rather something

constituted (although sometimes poorly) and reified in her notebook. This suggests that the system, by attempting to rigidly delineate work and personal, and the material features of her notebook do not map well onto one another.

4.2.6 Sentimental Lists

This imbalance between the system and the nature of the materials used is further apparent in another excerpt taken from Luci's interview. What emerges is that the sense of emotion embodied in material artefacts such as lists and notes can also be at odds with specific systems of separation. In the excerpt, Luci is sifting through several loose scraps of paper that she has in her notebook and chooses to talk about one on which she has sketched out a program for weaning her 6 month old son:

> I quite like this one, this is trying to get from breastfeeding to bottle-feeding and working out — this is basically how I was going to wean Jonah. I have to visualise things so anything like that I'll write down... I was trying to get down from seven feeds to five feeds. I think I realised there was no point in doing that, but I did get down to six feeds. It's snuck into my work book because I don't want to throw it away. I don't know — it's sort of, it is — it's this — this is completely sentimental. That's a page that represents his weaning. Which is, on bright pink paper!... The thing is in here there's umm, there are some little things. There's a [scrap] book that Felix made for me which I haven't used yet but this is another book that I'm going to be able to use and I have pictures of my children [in a white envelope] in here as well. So the thing is there are a few — it's a bit like my office I think in that it's basically a work space but then it's not quite as clearly defined as that.

Luci reveals that even in her 'work book', things to do with family have "snuck" in. What we see here is that the logical division she has sought to establish by dividing personal matters from matters related to her art collective is not hard and fast, and subject to intermingling. In this particular case, it is sentimental items that dilute the categorisation scheme, transforming what began as her work notebook into a repository for papers she has an emotional attachment to. There is a sense that sentimental mementoes don't fully belong

in the work realm, and yet it is not so clear cut. Luci describes a similar situation in her office: "it's basically a work space but then it's not quite as clearly defined as that". Again we have a situation, albeit of a different character, where a rigidly defined system of separation breaks down.

4.3. Discussion

From the fieldwork, we see that lists can act as an inscription of household organisation. By examining the written lists these mothers use to organise their households, we get a glimpse of the mechanics and practicalities involved in running those particular households. More importantly perhaps, we also get window into how that organisation gets done, which in turn gives some sense of the larger moral orders (Garfinkel, 1967) of these particular families . So in Claire's case, we see a small slice of how Claire does things in her particular family. Her schedule encompasses her family's domestic events, and this schedule is the timeline of the whole family's activities (bar her husband's). Claire thus acts as the organiser and timekeeper of her domestic setting. Examining Claire's list, we see how she situates each child's activities, and interweaves her own activities in and around her children's. That she does this is not in itself unusual or remarkable; indeed, many parents do this as a matter of course. What is interesting is how she does it, and what methods she uses. The fact that paper allows her to inscribe her own list and does not enforce a particular layout is what is notable here.

Likewise, with Jane's list, we again see a mother fitting her activities around her child's schedule and using the affordances of paper to allow her to do so. In Jane's case, we have the added element of the list acting as a geographical referent. Jane uses her knowledge of location and how long each activity will take to construct a temporal-spatial map of her day. Again, the features of paper, this time in the form of the back of an envelope, allow her to sketch out her schedule and route, in a casual freeform way. The fact that it is inscribed on the back of an envelope also allows her to carry that map with her, and to cross off her various destinations and tasks after they have been reached

or completed, and presumable to dispose of the envelope when her tasks are done.

With Luci's collective list, the list stands in as an instantiation of the shared responsibility of keeping track of what needs to be shopped for. Luci has devised this system with the aim of having other family members contribute to the household organising and as such, the list and its different members contributions give testimony to the efficacy of the system. The list also allows for various family members, specifically the children, to test out the boundaries and limits of the family values, in this case, vegetarianism and gum chewing. The collective list therefore acts as a reinforcement of the particular beliefs and attitudes that Luci and her husband wish to promote within their family.

On first glance, Luci's work book appears to be a rather ingenious arrangement to address the competing demands of work and home life. She has designed a means for blending listings of household and work arrangements into one notebook, relying on the physical differentiation of turning the notebook upside down. However, her lack of discrete boundaries between the activities in her work and her home life has led to problems with her system, and the notebook appears to reflect the ambiguity and tension Luci experiences in trying to balance and combine her personal and work existences. This example highlights a disadvantage of paper-based systems, underlining how certain material properties of paper can be problematic. The fixed and persistent quality of paper-based lists makes them less amenable to dealing with fluidity of everyday life, where distinct boundaries may be difficult to set (c.f. Sellen and Harper, 2002). Likewise, emotion and sentimental aspects can be difficult to fit into a separation category. Luci describes the difficulty of trying to maintain scraps of paper within her lists because of their emotive quality. Again we see how rigidity and static quality of paper lists can be difficult to work with; in this case family things have 'snuck in' to the working side of Luci's notebook.

4.4 Conclusion

There are several points to consider from the above analysis. First, that the humble paper list appears to be alive and well ensconced within the realm of household organisation. Second, that the term 'list' can serve as a catchall for a variety of things and purposes, ranging from shopping lists to spatial maps. The fieldwork illustrates that lists can do more than simply denote things; they can act as mechanisms for distributing responsibility as well as a means of enforcing particular moral values. Third, the data presented demonstrates that paper lists allow for the multiple and disparate tasks and activities related to the home to be ordered in various ways, and most importantly, in ways that are meaningful to their authors. The following section considers these points in the context of how they might be used to design technology to support organisation within the home.

4.4.1 Implications for Design

From the fieldwork then, we see that household lists can come in a myriad of forms and serve a variety of purposes, including, but not limited to, timelines, schedules, temporal maps and collaborative recording. They can also, at times, do more than that, for example, serving as an instantiation of multifaceted roles or acting as a repository for sentimental memorabilia. Of course, this is not to suggest that all families (or most or even any other families) use lists in these ways, as a qualitative study of this sort is not intended as a means towards that end. Rather, a study such as this encourages us to take a closer look at the assortment of ways that three families make use of lists, and to consider how lists are specifically equipped to do that work. The fieldwork suggests that the systems employed in household list making are multiple, varied and continually evolving, and that the material features of lists are tightly bound up with these systems of practice. This orientation has revealed two broad findings that are of importance to the design of organisational tools for the home.

First, the data presented demonstrates that paper lists allow for the multiple and disparate tasks and activities related to the home to be ordered in

various ways, and most importantly, in ways that are meaningful to their authors. In particular, lists, because of their specific material features, sit well with the artful and opportunistic creation of the organisational systems designed to manage the competing duties of home carers. The capacity for freeform entry (whatever); capacity to create systems to suit the moment at hand (however); portability (wherever); and accessibility (whoever)—all made available through the list—mean that it is a tool par excellence for the embodied organisation of complexly interrelated and disparate people, tasks and activities.

Second, it emerges that some of these same material qualities of paper lists weaken their benefit in what we have referred to as the *separation systems* that people deploy to divide their different categories of members, activities and tasks, be they related to personal matters, childcare, housework, etc. The trouble is, once enforced, the separation systems are not always applicable or appropriate, and they may fail to be sufficiently flexible to accommodate modification or repurposing. The very materiality of paper means that a list or the items on it only easily fall within one category at a time and must be crossed out, erased or physically moved if they are to be categorised differently or if the system is altered. Re-categorisation often necessitates the rewriting of the items on the list which can be tedious and time consuming. Re-categorisation can also result in a multitude of notation for redirection (arrows, lines, circles, etc.) which can add to the visual clutter and make an annotated list difficult, and even impossible, to read. This inability to neatly accommodate change coupled with a lack of easy re-categorisation, makes paper based lists less agile than might be optimal and suggests that technological augmentation could be of some benefit.

Both the strengths and weaknesses of the systems associated with paper lists thus reveal that organisational tools designed for the home should not only support the ad-hoc organisation of people, tasks and activities, but also that these systems should allow for the opportunistic making of separation systems. That is, new tools designed to support organisation in the home should enable information to be both organised and separated in opportunistic and artful ways. We also learn from this focus on the material features that the organising

and separating systems should be immediately evident in the physical properties of any solution and, ideally (if it is to make immediate sense), something that emerges from a user's own making.

The next chapter is also concerned with the material features of what might be thought of as a very loose form of organising system, that is, refrigerator doors in family homes. Whilst on first glance, the refrigerator doors examined in the fieldwork appear to be the antithesis of anything systematic or organised, upon closer inspection, we shall see that the display capabilities of refrigerator doors contribute a variety of elements to family homes and their organisation.

5. The Display Qualities of Refrigerator Doors

5.1 Introduction

This chapter considers the display properties of refrigerator doors. Similar to the previous chapter, the focus is on a commonplace artefact and how family members make use of it in their everyday routines. Although both lists and refrigerator doors are enlisted to aid in the everyday organisation of home life, they do so in markedly distinct ways and for different purposes.

In view of the relative paucity of literature on interactive systems for the home circa 2004, the refrigerator in comparison received a fair amount of attention. Commonly referred to as hubs or repositories, refrigerators were described as mediating the flow of household information, or framed as pivotal in the discourses of the-kitchen-as-hearth. These depictions, in turn, contributed to various technological imaginings. Projects focused on the contents of fridges and examined how technologies might track the quantities and expiry dates of various products or suggest possible recipes, whilst home appliance companies such as LG and GE have targeted the fridge door specifically, and marketed "networked" fridges that capitalise on the door as a central and shared surface in the home.

Interestingly, however, a good deal of this work appears to have been based on assumptions that potentially misjudge the role of an augmented fridge in everyday routines. For instance, at first glance, an indication of out of date milk might seem useful in managing a household's shopping needs, by alerting them of the need to buy fresh milk. It is questionable, however, whether household members would like the presence of outdated milk to warrant an automated (and potentially annoying) reminder. Similarly, feature-rich interactive panels on fridge doors offering portals to current events, recipes or online encyclopaedias (often no more than vertically mounted PCs), appear as unwieldy attempts at combining information technologies and household appliances without properly considering people's real-world practices. In the HCI and CSCW literature, there are examples of more detailed investigations

into fridge use; however, these works appear as minor points in more general discussions of household technologies. Crabtree [2003] and Graves Marksen and Grønbæk [2004] touch on the qualities of the fridge door as a display surface, alluding to its place in the coordinated efforts and temporal orderings of a household's organisation. However, these references to the fridge are only to its role as one of an assemblage of 'coordinate displays' and interactive surfaces in the home, and do not attempt to articulate its particular properties or why it has the status it does in the home.

The following is an examination of four families' real world practices, and how refrigerators and their doors are used in their everyday lives. The first section focuses on the physical characteristics that make refrigerator doors work as a display medium for families, in particular their shape, form and function within the household. The second section highlights how refrigerator doors can function in cooperation with other surfaces and organisational arrangements in the kitchen, such as diaries. The third section will detail some of the characteristics of items found affixed to refrigerator doors. The fourth section considers why refrigerator doors are appropriated in the manner they are, and examines the role that refrigerator magnets play in making refrigerators such successful family displays. Together, these sections point towards the fifth and final section, which discusses how refrigerator doors and the items affixed to them can go beyond simply representing functional information, and become a part of the negotiations of a family's social order.

5.2 Refrigerator Qualities

The topic of the display qualities of refrigerator doors emerged from the fieldwork investigations. During the course of conducting fieldwork and asking families how they kept things organised, people invariably pointed to their refrigerators during conversation. They would refer to schedules, school notices and calendars affixed, often haphazardly, to refrigerator doors. All the participant households had some version of what could be called a refrigerator 'display' (although typically not in the sense that it was purposefully designed), even one family with a father who explicitly preferred 'clear' refrigerator doors.

This family had gone so far as to buy a refrigerator with a non-magnetic front panel although whether the lack of magnetic attraction was the primary motivation for buying the particular refrigerator was unclear. However, the fact that it was non-magnetic was referred to as a positive attribute during the fieldwork. In amongst these schedules and calendars were all variety of things; photos, children's artwork, dry cleaning stubs, money saving vouchers, invitations, leaflets, souvenirs and recipes, to name but a few.

After visiting a number of families, I began to expect to be shown the fridge, or more precisely, information attached to the refrigerator door. Discussing my fieldwork with a colleague, I got to thinking about the fact that all the families had things on their refrigerator, somewhere or another. On the one hand, this seemed completely conventional and unremarkable, and in some ways quite fitting for the domestic realm; refrigerators, the symbol of kitchen-ness, conveniently serving as a family information display. One could however argue that there are several items that also could qualify as domestic symbols, such as washing machines, microwaves and dishwashers, and none of them had been appropriated in this manner in these families' households. There were also a number of other available spaces in kitchens that might have served a similar purpose, such as walls, bulletin boards and even backs of doors. Some of the families observed did indeed make use of spaces such as these, but significantly, *in conjunction* with the refrigerator.

Based on this, I decided to look into what it was about refrigerators that made them so popular and the surface of choice for families. The following is a discussion of various features of refrigerator doors and how, using illustrations from the fieldwork, the participating families made use of them. The first section focuses on the physical characteristics that make refrigerator doors work as a display medium for families, in particular their shape, form and function within the household. The second section highlights how refrigerator doors can function in cooperation with other surfaces and organisational arrangements in the kitchen, such as diaries. The third section will detail some of the characteristics of items found affixed to refrigerator doors. The fourth section considers why refrigerator doors are appropriated in the manner they are, and examines the role that refrigerator magnets play in making

refrigerators such successful family displays. The fifth and final section discusses how refrigerator doors and the items affixed to them can go beyond simply representing functional information, and become a part of the negotiations of a family's social order.

5.3 Shape and location

Refrigerators' physical shape tends to share certain characteristics. They are usually made of metal in the shape of an elongated cube, with large rectangular panels along the front, sides and top. There are several variations on this design; some have delineated freezer compartments in the top quadrant, some put the freezer compartment on the bottom, in a chest form, whilst some have two handles running vertically down the front panel, separating it into two doors. One of the refrigerators described in this chapter (manufactured by Smeg) had a slightly curved blow moulded front door. Despite this variation, the common features of large, flat panels of magnetic surfaces tend to be the norm.

Refrigerators' location and usage within the home tend to have common attributes as well. Usually placed in the midst of the kitchen, refrigerators often become a focal point in a heavily trafficked room. The function as a food storage receptacle typically makes it a shared device, available to all in a household.[5] The routine use of the refrigerator, for the storage and retrieval of food, means its surfaces are usually seen regularly. This use contributes to its success as a shared surface; unlike a bulletin board or diary, for example, no prearranged system has to be instituted to look at it.

The two following examples from the fieldwork give some sense how families build upon these material features of the refrigerator. The first example concerns a family schedule, and illustrates how it's normal use is intertwined and reliant on its placement on the refrigerator door. The schedule, divided into days of the week, is used to remind family members of routine, recurring activities and is placed at adult eye level on the refrigerator door. In practice, it is Aimee, the mother in the family, who tends to refer to the schedule—

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5 This is the case in western societies, at least; other parts of the world can have different practices concerning refrigerators. In India, for example, it is not uncommon to find locks on refrigerator doors.

typically in the mornings, when preparing breakfast. It is the actual activity of preparing breakfast, the act of opening the fridge door to get out milk and various foods, which draws Aimee's attention to the schedule, reminding her that she must have her eldest daughter's dance outfit ready or that her sons should have their swimsuits for swimming lessons. Thus we see that by its placement, the sight of the schedule is an inevitable consequence of the use of the refrigerator (Fig. 5.1).

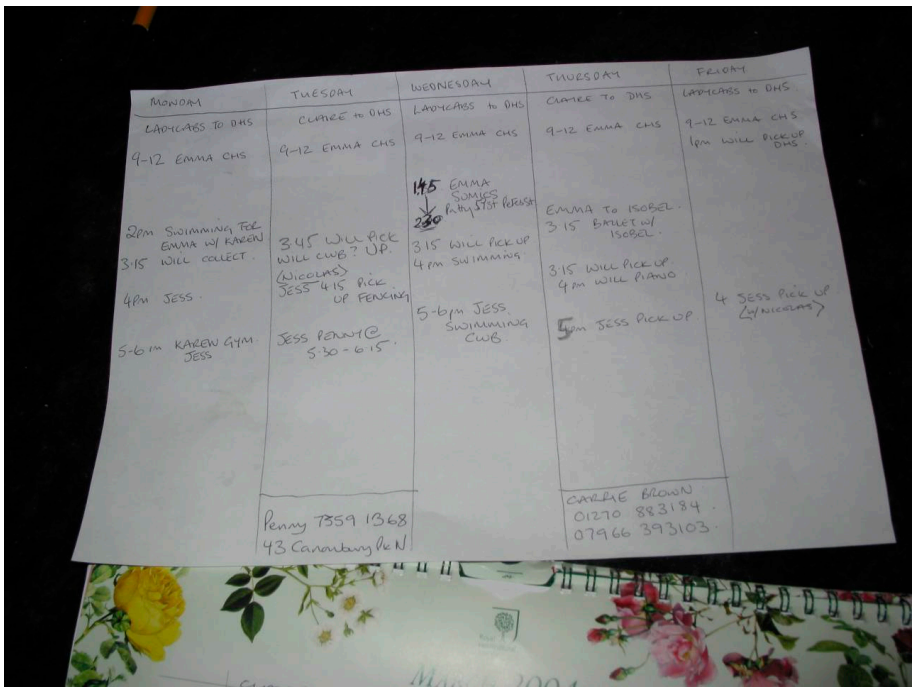


Figure 5.1. Aimee's family's schedule on side of refrigerator.

In the next example, the orientation of space and the magnetic capabilities of a refrigerator's surfaces, or more precisely lack thereof, are used to give some order to what is attached. In this particular case, the sides of the refrigerator (Fig. 5.2) are covered with an assortment of letters, notes, lists, invitations, train tickets, etc., with magnets of various shapes and sizes scattered throughout. However, the front panel, that is, the door of the refrigerator has nothing attached to it. From a functional standpoint, this is due to the door being made of moulded plastic (i.e., non-magnetic), styled to resemble refrigerators of the 1950's. However, according to Olivia, the mother in this family, this is kept empty for aesthetic reasons as well, because her

husband likes his surrounding to be clean and uncluttered, and he wants the fridge door to "look clear".

Figure 5.2. Side of fridge with assortment of letters, notes, lists, invitations, train tickets, etc.

Describing the arrangement of the materials attached to the sides, Olivia explains there is a "theoretical" order to the surfaces, determining which material is attached where. The top left side panel of the refrigerator is designated for things associated with the children's school and family's social activities, as well as home-related chores such as grocery shopping. The family's two daughters, aged six and nine, have been allotted the lower half of the refrigerator's left side panel, primarily due to their height. They have covered their sections with a magnetic Barbie and her extensive wardrobe, with skirts, shirts and shoes floating up towards the grocery lists and school notices. The father, David, has assigned himself a space, albeit limited in size, on the top right side panel of the refrigerator. Thus we see that this shared and multi-purposed use of the surfaces is afforded, in part, because of the refrigerator's size and shape. Likewise the location of the refrigerator has a bearing on what is attached to its surface; its location and use by all family members

immediately assigns its content the status of "public" and thus shared, at least by whomever is allowed into the kitchen.

5.4 Working Surfaces

This previous example, in which an area is given over to school and family arrangements and home related chores, suggests what might be thought of as 'working' surfaces on refrigerators, where a surface or region of a refrigerator is enlisted for the specific purpose of supporting the practical matters of organising home life. To operate in some orderly fashion, these working surfaces again rely on specific material features. For example, in another of the households visited, the upper side panel of the refrigerator contained items associated with practical matters such as cooking, shopping, and school-related activities. In contrast, the refrigerator's upper and lower door fronts were decorated with pictures, postcards, magnets and family memorabilia which could be observed by family members from the kitchen table, therefore operating more as an archival display than an informational surface.

This delineation between surfaces is further reinforced by the mother's description of her "system" for party invitations. She explains that when birthday party invitations for either of her children arrive, they are first put on the side panel of the refrigerator, in amongst the school schedules and grocery lists. When it has been confirmed that the child will attend the party, the invitation gets moved from its original position to the front of the refrigerator door. Thus it is relocated from the 'working' surface to the 'display' surface; in doing so it has been transformed from an item that requires action (in the sense of a parent responding to the invitation on behalf of the child) to a material reminder of the upcoming event. As such, the invitation also switches from being an unconfirmed possibility to being an expected event, and by being on the display surface, also affords the opportunity for the child to notice the invitation and (presumably) anticipate the party, in the midst of other activities such as eating dinner.

As well as relying on the relations between the refrigerator's surfaces, this refrigerator has also been appropriated with respect to its surroundings.

The "working" side of the refrigerator adjoins a kitchen counter, on which sit an electric kettle, a teapot, a kitchen roll holder and at the time the photo was taken, a bowl of newly washed salad (Fig. 5.3). Above this counter is a shelving unit on which sit boxes of tea, tea cups, a cup of pens and pencils, a jar of honey, and bottles of cod liver oil and tixylix (a cough syrup). Susan, the mother, explains that she uses the space adjacent to the refrigerator as a place to make grocery lists, check ingredients in food products (her son has dietary constraints and must avoid certain preservatives, a listing of which is on the side of the fridge), write to-do lists and review school schedules. Hanging prominently in the middle of the working display is a slip entitled "Remember" with a list scrawled under it. Susan says she uses this space as her "control centre". From this, we see that by enlisting the various surfaces of her refrigerator, Susan has essentially combined the horizontal and vertical surfaces, extending the functional possibilities as well as the dimensions of the entire workspace.

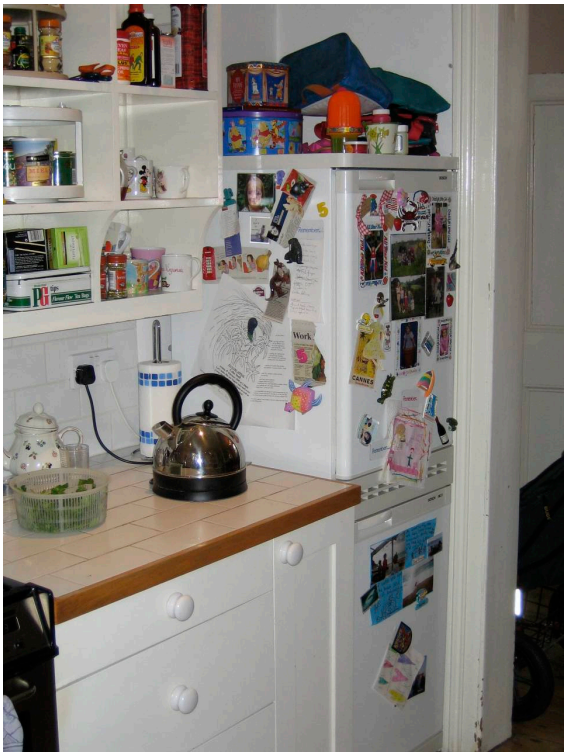


Figure 5.3. Refrigerator set against other kitchen surfaces.

In a similar way, the fact that the refrigerator faces the kitchen table makes its display available, as a matter of course, during activities such as eating

and homework. This seeming coordination of surfaces here, parallels the relations between the items on the refrigerator and other household artefacts. For instance, the shifting party invitation (above) is tied to the use of the phone; once the invitation has been accepted over the phone, its place is altered, as is its status. This characteristic was echoed on other refrigerators observed during the fieldwork, in that there were items displayed n refrigerators which were also noted in household calendars or diaries. Rather than being redundant, these distributed records serve multiple purposes; for example, a notation in a calendar reserves a time-slot for the family member who manages such things, whereas the event's record attached to the refrigerator stands as a visual reminder to all family members.

In sum, a refrigerator's surfaces can come to make up and/or be assembled into a home's organising systems. Particular features of the refrigerator make it successful for some aspects of this organisational work and not others. Because of its expansive surfaces and its central location, we see that items on a refrigerator can be configured in visible ways to express their purpose or to be clearly associated with surrounding objects and activities. However, where items are linked to entries in calendars and diaries, for example, these relations are less apparent, sometimes even opaque, in that they may be only apparent to their creator. This limits the effectiveness to the instituted relations between objects; the relations are only readily available to their inventor and even then they must, with no visible help from the system, be remembered.

5.5 Diversity and Longevity

That refrigerator surfaces have this sort of 'working' information affixed to them is not particularly surprising; more curious perhaps is the juxtaposition of disparate items on refrigerator doors, particularly those that are not ordinarily placed with one another. All of the households in the fieldwork had their "working" items stuck to their refrigerators in amongst an array of all sorts of things: photos, postcards, magnets from holidays, children's artwork and various other memorabilia. It is interesting to consider why refrigerator

surfaces should lend themselves to such mixtures of materials. People do not typically affix appliance manuals into their photo albums, nor put party invitations in toolboxes, but on the refrigerator functionality and everyday routine mixes with sentimentality with no apparent contradiction (Fig. 5.4). It appears that refrigerator surfaces behave as a catchall for household miscellany, where something might be forgotten if stored or filed, or when there seems to be no other obvious place. An illustration of this is evident in the following excerpt from a mother. Below, Nicola refers to a piece of Chinese calligraphy spelling out her son's name that is prominently displayed in the middle of her family's refrigerator.

> Every so often I do think about taking stuff off this refrigerator and there are things here that, you know, every so often I do a sort of mental clearout, or more than a mental, I do a clean out and I say ok we don't need this anymore, that voucher isn't valid or whatever but for some reason this one always stays, because I can never think of anywhere else to put it. It's so crumpled but I feel like I can't really throw it away.

Somewhat remarkably, the calligraphy she is referring to has been on her refrigerator door for seven years, which highlights an unusual characteristic of many items found on refrigerator doors, that is, their temporal variability and longevity. Examples from the data show that some items on refrigerator doors can linger for years, whilst other items can be up for a day or less. Thus, a school trip notice will be discarded after the trip, a school's term dates will stay up for the semester, and a piece of children's artwork or postcard may remain indefinitely. This range of life spans, as it were, further contributes to the incongruity of the items on the refrigerator door, in that some items are extremely current, relating to the immediate present, whereas others have lingered for ages and are no longer related to daily life.

Figure 5.4. Refrigerator with attached sentimental items.

This raises another interesting feature, which is the piecemeal creation of refrigerator displays. Although the presentation of what is on the refrigerator door may appear all of a piece (or not, in some cases), it has typically been created bit by bit, over time, and each item that goes up is not necessarily meant to go with whatever else is already residing on the refrigerator. This heterogeneity of materials, jostling for space and attention, presents a veritable kaleidoscope of stuff (Fig. 5.5), of varying physical form, function, aesthetic and vintages, and as such, stands in marked contrast to the ways in which electronic information can be affixed and displayed to surfaces. The refrigerator's exterior is thus more an assemblage than a preconceived collection and may be considered more a collage, pieced together over time, than a static canvas.

Figure 5.5. Items jostling for space on family refrigerator.

5.6 Magnets

In examining the surfaces of a refrigerator, then, we find a location where practical, sentimental, historical, functional and playful items can come together. The myriad items overlap and interleave with one another, competing for attention, sometimes having their functions and interrelations transformed over time. The question remains though, why the refrigerator? We see that the refrigerator offers a relatively large surface, available to all and its' surfaces provide a space for the haphazard arrangement of multi-functioning and ever changing items. However, other domestic areas offer similar features. There are bulletin boards, doors or even walls that can be equally expansive, similarly positioned in central locations and allowing for things to be affixed to them, using thumbtacks or tape.

Missing in these other domestic surfaces is, of course, a magnetic quality. Arguably, it is this that allows refrigerator surfaces, with their helpful counter-parties, magnets, to be unusually easy to interact with. Although attraction is achieved because of the material properties of the magnet, the sense to the human is of ultimate simplicity. The distinctive qualities of the magnet afford a fluidity and informality that both afford and characterise the assemblage of items on refrigerator surfaces. Magnets allow both a persistence

in display (like the bulletin board), but also an easy and somehow compelling means of continuously reorienting and reconfiguring what is attached.

Magnets are decidedly different to thumbtacks or tape. Thumbtacks require a piercing of the surface and a light effort—both suggesting more permanence—as well as a lasting damage to the given surface in the form of a hole. Although in the larger scheme of things both the effort and damage are minimal, they nonetheless instill just a bit more thought before placement than the magnet. Tape is slightly different. Although its initial placement has a similar ease to magnets, it can be hard to remove and leaves a residue. Thus, when something is taped, it is, by tape's nature, meant to stay. By contrast, magnets lend themselves to being put up, taken off, reconfigured—on the fly, by virtually anyone. Their magical quality and sheer simplicity promote the shared sense of refrigerator surfaces. In short, magnets bring specific qualities to the refrigerator surface, transforming it into a surface par excellence for accommodating the heterogeneous miscellany of things that typify the home.

5.7 Family Negotiations

As a final point, I would like to suggest that the very features of the refrigerator discussed and the ongoing ordering of items on its surfaces make it a site where the relations within a family can be played out and (re)negotiated. Returning to the earlier example of Olivia and David's refrigerator (Fig. 5.2), we see that the overall order to the divided surfaces is not static nor clearly defined. For example, Barbie and her assorted items of detachable clothing have migrated upwards; postcards and photos find their way in amongst organisational items; and, as Olivia explains, even David's tie-clad magnetic man and the leaflet it attaches to the refrigerator have been wrongly placed (Fig. 5.6). It is through these small signs of insurrection that we begin to see the possibility of something more to refrigerators; the refrigerator, so often described as central in a household's physical geography, can also be fashioned as a central player in a family's social relations. In the following, Olivia explains that although David has not understood the ordering of the refrigerator surfaces, the fact that he has attempted to situate his contributions, the magnetic man and the leaflet of

an event he plans to attend, on the fridge at all is at least a step in the right direction:

> He's put it this side bless him, but I think that's quite... At least he's put it somewhere. I think he thought that's his, [she points to the magnetic man magnet] so he kind of thought he was to put that there [points to the attached leaflet and laughs]... I think he's trying to get in on the... Cause I must say the one and only thing that has appeared more than once as a point of friction within our marriage has been him not paying any attention to the family diary... The fact that he doesn't refer to it, so I think this is his attempt at being part of... [cut short]

Here we see that, over and above its use in ordinary housekeeping matters, the refrigerator is transformed into a location where Olivia and David's one point of friction is to be worked out. Whether intentional or not, David's efforts are seen as an initial forée into participating in the family's organisational matters. Again, the interesting question is why the refrigerator? The answer would seem to hinge on a point already made concerning the refrigerator's central location and the fact that, because of its frequent use by all, it acts as a display. Any item on the refrigerator must therefore be accounted for; the act of changing or attaching something unavoidably holds one to account. Whether we speculate that David's efforts are a public gesture of détente or simply an indication that he wishes to carve out family time to attend an event, the fact remains that his actions are bound up in the practical workings of the home; they are the constituents, in some sense, of realpolitik in the home.

Figure 5.6. Right side of Olivia and David's refrigerator.

Furthermore, it is not simply the refrigerator's location and orientation of its surfaces that make it so successful in this regard; the sheer simplicity of the magnet makes the mechanics of interaction nearly effortless. The fluidity and reconfigurabilty afforded by magnets—in their inherent simplicity—are what allow for this expressive quality. Moreover, the iconic character assigned to magnets enable family members' actions on the refrigerator to be immediately recognised. It is telling that although Olivia cites the diary as the point of contention for her and David, it is the far more visible magnet-friendly refrigerator and, specifically, the use and positioning of the tie-wearing figure that is where the action is.

5.8 Conclusion

By considering refrigerator doors and the things affixed to them, we have seen how they can come to be part of organising systems within family households. The physical characteristics, the shape, location and function of refrigerators, all work towards making them well suited to this role. From the fieldwork, it's

evident how refrigerator surfaces can come to be appropriated into family routines and organising systems; its function as an oft visited food receptacle allows items posted on it, such as schedules and calendars, to be seen on a regular basis, for example. Its physical characteristics, specifically its shape and its long expanses, offer certain affordances; children can appropriate the lower regions for playing whilst parents may utilise the higher regions for organisation, train schedules, shopping lists etc.

The interplay of surfaces, both on the refrigerator and within the kitchen, add a further element to its organising features. The coordination between the sides of a refrigerator and the adjoining countertop, and the orchestrated movement of the party invitation illustrates this. The curious mixture of items on refrigerator doors suggests that this space can serve as a catchall, both for assorted household things as well items that need to be remembered. Because of this, the assemblages on refrigerator doors often have a collage like quality. They also can remain *in situ* for years, becoming part of the furniture, as it were. The magnetic quality of refrigerators allows items to be easily posted, taken down and reconfigured in a variety of ways, with very little effort. The contrast between magnets and other things, in particular thumbtacks and tape, reinforces this. The fact that the use of magnets require little to no thought as well as minimal commitment allows them to be used in a casual, uncomplicated manner by all family members. Thanks to the synthesis of all these qualities, we see that refrigerator doors can act as a site where family relations get played out. In the final example from the fieldwork, we see a couple working out relationship friction due to miscommunication in scheduling via where magnets and information items are placed on the refrigerator. This easy visibility and reconfigurability of magnets on refrigerator doors affords this role, giving it a particularly essential, as well as multi-dimensional, role within the household.

In chapter 8, I will discuss what implications these general findings have for design and how, in collaboration with members of the Socio-digital Systems groups at Microsoft Research, we went on to produce some conceptual designs for some digitally augmented fridge magnets.

6. Clutter

6.1 Introduction

The next chapter is concerned with examining clutter in family homes. The first section discusses the focus of the fieldwork, and how that came about. The second section examines the ways one family uses bowls to manage and contain their clutter, and how these bowls support other organisational systems within their home. The third section considers the contents of one family's 'junk' drawer, in an attempt to understand what sort of things are considered clutter, and how these things can begin with a different status and transform into clutter with the passage of time. The final section examines a theoretically clutter-free home. This in turn reflects on the sometimes ambiguous status of clutter, and what determines how and when something is classified as clutter, as opposed to simply a collection of things.

6.2. Choice of Topic

In keeping with the previous fieldwork examples, the topic of clutter emerged somewhat unexpectedly during the fieldwork visits. One of the participants in the refrigerator door fieldwork felt quite strongly that her friend's refrigerator door should be included in the study, because of the variety of things attached to her friend's fridge (she felt that her refrigerator door was relatively boring compared to her friend's refrigerator door). Being in the habit of following up recommendations from participants, a visit was duly made to the aforementioned friend. The recommended refrigerator door was indeed covered in a diverse mixture of disparate items, including a seven year old piece of Chinese calligraphy, and examining that refrigerator door turned out to be informative and interesting.

During discussions of how things affixed to the refrigerator serve to act as reminders, and how at some point, those things can turn from visible

notification to almost a form of filing on the fridge, we stumbled across this next topic. Nicola, the mother in question (and a mother of two boys, aged six and ten), made several references to her bowls, and how she used them for all the various miscellany that family life generated. Intrigued, she was encouraged to go into detail; she began to show and talk about a collection of bowls, situated at various points around her kitchen and family room. The following captures something of Nicola's bowls and her thoughts about them.

6.3 Effortless containment

In Nicola's open plan kitchen/dining room, three stacks of bowls sit near the work surfaces, presumably to be used to serve food. Upon further inspection, it becomes apparent that they have instead been appropriated for an assortment of miscellaneous items. She describes the origin of this usage:

> I suppose it's because you have *stuff* [said with emphasis, as if in a pejorative tone] and you need to put it somewhere and bowls seem quite a good receptacle in that they just swallow everything up. Ummm,... [pauses] completely without any thinking or planning... (Fig. 6.1)

Figure 6.1. Bowls in Nicola's kitchen.

The 'stuff' Nicola refers to is a haphazard mixture of sunblock, cheque stubs, door locks, mobile phones, and various other things. In an effort to keep clutter at bay, Nicola has appropriated a class of common household items,

bowls, to act as repositories for this varied paraphernalia. Her reference to bowls' ability to 'swallow everything up' makes them well-suited, in her view, to containing family flotsam and jetsam, with a minimum of effort.

As we will see, this minimal effort technique has become part of the organisation of her home. She continues, describing her husband's use of bowls:

> ... sometimes he'll plug into them. So he knows for example that- it's never talked about, but he'll know that batteries go in that bowl, keys go in that bowl and, if you have paperwork that needs sorting, it'll go in that little pile. So I guess he tunes into it almost subconsciously. They are my systems, but they become the home systems I suppose. And they're really not- it's rather a grand word to call them systems actually.

Here we see an example of organisational collaboration between family members. Nicola mentions in another excerpt that although her sons rarely add items to the bowls, not being partial to tidying up, they both know that the bowls are where certain types of things, like batteries, are found. We see that the methods Nicola has instituted to organise mundane artefacts of daily life have been adopted by her family as well. On the face of it, then, it would appear that bowls and piles can be considered useful in a home because they help family members achieve, in an ad hoc, lightweight way, some semblance of order with minimal effort.

As the next excerpt illustrates, however, Nicola does not find her system of bowls, despite their ease of use, a wholly satisfying solution. Although referring to piles in the following excerpt, Nicola's remarks are directed at a stack perched precariously on top of a bowl full of items:

> I think a file, somehow, would just get forgotten about more than just a visible pile that's actually irritating me. That's part of it. Part of it is that I don't like clutter, even though you wouldn't know it [gestures around house]. I don't like all these piles of things everywhere so if I deliberately make a pile then it's sort of a motivation to get rid of it as well.

Unlike things that are filed away, visible piles and bowls full of stuff attract attention. In this way, they are reminiscent of the things we leave out to

trip over to act as reminders (Norman, 1988). Nicola's bowls summon attention because she can see at a glance that things are in them, waiting to be 'properly sorted'. Nicola's remarks suggest that these noticeable reminders can be an annoyance, serving not only as a to-hand solution, but also as an irritating reminder of the tidying and organising that needs to be done. A subtle balance is achieved (or perhaps not quite), between placing disorder out of sight and having it displayed as a visible reminder of something to be acted upon later. Nicola's bowls are thus a partial or *temporary* solution to the problem of tidying up, a solution which will do in the short term.

Another of Nicola's bowls, this one tucked out of sight behind the kitchen door, further confirms the value of having bowls to hand but also raises another important property, that is, the possibilities of *layering* that the depth of bowls enable. Pointing to the bowl, Nicola runs through its contents:

> This is old mobile phones that we're going to chuck out but I think actually I'll get them recycled somehow. Film for the camera, batteries- the inevitable batteries because if you have kids all their toys need batteries, the A-to-Z. You know, sort of bits and pieces but if you dig down to the bottom I'm sure there are things in there that I have long since forgotten about. So it isn't very organised in that respect. The things on the surface are important, but in some sense it's like geology.

We see from Nicola's description that bowls allow for the piling in of items, which in turn results in a type of loosely chronological layering. The bowl's physical properties, its depth and its sidedness, actually, despite Nicola's remark, organise the items in an uncomplicated, obvious way; newer items sit on the surface whereas the older and/or smaller content gradually drift towards or become compressed into the bowl's bottom layer. Nicola's reference to geology seems apt; during the fieldwork, the informants' process of rummaging through their clutter felt reminiscent of an excavation. As such, the temporal aspect of physical layering becomes a cue for recollection and management, for navigation through the accumulated layers.

6.4 Types of clutter

The example above examines some of the myriad items found in one family's clutter containers (or bowls to be more precise), as a means of getting a sense of what can constitute clutter. For another family participating in my fieldwork, their clutter or at least some of it resides in a 'junk drawer'. This drawer has a broken front and is located amongst the kitchen cabinets (Fig. 6.2). This drawer is not particularly noticeable; when closed, it looks like any drawer, save for its broken front. Inside the drawer is a jumble of items, including string, spare plugs, cards, sunglasses and bicycle lights, among other things. There is no explicit system of separation or organisation; it appears to be simply clutter. We hear from Emma, the mother, however, that there is some form of order to the drawer, albeit a loose one:

> This is where I just put things where I- you know where you think you really want to throw it away but you don't feel that you can... so it's a combination of those things and little things that I don't have a home for but I should have a home for, like the tape measure, and the rulers, and the paper clips, and things.

Figure 6.2. Junk drawer in Emma's kitchen.

Here then we have an intriguing combination; things that cannot be thrown away, although one might want to, and 'little things' that deserve a 'home'. Emma's description of clutter as things "you really want to throw away but you don't feel you can" serves nicely as a general description of clutter. Why

these things might warrant being thrown away, and why they can't be, will be examined in more detail in this section, but first we will consider the second part of the description. The fact that there is a category of "little things" that "don't have a home but ought to" is illuminating. Tape measures, rulers and paper clips appear to have a different status than more 'garden variety' clutter; presumably these little household tools deserve a 'home' due to their usefulness and ubiquity, and are only residing in the junk drawer until Emma establishes their 'home'. Emma's use of the word 'home' regarding these items is also interesting; although a common figure of speech, by using the word 'home' in the sense of things having a rightful place, there is the suggestion that homes, by their nature, have an inherent degree of organisation, although as the examples of this fieldwork indicate, this is not uniformly true. Following this line of reasoning would suggest that being located amongst the clutter is therefore tantamount to being 'homeless'.

Digging deeper, it emerges that there is further categorisation within the clutter. Emma elaborates while sorting the contents into several small piles:

> Those are dice, but again they should go, there's a little bag we have upstairs for dice so that should be, they should all be in the dice bag... Lego, that needs to go in the Lego box...more dice, they should all go in the dice bit...

In Emma's drawer, we find items from various larger collections, stored elsewhere in the house, such as dice and Lego. This is a particular type of clutter; it is "matter out of place" (Douglas, 2002). Important here is that these pieces do have a 'home', they are just out of it, and Emma's description of them "going places" underscores the fact that they are in transit, albeit perhaps temporarily on a stopover in the junk drawer.

It is interesting that Emma, when asked to describe what is in her junk drawer, begins pulling the items out of the drawer and sorting them into piles. Although she had not been asked to do so, it appears quite natural, if only because separating items from the jumble inside the drawer makes them easier to see individually. As the discussion ensues, her piles become more numerous and more populated, and they begin to stretch across the kitchen counter as

well as the kitchen table. This process of sorting out items and categorising them is well suited to being done on a wide, flat surface, such as a table or counter, whereas a container such as a bowl or drawer, does not offer this capability. Emma's natural inclination to spread the contents of the drawer onto adjoining surfaces for organisational purposes takes advantage of the properties of those surfaces.

By far the largest pile on the counter and table top is the one designated 'rubbish', which is interesting in itself. As a case in point, Emma holds up a card, explaining that it was from the last Harry Potter movie and "was terribly precious for a short period of time". She then throws it onto the rubbish pile. The fact that a sizeable proportion of things in junk drawers can be disposed of upon sorting out says something about the ephemeral nature of some clutter. It suggests that items can go into the drawer with one status and come out with another, that something "terribly precious" can transform, over time, into rubbish within the drawer. Items such as media associated with new movies derive some of their value from their newness; when the novelty wears off, their status plummets. The drawer can thus act as a holding place, a safe spot for things with a temporary shelf life to live until that life expires.

Emma's junk drawer appears to have other transformative powers. The following excerpt, this time involving a Yughio trading card, shows us something more complex occurring:

> ... torn up Yughio cards [tossing what looks like part of a card into the rubbish pile]. I think there are torn up Yughio cards because when sometimes the boys fight and they tear up each other's cards and I have to say: 'don't worry I'll fix it!' which of course I can't do, but I'll say that [laughs]... and then I'll put it in there [the drawer] and it gets forgotten about and then it's all alright because nobody cares and they won't remember.

Here we see a kind of fictitious 'magic' powers that parents can provide for their children: when Emma places a torn Yughio card into the drawer to mollify her battling sons, the card transforms from a point of conflict to an opportunity for reconciliation and finally into rubbish. Relying on time and the out-of-sight-out-of-mind tendency of children, the torn card lingers between

cherished and destroyed until, once safely forgotten about, its status no longer matters.

Clutter bowls and junk drawers can function as repositories for items with problematic status, as we shall see in the next excerpt. Rummaging through the drawer, Emma gingerly holds up a small wooden object, shaped like an apple:

> ...that is an air freshener for a car that [smells the wooden object]- ugh, smells horrible, but it was in the car when we bought it so we've hung onto it for sentimental reasons... when we bought our car that we have now it was new and for some reason it was in there. I don't know why it was just- I think the kids thought it was exciting that it came with an apple as well. You know 'new car *and* wooden apple!' [laughing] so for some reason we still have that.

Thanks to her sons' positive associations with it, the wooden apple has achieved the status of a thing "you really want to throw away but don't feel that you can." Although Emma's drawer might not, on first glance, seem an obvious place for archiving memorabilia, her wooden apple represents an interesting point. Namely, not all sentimental objects are guaranteed a place on the mantelpiece, as it were, and junk drawers and bowls give refuge to items of ambiguous value.

Examining a few items from Emma's junk drawer provides a glimpse of some of the various forms that clutter can assume, as well as some of the functions clutter containers can provide. Besides acting a safe haven, for detached items of household collections located elsewhere and homeless but useful household tools, Emma's junk drawer works as a 'holding tank' of sorts for ageing media as well as a home for ambiguously sentimental memorabilia.

6.5 Battling clutter

The next example further explores the concept of ambiguity. This excerpt is taken from an interview with Olivia, mother to two girls, aged six and nine. Olivia's family home is especially tidy, and on first glance does not seem to be a

promising arena for studying clutter. There is none visible, and Olivia herself claims that she does not keep "stuff" and throws away as much as she can. Indeed, one of the reasons Olivia was asked to participate in the study was because of the tidiness of her home. Two other informants, when discussing their own clutter, made reference to Olivia's home, one of them saying "I bet she has none!" In the interests of seeing a possibly clutter-free home, Olivia was asked to take part.

Initially, it appears that the other informant may be right. Delving further, however, we are able to find little hints of clutter, and more interestingly, Olivia's efforts to keep them at bay. Tucked into the corner of a cupboard of wine glasses is a small bottle of homeopathic drops. The bottle of ointment, a gift from her daughter to help Olivia 'unwind', presents a small problem of classification for Olivia:

> I thought well- I couldn't think where to put it actually, and you can't see it when you close the door... I mean really it could be put in another drawer. But this is me, I think to myself 'Why is that out? Put it away.' So it may not be in the right place but I put it away because I can't stand stuff lying about.

Although Olivia's gift is placed out of sight in a cupboard, we discover it does in fact have its right and proper place in a drawer. The overriding criteria appears to be that stuff cannot be left lying about. Therefore a bottle belonging in a drawer is tucked away in a corner, to conceal it. Unbeknownst to her daughter, stress is relieved not by using its content but by hiding the bottle from view.

Olivia has recently had her kitchen and adjoining utility room redesigned with banks of closets, cupboards and drawers, and feels that she now has "places to put stuff". Peering into various drawers, we find collections of like things, neatly separated by containers, dividers, trays, plastic bags, etc. Indeed, the drawers are the epitome of organisation, and it does seem as if Olivia has perhaps eradicated the spectre of clutter by categorising it to the n^{th} degree in all its minutiae. We find a drawer for table mats and all things table-associated, another drawer for stationary paraphernalia, all neatly separated by

dividers, and another drawer for sewing-related items, again neatly compartmentalised.

In a drawer of tools and household implements, however, we get a glimpse that all is not as it seems. This drawer has, besides a tray full of tools and a case of socket wrenches, a biscuit tin of batteries and a plastic tub of keys. Olivia explains that the tub is specifically for keys, separated out into a plastic bag, and keyrings. When the number of keys is remarked upon, she replies: "I have no idea what they're for, but I've kept them because that's where they go."

Olivia has thus taken something of uncertain status found in nearly every household—in this case, keys to unknown locks—and has given them a home. In doing so, she has not resolved their status; she has no more idea of their rightful destination than the other informants would, but by giving them a designated place "where they go" she has organised them and attended to them, compartmentalising and thereby minimising their ambiguity.

Encouraged by this chink in the organisational system, we dig further into the key tub and find further breakdowns in classification. Underneath the plastic bag of keys we find several un-key-like items. Olivia's response is illuminating:

> They're just things, aren't they? I don't know what to do with them so I put them in here... [pointing to a glass sphere]. That's a ball off the garden swing. It's of absolutely no use but it's beautiful so I couldn't throw it away, could I? So I've put it in here.

In the glass ball off the garden swing, there are echoes of Emma's wooden apple car freshener, of an item having the dual status of being junk and sentimental at the same time. Fascinating is that although Olivia tackles the business of classifying the miscellany of the household with fervour, and has closets, cupboards, drawers and dividers to help her, ultimately she too ends up with a small tub somewhere full of 'just things'.

6.6 Conclusions

Reflecting on the prior examples— Nicola's bowls and piles, Emma's drawers and Olivia's trays and dividers—we see that the containers and the material within have a number of properties, some of which have important implications for the design of tools to manage digital media in the home. By using containers that demand low levels of organisation and consequently, interaction, items like bowls and drawers, our families are able to deal with household clutter with minimal effort. These devices afford at-handedness; their placement near to where clutter accumulates means they offer a simple and lightweight resource for containing or hiding clutter. Moreover, bowls and drawers allow the user to place things in them without careful thought or deliberation. Part of their success is due to their visible functionality—anyone can see what they are for, no labelling is needed and no expert training is required before tossing something in. The self-evidence of these devices is further represented by their layers and the 'geology' of the stuff they contain, both serving to show the history of their use.

We have also seen that things belonging in other parts of the home often end up in clutter bowls and junk drawers. In theory, these items are in transit and are in the bowls and drawers only temporarily, on their way back to their collections. This finding underscores the point made earlier, that is, that people use bowls and drawers as a low effort resource in their quest to keep some semblance of order. No doubt Emma knows where Lego pieces and marbles belong (as she probably decided where in the house that was) but she lets small bits of collections accrue in the junk drawer to avoid spending time constantly putting things away.

The nature of the stuff that constitutes clutter has commonalities with the content that digital technologies produce and store. For example, some of the material one finds in bowls and drawers is there because of its limited life span. Media associated with something new can, as Emma mentions, be "terribly precious for a short period of time". Video clips from YouTube can have this quality. Bowls and drawers can act as convenient holding places for

something with diminishing value, yet have a casualness that allows for easy removal and disposal when that value has gone.

Other things get left in bowls and drawers because they have attained sentimental status, yet not of enough note to warrant formal archiving or display. Olivia's glass ball and Emma's wooden apple air freshener are examples of this – unable to be thrown away because they mean *something*, yet not meaning *enough* to be kept somewhere else. Again, YouTube videos can fall into this category as well as photos from mobile phones. Here, the informal quality of bowls and drawers is especially pertinent; these devices do not force any particular decision nor demand that objects within them be dealt with in any particular way.

And finally, there is the stuff that no one knows what to do with. Olivia's tub of keys and Nicola's forgotten "bits and pieces" fall into this category. This material often gets put in bowls and drawers simply because they offer a temporary solution to the question of what to do with them. Bowls and drawers can thus serve as a refuge for the unclassifiable, the outcasts of a home's ordered arrangement.

In sum, the fieldwork illustrates how bowls and drawers can come to provide a 'safe' site of containment for clutter, giving the miscellaneous items space to be properly dealt with and classified, or not, as the case may be. The shared but idiosyncratic practices families use in clutter's containment appear to be ritualising, in that they act as material expressions of the family home and a collective means through which the home is made unique. In chapter eight I will discuss, in detail, how these points have implications for the design. Specifically, I present a prototype designed to manage digital clutter using the fieldwork reported above as a basis. Moreover, I reflect on what can be gleaned by thinking more broadly about clutter as an idea—as stuff or matter out of place.

7. Artful Systems

7.1 Introduction

This final empirical chapter considers a variety of handcrafted organising systems for the home. In the course of collecting fieldwork about lists, refrigerator doors and clutter, several of the participants drew attention to ways and means that they had devised to keep track of various aspects of daily life in their families which didn't fall into any of these categories. These ranged from using old Christmas cards as shopping lists, as a means of recycling and remembering old friends at the same time, to arranging pending paperwork on a double desk so that it was visible to the person meant to deal with it, but not to others. Some of the participants referred to these methods as their 'systems', which is how I consequently came to think of them. The idea of studying what these systems were and how they functioned seemed particularly apropos; the term 'systems' particular significance in computer science and the decidedly low tech nature of these handcrafted systems had a nice resonance with the theme of this thesis. Often quite unusual as well as ingenious, these systems were all distinguished by their deeply bespoke nature and the amount of thought that had gone into devising a solution that worked for their inventor's particular circumstances and needs.

The following examples describe several artfully designed systems for organising information related to a household's management and childcare. In keeping with the fieldwork in the earlier chapters, it is again mothers who are seen to manage these matters, albeit in collaboration with other family members. We see how a variety of artefacts are enlisted to assemble and sustain the organising systems. Thus the selected examples are a diverse grouping, involving an assortment of artefacts; a school letter, a paper schedule, a re-writeable plastic writing surface and a notebook record of a baby's activities. One of the few functional commonalities between these items are that they involve some form of writing and thus are capable of conveying information in

some form or another; however they all serve, in one way or another, to contribute to the organisation of the household and family activities.

7.2 The school letter

The first example follows the trajectory of a letter from school to home, via a child, detailing logistics for a swimming gala the following morning. The mother, Jennie, uses a combination of methods, including the physical placement of the letter, the coordination of other material resources and talking aloud to organise how her daughter will get to the event, and with whom. What is particularly relevant about this example is its very ordinary nature; it is neither remarkable nor unusual, and occurs in countless families every day. Any previous logistics or information concerning the production of the letter, who the author is, how the swimming gala was arranged or who was involved, are not considered here; although these previous arrangements may have been a complicated and multifaceted situation with many players, for the purposes of this study, the focus of the transcript below is on three family members coordinating their morning schedules.

[Jenny ushers her only child, Sophie, from the school gates]

Jenny: Come on trouble.

Sophie: I'm a bloody reserve...

Jenny: Excuse me?

Sophie: I'm a reserve for the swimming thing

Jenny: Oh, that's good

Sophie: I'm not going! I don't want...

Jenny: That's not too bad, a reserve.

Sophie: Yeah, there's somebody [inaudible]

Jenny: Well, at least you get to take part.

Sophie: Only one kid from our class has got in.

Jenny: Really... [Addressing researcher:] Typical school letter [reads through it]. When is it, 17th of June?

Sophie: Tomorrow.

Jenny: Tomorrow?

Sophie: … and we've got to be at school at 8.30

Jenny: What? Tomorrow?

Sophie: yeah

Jenny: … [reads from paper] Early start, leave school at 8.30. Errgh! Well, you'll have to talk to dad. Alright, let's get out of here.

Back at home, having returned from the school run, Jenny places the letter about the swimming event on her sideboard (Fig. 7.1). This is the place she temporarily puts paperwork that is awaiting action. As she makes herself a cup of tea, she returns twice to the sideboard to read over the letter. Following the second reading, she gets a diary from a filing cabinet kept in the living room and steps out on the balcony to talk to her husband Simon, who is back early from his job as a window cleaner. Simon's talk is inaudible but Jenny's side of the conversation gives us a sense of the proceedings:

> You've got Jim at 9 o'clock… yeah, I know it's a pain in the arse, … yeah, but I don't need to go anywhere tomorrow! [Returning to the living room, she again picks up and looks at the correspondence about the gala]. Hmm, ridiculous, 8.30 start!

Later Jenny reveals it was Simon's diary she had with her when talking to him on the balcony. She explains what it was she was doing:

> I knew Simon was taking her to school but I couldn't remember what time his first job was but luckily he can do tomorrow. So he's going to take her at 8.30. Then basically come back have a cup of tea and then go back out again, cause his job at 9 is right opposite the school, so he's going to have to go back and forth [laughs].

Figure 7.1. Sideboard with school letter placed on it.

There are several interesting points in this excerpt. The first is how Jenny is confronted with an organisational matter when out on the school run. Whilst her daughter Sophie is busied with expressing her disappointment at being a reserve for a swimming gala, Jenny attempts to get to grips with the practical arrangements. She moves between reading the letter she's just been handed and coaxing the details from Sophie directly. Watching her, it is evident that Jenny is attempting to work out the logistics of where, when and how she will get her daughter to the gala, an unexpected obligation that she is none too pleased about.

Once home, it is notable that Jenny puts the correspondence about the swimming match in a place she has established for things that require action. Her solution relies on tasks and chores having some embodied form, in the shape of scraps of paper, or, in this case, a printed letter. The location of her sideboard, in the main living space and in full view when either sitting in or passing through the room, is an important part of her method. Over the course

of the afternoon, the gala letter's location serves as a physical point of reference for Jenny. She returns to the sideboard and the letter several times, presumably to absorb its content and figure out how the logistics for this event can be arranged. Jenny interleaves various other chores and activities with this deliberation; she seems to have to mull over the specifics for an extended period, and it is only after a period of time that she addresses Simon armed with his diary. What is interesting here is that Jenny takes responsibility for making the arrangements; she has assumed the role of managing and coordinating Sophie's movements, even when they encroach on Simon's work schedule.

The point to be emphasised is how the swimming gala letter, given to Jenny, precipitates a chain of events centred on integrating and arranging the relevant information into the household's existing organising systems. We see that the capture and integration of information is part of a larger ongoing sequence, the specifics of which are coordinated by one central figure: Jenny. Of particular importance is Jenny's use of actual material artefacts in this coordination; the printed letter, the sideboard and her husband's diary are all enlisted into the unfolding sequence of events which enable the organising systems to work successfully.

7.3 The Family Chart

This role of coordinating family and household activities is further illustrated in the next example. Mandy is a mother of three girls, aged nine, six and three. To keep track of her daughters' various activities, as well as her husband's, she uses a home-made calendar, or what she calls her "family chart" (Fig. 7.2).

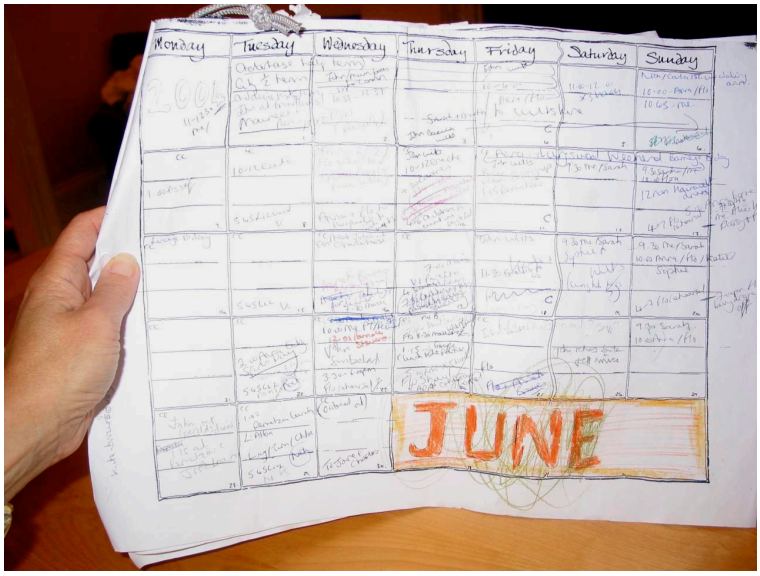


Figure 7.2. Mandy's family chart.

The chart, heavily annotated with the family's comings and goings, is affixed to the side of the refrigerator, in a prominent location available to all the family members. Mandy describes her own regular use of it:

> I generally look [at the chart] at the beginning of the week. So just to remember like when there are tea dates, when I'm going out for dinner, have I got babysitting, and that kind of stuff. But I do look at it every morning. I do religiously come down, put the kettle on, have my shower, come back, look at it while I'm making the tea, and then go up back to bed with tea. And that's what I do every morning, that is my routine.

The way in which Mandy describes the routine nature of the morning ritual with her chart is striking in this excerpt. The chart's fixed place in her morning schedule, in and amongst shower taking and tea drinking, signifies how it is she who takes on the role of overseeing the family's agenda in its entirety, to know who is doing what at any given point in the day. The very ordinary, everyday quality of the described ritual establishes this work as a taken for granted feature of what Mandy does.

As the next example shows, the coordination of multiple family members' different activities sometimes requires more than simple scheduling. Mandy has encouraged various family members to get in the habit of noting

their planned activities onto the chart (dependant on their ability to write). The following is a discussion about Mandy's husband, John:

Researcher: Does John refer to it [the chart]?

Mandy: He does. He does now yeah, occasionally he'll go through the year putting in when he's going fishing and when he's going to Belfast and when…

Researcher: Really, where's that? Has he put it ahead of time?

Mandy: Yes he does. He occasionally gets crossed out… [both laugh]

Researcher: Who does he get crossed out by? [both laugh]

Mandy: By me if I find something better to do.

Although from the text it appears as though Mandy may be somewhat Draconian in her methods, what is evident is that she has enlisted practical ways for her and her family to get on with family business. Her occasional crossings out of John's fishing trips or trips home to Belfast are not simply authoritarian measures (in actual fact she is enthusiastic about his fishing), but rather reveal a system of hierarchy based on balancing individual needs within the larger context of the family's activities as a whole.

From the above, we can see how the chart becomes a material representation of the socially constituted order of the home—who does what and which activities take precedence over others. Central to this practice is Mandy's accepted role as overseer. Mandy acts not only as coordinator and overarching arbiter of the chart's content, she also has a vested interest in its efficient functioning as a family resource. A primary concern for her is how well it integrates into the organising systems the family have in place and, specifically, how well it conveys the necessary information to her family as well as herself.

To consider this in more detail, let us turn to another quote from Mandy, specifically her reply when asked how she conveys the day's schedule to her family:

> I think [breakfast] is more a rush, and I think you're trying to get the kids breakfast and get out the door. And actually when we're all sat in the car and you're in a very enclosed space for, you know, ten minutes and nobody's going anywhere and actually you've got their attention – I'm like 'remember, Anna, you're going to Chloe's for tea tonight', or 'remember I've got to go pick up Chloe', and you know, 'Flora you're doing this' or 'Caroline Oswald is picking you up tonight and I'll see you at Britannia.' So then they actually know – because I think it's important for them to know.

Mandy's description illustrates how her morning ritual, where she absorbs the day's events, feeds into her system for conveying information to the family. In the car—where there is no getting away—the tasks, activities, play dates, etc., inscribed in handwritten markings on the chart, are translated into a verbal listing of where people will be, who they will be with, and so on. Mandy stands in for the chart, conveying the day's schedule and also renegotiating anything unforeseen. Her reeling off of the children's activities brings us back to the items listed on her chart, interweaving one child's schedule with another's, timetabling the day with reference to the chart's structure and order.

This process reveals how Mandy has had to contemplate the most effective way of conveying the chart's content. In contrast to breakfast, the ten-minute school run is seen to be the best time to ensure the family's attention. What's particularly remarkable about this example, however, is how Mandy's system for conveying information is fashioned in and through the family's practical routines. The system is enabled by the car, because it provides an enclosed space, and it arises and is sustained through the family's routines and, specifically, through Mandy's matter of fact engagement in them. For Mandy there is no time out from these systems and their enactment because they are the very business of parenting.

7.4 A Petal-board and a Kitchen Table

The examples from the next household illustrate that the organisation of family and household matters can be far from straightforward or obvious. The coordination of action and responsibility undertaken by parents become more complex when factors such as children's moral development come into play. In

our next example, Amanda has placed what, for lack of a better term, I refer to as a "petal-board" in a room that is by the family entrance to the house, where the family keeps their shoes, coats, schoolbags, etc. The board is made of wipe-clean plastic in the shape of a flower with five surrounding petals, labelled Monday to Friday, and with the centre of the flower labelled 'Sat/Sun' (Fig. 7.3).

Figure 7.3. Amanda's petal-board.

The petals for Monday and Friday have been written on by Amanda, while Wednesday's entry has been inscribed by Lilly, her 8 year old daughter. Under Monday, the entry reads "Kagoul (L), trip slip signed, music books x 2." Amanda's explanation of these items provides us with an insight into how the petal board is used:

> This was for this Monday, just gone. Because that was Lilly who went on a trip on Monday and so I needed that [points to the "trip slip" inscription] for that day and they both do music on a Monday. And Lilly's Kagoul I knew was at home and it was supposed to be at school and that's why... [moves onto new topic].

Amanda's explanation reveals how the petal-board is enlisted to manage and convey the work and routines that make up family life. The list stands as a three part embodied reminder of 1. the Kagoul (a type of raincoat) Lilly, (L), must have for a school trip; 2. the "trip slip" that needs to be completed, giving permission for Lilly to go on the trip; and 3. the music lessons the two daughters attend on Mondays.

Elaborating further, Amanda reveals that the petal-board has a secondary function:

> This should be for the children. That was the theory... I did it to try and encourage Lilly not to forget everything on a regular basis.

Amanda's use of the word "theory" suggests an underlying motivation to her system. Her explanation denotes a moral undertone suggesting her aim is to design more than a simple aide-memoire for Lilly. Her artfully devised solution seeks to instil a sense of responsibility in her daughter, and lessen the reliance she has on her mother. For Amanda then, the petal-board amounts to more than a simple organisational system. Rather, it provides a practical method to foster a self-reliance and independence in Lilly.

Amanda goes into some detail describing how she has chosen to situate the petal-board where she has. After careful consideration, she has placed the petal-board next to the door in the entry hall where her daughters can view it as they enter and exit the house, but in an unobtrusive spot so as to not be unsightly for other visitors. This forethought and attention to detail gives a sense of Amanda's interest in the system she has created, as does her continual assessment of its effectiveness. The quote below describes one of her various strategies to improve upon it:

> It needs updating otherwise people get tired of looking at it cause it looks the same... What happened was we used it a lot, Lilly wrote all over it illegibly, but she could read it and then it kind of got ignored because it was the same things every week. So I kind of wiped it clean and started again and I think wiping it clean's a better thing.

Besides her ongoing commitment to the petal-board, this excerpt gives a sense of Amanda's overall say in the family's organising systems. Even though the board has been designed to be instructive for Lilly, it's Amanda who has the last word on the board's content. Key here though, is that the wiping clean and starting again are done for the very practical reasons of clearing the illegible handwriting and reinstating the board as a something not to be ignored. Amanda's authority is exercised so that the device can function properly; it is necessarily implicated in the use of the artefact to successfully convey information.

In a similar way, Amanda relies on the inherent properties of the kitchen table to assemble another system. During one of the fieldwork visits, she recounts the arrangements behind a school trip scheduled for her younger daughter. Her description presents the necessary arrangements as logistically complicated, involving an array of instructions listed in a letter sent home by the school that are too detailed to be accommodated on the petal-board. Explaining her preparations for the trip, she tells of her use of the kitchen table as an alternative:

> My other system is doing everything the night before. So I got it all ready last night and went through it in my mind and I looked at the thing [the letter relating to school trip] and put – on the [kitchen] table I put a note of what I was to remember.

What this example demonstrates is the manner in which one household system can lead into and co-exist with another; for detailed arrangements, we see that the petal-board is simply not adequate, and that the "note-on-kitchen-table" system must be invoked instead. Amanda's reference to her "other system" suggests that she has instituted a range of systems to handle the organisation of information and these co-exist for different, albeit related, purposes.

Interestingly, the kitchen table is also used as part of a different system that Amanda has devised. When dealing with the miscellany of documents and paperwork associated with her household's management, Amanda has

instituted a practice of laying out the various items that demand attention across the kitchen table. As an item is dealt with, she takes it off the table and puts it in a pile elsewhere, signifying that it has been resolved. When particular items need thought or the relations between them need to be carefully arranged, Amanda finds herself walking around table, circling her paperwork as it were, in an attempt to get to grips with the task she faces.

This variety of functions that Amanda's kitchen table serves (besides the obvious as a place to eat) is interesting because it illustrates how the table's inherent properties can shape its use as an information 'artefact'. In the first example, the table functions as a temporary and shared display for family members, a location where critical reminders can be placed that need to be seen in the morning. In this incarnation, its important attribute is that it is centrally located and likely to be used for breakfast. In the second example, it is used as a setting to lay out and interrelate an array of documents—the physical space provided affords the spreading out the documents and facilitates their sorting out and management. Of course, the table has myriad other functions in family life: an offloading point for schoolbags, a place to do homework, etc. The point, though, remains the same in each case: it is the material properties of the table and its placement in the home, both physically and socially, that afford its use.

7.5 Recipe Books' Multiple Functions

The next example considers a book Kate keeps that contains what she refers to as 'critical phone numbers'. The book, placed on a shelf in the kitchen, originally began life as a record of their youngest child's first two years. Because Kate works outside the home, as a teacher, this was a book kept by the baby sitter, or nanny, to keep Kate up-to-date with her youngest child's routine, schedule and significant occurrences. In describing the book, Kate, like Mandy, gives a sense of the maternal overseeing that she considers her natural prerogative, which in Kate's case is done remotely with the help of the book:

> When our nanny first started, this was like Dotty's... she would just write in the times of her feeds and nappy changes, but she's grown out of that now. But we had a similar system when the boys were little and it was nice for me just to know when they're small babies what was going on.

From Kate's description of the book, we get a sense of the evolving nature of family life as well as the mechanisms devised to accommodate them. Because Dotty has grown out of needing a record of nappy changes and feeds being conveyed, the book is no longer needed for its original purpose. However, a particular predilection for Kate is 'putting things to good use', which ensures that almost every artefact in her household is made 'useful'. Because of this, the book under discussion now serves several purposes:

> The reason it's still in existence is because in the back there's like critical phone numbers for everybody so they're like my mobile, doctor's, Colin's work, the schools. Actually that's defunct cause she's moved to Frankfurt [points to name in book], quite a few of these things are defunct, (pause) so this could be re-jigged really, this system [pause]... except the other thing is it's got all our nanny holiday dates.

There are several points to be examined here. The fact that Kate refers to this as a system that's defunct and could be re-jigged, shows that she sees it as something she has constructed, which can be improved upon. After a moment's pause, during which she apparently conducts an ad-hoc evaluation, the book is deemed worthy because it's still serving some function other than simply being Dotty's baby book. Thus, even though it has been deemed more or less 'defunct' in terms of acting as a repository for critical phone numbers, it is, on final reflection, still serving a 'useful' purpose as a written reminder of the nanny's holiday dates. Similar to Amanda's petal board, there's an ongoing assessment of how well the system works. And in keeping with other household systems, this evaluation happens in an informal manner, as she runs across it, in the course of looking for something else.

Kate's interest in things having a useful function and/or serving dual purposes extends to other items in her household. Indeed, this system of transforming baby records into artefacts that have practical use has a historical

precedent; her older son's baby notes, recorded in a book from 1995 (Fig. 7.4a/b), have been similarly co-opted:

> It has a kind of sentimental value... And I can't bear to throw it away but you know, it's silly to keep, so I've kind of made it into my recipe book where I stick in recipes and stuff. So I can see some of it but some of it's just boring and repetitive and (flips through book) there are lots of useful pages in the back so...

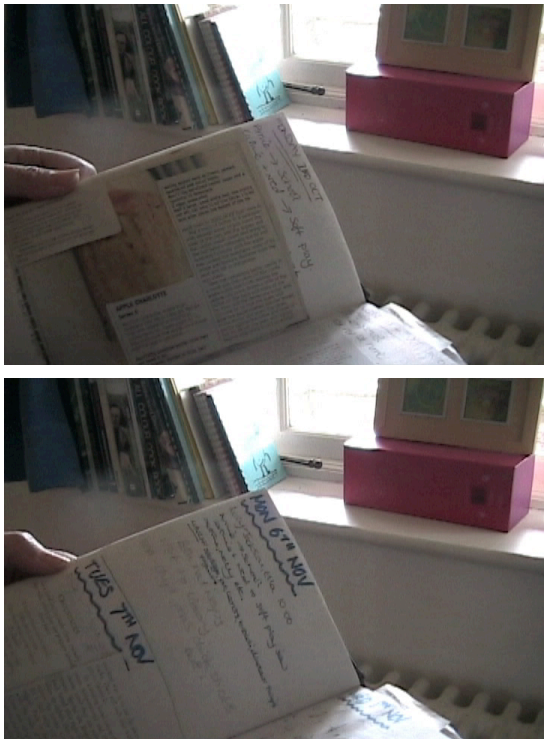


Figure 7.4a/b. Kate's multipurpose book.

The statement "And I can't bear to throw it away, but it's silly to keep," nicely captures the conflicting dichotomy between sentimentality and a certain degree of functional utility that Kate finds necessary in her household. Because the book relates to a period of her sons' lives that won't happen again, it has personal and sentimental value, yet the book has no immediate purpose other than acting as a memoir of that time. This tension between functionality and sentimentality in domestic life is an important characteristic of this particular environment and we see how Kate has come up with a creative solution to reconcile the two. By turning the baby record into a recipe book, she has

managed to reconfigure the book into a functioning artefact which has a justified place on the kitchen shelf, thus allowing her to retain something of sentimental value. Her sense of pride in being able to combine the two is evident, both in the way she displays the baby record/recipe book and in the fact that she continued the tradition with her daughter's baby record, albeit in a somewhat different form.

Continuing to examine Kate's statement, the description of parts of her sons' baby book as "boring and repetitive" is illuminating. Ignoring any moral undertones in this description, the significance for our purposes is that Kate uses it to provide a justification and rationale for gluing recipes over memoirs of her sons' baby activities. A secondary consequence of this practical work is that in so doing, Kate ends up acting as family arbiter; by choosing where to glue her recipes, she is determining what is worth keeping a record of and what isn't, which ultimately influences which version of family history is maintained.

Her drawing attention to the "useful pages" in the back is also notable; it suggests that this book could be reconfigured for yet another bit of domestic work, the repository of some other household system. The possibility of this book being used for yet another purpose conveys the ad-hoc nature of household systems (reminiscent of lists on backs of envelopes), and the opportunistic combining and reconfiguring are indicative of how they evolve over time.

7.6 Conclusions

7.6.1 Heterogeneous organising systems

The results from this fieldwork confirm much of what Crabtree et al. [2002, 2003] have reported in their studies of the information artefacts tied to a household's organisation. We've seen, for example, how Jenny keeps her pending items on her living room sideboard or how Kate keeps a book with her critical phone numbers on a kitchen shelf, and in so doing make up what Crabtree et al. refer to as a home's *ecological habitat* of information artefacts—

the arrangement of communication media throughout a home[2003]. The way in which Amanda arranges her paperwork on the kitchen table illustrates the use of *activity centres*, the established places in the home where the actual work involved in using these artefacts is done. The shared use of Amanda's petal-board and Mandy's chart pinned to the refrigerator also point towards the use of *coordinate displays*—places where communication media are located to support collaboration [2003].

Building on these findings, the presented examples suggest that a home's ecological habitats, activity centres and coordinate displays are all incorporated into broader *organising systems*—systems in which heterogeneous collections of artefacts are enrolled to capture, integrate and arrange, and convey information. The first example, with Jenny, illustrates this, where a letter she's given at the school gates finds its way into the family's system for arranging pending to-dos and is then translated into a scheduled journey in and amongst the family's routines.

The organising systems are often artfully devised so that they can overcome the limitations of particular artefacts or stand in as alternatives for other systems in their entirety. Amanda's note-on-kitchen-table, for instance, offers an alternative to the petal-board when the arrangements to consider are too detailed. Likewise, another mother, Carrie, records her 'to-dos' on her answer-machine, a system that replaces the use of paper-based lists in inopportune moments, when pen and paper are not available. Carrie makes use of the hands-free attachment on her mobile phone whilst driving on the school run to record reminders for herself so that she can later integrate her fleeting thoughts into artefacts like her diary or calendar.

The findings also reveal how a family's organising systems are by no means static. The systems are continually being (re)designed to suit any actual case and to meet the ever changing needs of families as children age and relationships develop. Kate's multipurpose baby-record-cum-recipe-book provides a nice illustration of this. Kate re-appropriates the artefact once its function as a baby-record has run its course, transforming it into a volume for recipes. The organising system thus becomes one of integrating and arranging

handwritten notes and newspaper cuttings (detailing food ingredients and cooking instructions) with inscribed mementoes of her children's past.

7.6.2 The social organisation of the home

Less immediately evident, but perhaps more critical, is how these organising systems come to make up a home's social order. What we've seen, throughout the fieldwork, is that one person—typically a family's mother—enlists a variety of systems to organise a household's arrangements. I'd like to suggest that the work that mothers do to artfully construct these systems, and then maintain them, has consequences over and above the organisation of a family's practical arrangements, so that the systems are not merely about the management of information. The systems lie at the heart of the fundamentals of home life, insofar as their routine and practical use orders the social organisation of the home.

Critically, this ordering is by no means something that is explicitly imposed. Rather, it is accomplished through the ways in which the organising systems are routinely and practically instituted. Amanda's petal-board is a particularly good example of this because it shows how a system of organising also works to instil a sense of responsibility. In other words, the actual use of the petal-board institutes a system through which her daughter Lilly might begin to conform to the expected order of things. It is the *doing* of systems such as these that constitutes the order that places the mother as the nexus in organising household information. In short, it's because mothers do the school run, manage calendars, arrange notice boards, piece together multi-functional books, and so on, that they come to play a central role in designing and maintaining the organising systems. Their centrality in household work is, in this regard, an unavoidable consequence of their part in getting on with everyday household matters.

7.6.3 Design Implications

I'd like to use the final section of this chapter to draw together and reflect upon aspects of the previous four chapters. In particular, I want to bring out, in a broad sense, some implications for the design of technology for the home. I will sum up three points to be taken into consideration when thinking about designing information technology for the home, points which, although directly linked to this chapter's fieldwork, are also relevant for the fieldwork in the thesis overall.

Organising systems are afforded in and through the properties of the artefacts used, and this is a critical aspect for design. The very nature of the artefacts—their form, the way they are arranged, and their routine use—are what give shape to the systems and allow them to be sustained. For example, the schoolbag illustrates one of the ways information can be transported into the home. In discussing how she stays up-to-date with events at her children's schools, Zoe's (mother of three) description of her 5-year old son's schoolbag shows its communicative function, acting as an embodied method for transporting details about school-related events, projects, etc. in the form of notes or letters. Moreover, the schoolbag's contents can have a monitoring role, so that exercise books, homework diaries and artwork all provide an opportunity to coax the less obvious details of a day from a child. It is the fact that a young child's school bag is designed to contain specific material, that it is transported to and from school, and that it is packed and unpacked by the child's mother that afford its part in a system designed to incorporate school-related information into the home and monitor progress at school. The organising systems thus arise from and are part and parcel of a home's ordinary routines and through the use of specific artefacts in these routines.

To a certain extent, the presented findings point towards a number of broad design implications. They suggest that technological infrastructures for the home should allow for the use of multiple, mobile and embedded, information devices that can be combined and interconnected in ad-hoc ways. Such a position harks back to Weiser original vision of ubiquitous computing

articulated in 1991. Three further insights that I believe emerge from the work above are as follows:

1. *Artfully combining heterogeneous devices* – first, the findings call for an infrastructure in which a heterogeneous collection of devices can be assembled to capture, integrate and arrange, or convey information, or do all three. Crucially, though, they should be able to be artfully combined so that people can design organising systems that suit individual or family needs. Thus, recognition should be given to the bespoke character of organising systems and how they are often assembled for reasons that cannot be simply predicted or generalised.
2. *Pliable systems of organisation* – closely related to the first point, it would seem that technological infrastructures should allow devices to be combined or removed from organising systems so that the overall function can be redesigned in an ongoing way. The point here is that a system should be pliable in so far as its function can be altered over time, or that it might serve multiple functions, through the recombination of devices.
3. *Integration with established organising systems* – third, the findings suggest that information devices introduced into a home should be able to integrate with a home's established systems. This includes paper-based systems. For example, thought could be given to how paper-based notes, letters, calendars, notebooks, etc. could be embedded with electronic tags (e.g. RFID) so they can be integrated with their electronic counterparts. Central to this point is that the architecture should allow all available devices to be enlisted and (re) combined to render the organising systems pliable.

Generally, then, the implications above outline a vision of multiple and heterogeneous information technologies operating within the home, a vision that is closely aligned with the ubiquitous computing project. Importantly though, like Ed- wards and Grinter [2001], what I have suggested is that

technologies should be designed so that they can be gradually incorporated into homes in a piecemeal fashion.

In sum, this chapter has considered a variety of examples of household organising systems created by the families who participated in my fieldwork. Distinctive in these examples are the way these systems have been artfully designed by their creators, using a multitude of artefacts to address very specific needs. The bespoke nature of these systems as well as the effort and attention put into their creation make them both artful and unusual. The examples also reveal the ways in which the participants, in this case the mothers, take on the primary role of designing these systems, initiating, sustaining and developing them in order to organise matters relating to home- and child-care. Notable here is the part a family's organising systems have in shaping the social organisation of home life. The findings suggest that a home's social order is constituted, at least in part, through the practical accomplishment of its organising systems, and that these organising systems are afforded in and through the artefacts that are enlisted.

The implications for design have been left intentionally broad. In many respects, I see this chapter as bringing together the overarching themes of my empirical work and its general relevance to designing for the home. My intention has not been to propose specific technologies or technical features, but rather to frame the home as a particular kind of place with some fundamental features that shape how a home is both socially and materially organised. Design seems something that should be guided by how homes organise themselves in these ways. As I see it, the work set out for us in the HCI community is to understand how homes and the people who live in them might artfully integrate new information technologies into existing, everyday practices. Turning to design in the next chapter, I use two examples of prototype design to further develop this thinking.

Chapter 8: Implications and Reflections for Design

8.1 Introduction

In this chapter, I present two design projects that emerged from the presented fieldwork. The two projects are based on the findings presented in Chapter 5 on refrigerator surfaces and those from Chapter 6 on household clutter. The section entitled 'Motivations' outlines the larger intention behind the choice of these two topics. Both projects offer technical solutions, but the latter, in particular, also aims to extend the thinking around design by drawing out some broader implications. In the chapter's conclusion, I present a set of overarching concerns for designing domestic information technology that have been informed by both the fieldwork and the two design projects.

8.2 Motivations

In many ways, the presented ethnographic findings did not lend themselves easily to technology design. Problems arose in translating the findings into something relevant to design because the fieldwork came to be more about understanding the practical accomplishment of a home's social order rather than detailing its functional requirements. Because the fieldwork focused on uncovering the rhythms and routines of home life rather than identifying and optimising a series of set tasks, the identification of explicit design implications was far from straightforward, as is so often the case with ethnographic studies (Dourish, 2006).

This chapter is not an attempt to solve the general problem of translating ethnographic materials into design implications; although fascinating, this is a complex problem beyond the scope of this thesis and, indeed, in its own right has been the subject of numerous projects and PhD theses. Instead, my intention is to illustrate how domestic technology design

might be made sensitive to the distinctive qualities that make up home life. As I set out at the beginning of this thesis, my hope in undertaking the presented fieldwork was to better capture what living in a home and managing day-to-day family activities entails. The aim of this chapter then, is to show how this detail has been used to guide two design projects. In effect, the two design projects have been exercises for myself to assess whether rich and detailed descriptions of home life are capable of producing decent design implications.

Although the following design ideas are not in any way complete or all encompassing solutions to the issues raised, the intention is to illustrate how the fieldwork could have relevance to information technology design. In these terms, the two design projects can be seen as a reflection of the challenge of using fieldwork materials to inform design. The first of the presented projects, drawing on the refrigerator surface study, adopts a relatively functional perspective. At the early stage of my PhD, my inclination was to use the fieldwork in a prescriptive way, as a means of defining, as well as possible, the design and functionality of a novel system. Thus, the findings are used to produce some specific suggestions for a set of digitally augmented magnets. The motivations for these magnets are inspired by the observations of refrigerator use in family homes, but their designs rely on a number of principles that are well established in HCI, such as affordances, lightweight design, and appropriation.

In contrast, the design ideas that emerged from the studies of household clutter were different, and in some respects more sophisticated. Similar to the magnet designs, my initial inclination was to tease out specific design recommendations that could inform design—resulting in an augmented digital clutter bowl. However, as my PhD progressed and my thinking around the topic of families' everyday clutter developed, it became apparent that some broader design implications could be gleaned. These were not so much aimed at producing concrete design suggestions as they were at sensitising design to what I came to see as the particularities of families' treatment of clutter, alongside that their ideas of neatness and cleanliness. Not only did the design exercise find inspiration in the fieldwork then, but the principles of designing domestic technology were guided and shaped by the findings as well.

The following two design projects should be seen therefore as exercises, reflecting how I came to see the value of detailed fieldwork of home life for designing domestic information technology. In concluding the chapter, I aim to explicitly state both the narrow and broader implications of both exercises in the form of eight design concerns. I also reflect, briefly, on the overall design process and the extent to which the design work reflected my initial aim of sensitising design to the nuances and subtitles of home life.

8.2 Refrigerator Magnets

The first design project to be discussed began roughly a year into my PhD. research, following on from my field studies of refrigerator surfaces. As such, it centred on the development of a series of augmented refrigerator magnets. The design concepts were inspired by the lightweight, simple properties of interaction found in actual refrigerator magnets. Thus, the objective was to augment existing features and interactions inherent in non-digital refrigerator magnets.

First and foremost, the descriptions that follow are meant to demonstrate how some of the findings from the refrigerator surface fieldwork offered a way to inform design. The exercise provides an example of how my fieldwork led to some ideas that were relatively functional. The following descriptions, however, also include some of the technical details that may at first seem out of place in the context of this thesis. My reason for presenting them here is to show how the designs were not just shaped by the fieldwork findings, but also technical decisions such as the how sensors can be arranged on circuit boards and to what extent small, simple-functioning, magnet-sized 'devices' can be battery powered.

The augmented magnets were developed through to a prototype stage in collaboration with several members of MSR Cambridge's Computer Mediated Living Group. The prototypes took the form of paper (cardboard) lo-fi mock-ups and in some cases, preliminary hardware designs (Fig. 8.1). The paper prototypes were used to assess the design approach and gain an early sense of households' perceived usefulness of the concepts. The hardware was built to test

the idea of a generic platform for digitally augmented magnets and the feasibility of using the assembly of sensors and enabling battery-operated power on a small magnetic circuit board.[6]

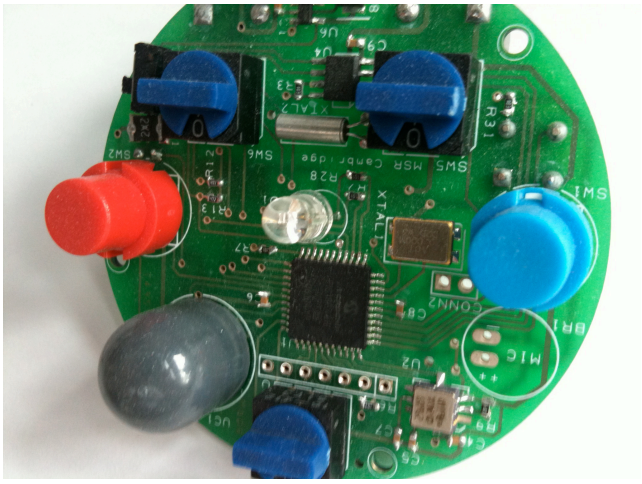


Figure 8.1. Hardware design for augmented magnets

To briefly recap, the fieldwork on refrigerator doors suggested four loose categories of artefacts which families used for, one, organisational purposes; two, reminders, three, organisers/planners; and four, items signifying ownership and family memories. For the augmented magnet project, the decision was made to design around only the first three categories for a number of reasons. Although in many ways, the embodying of family memories is possibly the most interesting of the four, it also is potentially the most complex and therefore the most difficult. Exploring the variety of ways that families encapsulate their memories and trying to design something to do justice to that was beyond the time and resources available to the project. Reminders, planners and items signifying ownership on the other hand, had the common attribute of being functional, i.e. they have a distinct organisational purpose. Although they of course serve more than a functional purpose, there is some level of cohesion

6 The details of this work have been fully described in "Designing Augmented Refrigerator Magnets (Eardley et al 2005)" "Augmenting Refrigerator Magnets: Why less is sometimes more" (Taylor et al 2006). For the purposes of this thesis, the emphasis is placed on how the concerns listed above helped to fashion the eventual designs.

due to this. Thus we decided to focus on the first three categories, in hopes of returning to the topic of family memories for a different project.

In each of the examples, the digital enhancements and additions were an attempt to build upon the existing interactional properties of the refrigerator as a display surface, with a particular focus on the interplay between surfaces and refrigerator magnets. As noted, in keeping with the previously mentioned list of attributes, a central principle in the concepts was to maintain the lightweight and simple interactions afforded by refrigerator magnets, with the aim of providing a basic level of functionality that could be easily understood and operated. The digital enhancements of the magnets were therefore purposefully constrained, in the hope that by doing so, the richness of features would arise from the interplay of the various magnets, as opposed to a complex feature set provided by any one magnet.

8.2.1 Reminding

The first of the design concepts considers the ways that the families in the study used the refrigerator surface as a means of reminding. The fieldwork showed that the refrigerator provided a relatively effective place for information to act as a reminder, in spite of the information being essentially passive in nature. Two things undermine this effectiveness, however. One is how households can habituate to the objects displayed on the refrigerator that can result in new information or new arrangements of objects not being noticed. The second is that as space becomes crowded, some information may become hidden from view. The question became how might digital technologies provide simple ways of drawing attention to items on the refrigerator.

The first design prototype relates to the point that many objects kept on the refrigerator concern events that are time critical. This includes appointments, social events, vouchers that expire, concert tickets and so on. A problem with passive displays such as those found on the refrigerator is that they rely on people coming across them at the right time to trigger a time-critical reminder. Because of this, these reminders often fail because, being passive, they cannot draw attention to themselves. The idea was to construct a

collection of magnets that allowed users to set alerts for upcoming days or hours. The different units of time could correspond to different magnet sizes (see Fig. 8.2a for day of month timer). Consider, for example, a card with an impending dentist appointment on the 21st of the month. The person who fixes the card to the refrigerator chooses the day-of-month magnet and sets the dial to '21'. On the 21st, the magnet begins to intermittently glow, with the colour or light pulsating more quickly as the day passes. The alert would continue until the magnet is explicitly switched off. Technically, such an idea is relatively straightforward to implement and more detailed description can be found in Eardley et al. (2005) and Taylor et al. (2006).

A second design for supporting reminders is to construct magnets that are sensitive to movement. They might glow or change colour when moved, with this change gradually fading over time (Fig. 8.2b). In a simple way, this would display new items that had been added to the refrigerator, or that things had been sorted and rearranged. Such a method could be combined with the timer concept so that magnets labelled with, for example, the days of the week would be set to glow on their respective day if moved (Fig. 8.2c). From an implementation point of view, these ideas are very similar to the timed alert outlined above. The main difference is that the alert would be triggered by some kind of electronic movement detection. The most obvious candidate for this would be a simple mechanical movement/vibration switch with an appropriate sensitivity. However, the refrigerator door itself will of course move frequently (as the refrigerator is opened and closed) and it should be ensured that this regular operation does not trigger any of the attached magnets. It *may* be possible to distinguish between different types of movement (e.g. the movement of the magnet across the door vs. the movement of the door itself), but an alternative approach would be to detect when the magnet is lifted away from the refrigerator surface with a mechanical or optical switch built into the magnet. This would reliably detect the redeployment of the magnet to a different task, but would not falsely trigger when the refrigerator door itself is moved.

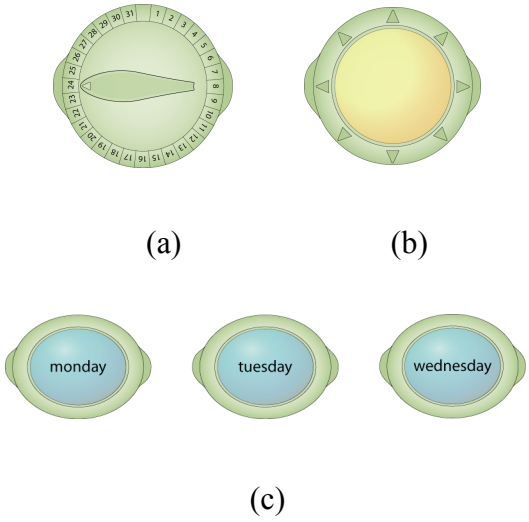


Figure 8.2a. Example of timer alert designed for days of month. The magnet is manually turned to set alert. **8.2b.** Glowing magnet designed to glow for 24 hours when moved on/ attached to refrigerator surface. **8.2c.** Three of the possible seven magnets assigned to days of the week. If, for example, the 'Monday' magnet is moved on the refrigerator surface, it will glow on the upcoming Monday.

8.2.2 Organising and Planning

As discussed in chapter 5, the refrigerator surface, in combination with physical objects such as paper and magnets, provides a place where important information can be kept to hand. One of the favourable properties of this kind of working space is that family members who are at home can access it locally; however, the converse to information being on the fridge means that it is not available remotely. Items such as shopping lists, telephone numbers, details of party invitations and so on are not typically available in other places where household members might need them, such as when planning activities at work, or when mobile (while shopping, for example). Thus this suggested thinking about how technology might make such information available remotely.

The fieldwork illustrated how people often designate particular areas of the refrigerator to display important pieces of information. Based on this, one idea was to construct a magnetic frame with an attached camera, where the frame corresponds to the field of view of the camera (Fig. 8.3a). The frame

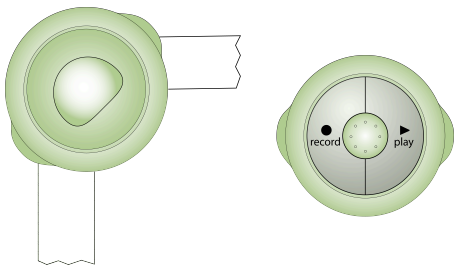
could be moved about and placed over important documents and objects. Householders could then place items into the frame which they think they might want remote access to, such as shopping lists, schedules, important phone numbers, addresses and so on. This in effect delineates the "working area" of the refrigerator as in the example presented earlier. A simpler version of this might simply be a camera that magnetically attaches to single items to allow remote access to smaller fields of view. Ideally such camera views could be seen remotely not only from desktop PCs but also over mobile devices such as cellular phones.

Whilst there are technical challenges involved in implementing this scheme, a number of solutions exist. Digital camera technology has evolved significantly over the last few years due to the popularity of camera phones. Consequently, a wide range of small, high-resolution, low power camera modules are available. More challenging is making the image data remotely accessible. Assuming once again that a wireless solution is required, a communications technology such as Wi-Fi or GRPS would need to be embedded into the device, and a suitable system infrastructure would need to be put in place to make the images available to an appropriate set of client devices (such as PDAs, computers and mobile phones). Similar systems have previously been built for the domestic environment (e.g. Hindus et al., 2001) so this should not be a major technical impediment. One of the most obvious difficulties to be addressed is the delivery of power to the augmented magnet. The power requirements almost certainly mean that a battery is inappropriate, yet the requirement is for a wireless device. A possible alternative is the idea of powering the magnet through the surface of the refrigerator. This issue will be addressed in a later section in more detail.

Another issue related to organising that comes to light is that family members have different, idiosyncratic ways of indicating the state of actions with respect to some activity, such as the example of Harriet moving a party invitation from one part of the refrigerator to another as evidence of having replied. These actions may well be opaque to other members of the household, yet there may be times when it is important to be able to record a history of actions taken with respect to some event that is shareable with the rest of the

household. This kind of activity could be simply supported by allowing materials to be annotated using a lightweight audio record/playback magnet.

The technology to support audio recording and playback in a refrigerator magnet is readily available today, and is present in many different devices such as electronic toys. The basis of the implementation is a single IC that could process and store voice input to be subsequently replayed. Power is supplied using a battery (either rechargeable or simply disposable); depending on use, a reasonably sized battery would provide many months if not years of operation. In addition to the modest power requirements, the size and cost of such a recording/playback device are modest and therefore quite acceptable. The issues related to implementing a visible 'reminder' to indicate when a new message has been left are very similar to those discussed in the previous section and therefore are not repeated here.



(a) (b)

Figure 8.3a. Camera magnet attached to partially drawn frame. **8.3b.** Audio record and playback magnet.

8.2.3 Ownership

One of the findings in the fieldwork demonstrated the ways that refrigerators are used collaboratively in households. Yet it is often the case that areas of the refrigerator are understood to be the domain of one person, for example, the way that personalised magnets are used to convey to others who has posted an item on the refrigerator, who needs to attend to it, or who is accountable for taking action on something.

Digital technology points toward new and interesting ways that people might personalise or claim ownership over magnets and the materials they are attached to. As display technologies become cheaper and more ubiquitous, one can envision that magnets might incorporate small display screens. This means they could be capable of displaying text, still images or possibly full motion video clips. One could imagine magnets as display screens to which one beams (via Bluetooth, for example) content from camera phone images. This functionality could be used to assign ownership, allowing people to tailor the objects on a refrigerator in a wide variety of ways. Most obviously, someone could beam an image of himself or herself to claim ownership of a magnet and the materials it holds on the refrigerator (Fig. 8.4). Further, it might be useful to remotely send information to the refrigerator magnets, as actions taken with respect to items may happen in other locations. Text messages or voice recordings, as well as pictures, could be sent to a magnet (Fig. 8.4) from a multi-media enabled mobile phone to leave messages related to the items attached to the refrigerator.

Figure 8.4. Magnets that can be individually labelled with text, voice or picture messages using a mobile phone.

In many ways, this is technically the most challenging idea presented in this research. The requirements of the display embedded in the magnet are more demanding than for any of the previous applications because they require a complete image to be rendered, rather than a simple indication of state. This in turn means a bigger, brighter, high-resolution display that will be more costly and will require more power. In addition, the image to be displayed needs to be rendered onto the display which may require a reasonable processing capability, especially as the image may be provided in different formats from a number of different sources (e.g. picture messages from different types of mobile devices). As with the previous example, electronic communication to the device would

have to be provided via Wi-Fi, GPRS or a similar wireless networking technology.

8.2.4 Summary

In summary, the concepts presented above outline an attempt to augment the commonplace refrigerator magnet in intuitive, intelligible ways, ways that could easily fit into a household's ordinary practices. Meant to illustrate how a particular approach to augmentation might be used in designing technology for the home, the aim has been to show the ways in which a model of simple, lightweight design can sometimes be more suitable than an all-encompassing, computationally complex solutions. These proposals, although technologically modest, are designed to perform straightforward tasks, derived from the fieldwork findings, in a simple and direct fashion.

The proposed concepts are also considered to complement each other so that combinations of the lightweight solutions might operate in an integrated way on the refrigerator (and elsewhere). Magnets enabling timed alerts could, for instance, be combined with the camera/frame concept so that alerts to items on the refrigerator might be 'delivered' to household members at designated times. Key to this 'networking' of magnets is that possible combinations are not dictated by the system, but left to emerge based on the wants and needs of a household's members.

Thus, the larger aim has been to demonstrate that a design philosophy of divergence, of less is more, rather than convergence (Buxton, 2001) can lead to a range of practicable solutions for settings like the home. The hope is that by taking into account the notions of intelligibility and to-handedness, this design sensibility encourages the ubiquity of technology in the home because it fits with an existing mindset that households have for using heterogeneous collections of low-tech artefacts to manage their everyday routines.

8.3 Digitally Augmented Bowl

The second half of this chapter concerns the design of a bowl for digital media. Drawing on the fieldwork findings related to clutter, a team from Microsoft Research Cambridge, comprised of Alex Taylor, Shahram Izadi and myself, set about exploring how we might design a way of containing digital content that resembled the way people dealt with their clutter. We took the approach of creating a design sketch which culminated in a *Wizard of Oz* prototype (Fig. 8.5). The sketch illustrates how a bowl's physical properties might be used to enable a simple, lightweight method for casually displaying and containing the media held on devices like digital cameras (still and video), mobile phones, music players, and so on.

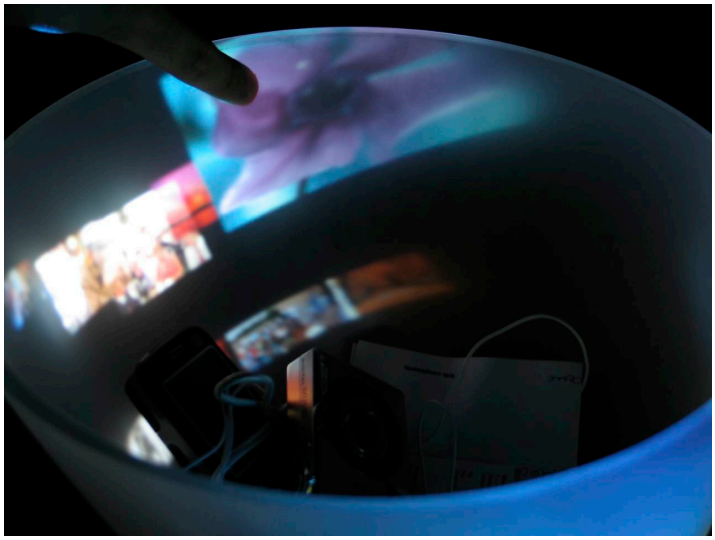


Figure 8.5. Digitally augmented clutter bowl.

Much like the augmented magnets, the features of the augmented bowl were designed to exploit commonsense understandings and everyday uses of containers. The design concept was based around a semitransparent physical bowl capable of holding both digital and physical content (Fig. 8.5). The basic idea is that when devices such as cell phones and digital cameras are placed inside the bowl, their content is copied and displayed on the bowl's sides. As more content is added, existing items fall deeper to the bottom. Similar to the bowls in the fieldwork, the augmented bowl was designed as a temporary

holding place where digital content can be casually added and viewed, and loosely arranged.

The next four sections describe in some detail the reasons we pursued this design for the bowl, and presents the design choices in terms of the fieldwork in Chapter 6.

8.3.1 Beyond the PC

One of the particularly salient findings from the fieldwork on clutter was that household members, in their day-to-day routines, often devise simple, easy-to-use techniques for managing their physical 'stuff'. It would appear that often in daily life, people want easy-to-hand places to put things that casually and informally organise their stuff. A key feature to these places is that they require minimal effort to use, requiring little engagement.

In contrast, consider the PC. The PC provides the necessary hardware and software to perform a host of functions on diverse media formats such as digital photos, video, music and so on. However, this PC-centric model of handling digital media contrasts with the minimal effort practices and casual storage afforded by bowls and drawers. As presented in the fieldwork, bowls and drawers function as a lightweight method for holding content, one that is readily adopted in the home. They store and loosely organise as a natural consequence of placing objects within them, and therein lies their appeal; very little if any effort is required for bowls to work in an intelligible way. Indeed, it is the limited rather than abundant number of features that make it compelling (Norman, 1998).

The PC's ability to perform a range of activities related to storage, organisation *and* manipulation demands a level of complexity that makes it unwieldy and thus difficult to incorporate into everyday routines. Because of this complexity, no casual way exists to simply contain or store digital media—there is no equivalent to an object simply placed in a bowl or drawer and minimally organised by its size and when it was placed there. There is an in-built formality to both containing (or 'uploading') content and organising it on the PC that is manifestly different to physical containers. Consequently, the PC

is better suited to the more formal storage and organisation of content that requires highly focused interaction, the sorts of activities that are put off in the family home in daily life for when one has 'more time'. Thus, a goal with the design of the digital bowl was to explore how we might allow for the casual, easy containment of digital media, one that didn't require putting off until one had enough time.

8.3.2 Containment

In the mock-ups of the bowl design, a primary motivation was to support the minimal effort qualities of clutter containers. Our goal was that the simple act of placing a device in the bowl would accomplish the containment of digital as well as physical media. By preserving the familiar, physical properties of a bowl, the hope was to retain the semblance of intelligible and lightweight interactions. The limited features were chosen to emulate the informal and casual ways that clutter containers are used. For example, the image thumbnails displayed in the bowl might be moved simply by moving the associated device in the bowl, or alternatively, by interacting with the thumbnails directly. Moreover, the projected thumbnails would be 'stretched' as they were moved from the rounded bottom of the bowl to its relatively flat sides . This 'stretching' was seen to exaggerate the effect that would be obtained by moving a projected image from a tightly curved to flat surface: a visible and intelligible property of the bowl's physical form.

8.3.3 Storage

As suggested, it is the simplicity of use and to-handedness that promote bowls as particular sorts of storage receptacles. In contrast to the PC, items can be literally tossed into physical containers such as bowls and drawers with minimal expectation of order. As seen in the fieldwork, this minimal organisation of household stuff into containers is routinely bound up with where it is allowed to coalesce and how it interleaves with a household's comings and goings. The aim of the bowl concept was to build on this by designing the bowl to operate

as a standalone container, with family members having the choice to place them in different locations.

Contemplating the individual storage capabilities of these augmented bowls, it is evident that the size of the bowl clearly restricts the extent to which media can be organised. The point in exploring the bowl as a digital media container, however, has been precisely to limit the organising capabilities of the receptacle. Our goal in doing so has been to explore a just-good-enough solution for loosely storing grouped items, as opposed to assuming that increasing the storage capacity is automatically preferable.

The design took this principle into account in a number of ways. For example, media were designed to be obscured as more items were added. Rather than a limitation, this is seen to be an intelligible feature: as with a conventional bowl, as items are placed in it, other content is obscured. Also, to view lower lying items, the top layers had to be sifted through, moved apart or removed. In terms of detaching media from its associated device, an attempt was made to maintain the idea of layering that was referred to in the fieldwork, where newer items remain atop a bowl's content and older items end up constituting a container's sediment over time. In general, properties such as fullness, layering, and loose temporal ordering were explored to see how they might be supported by a digital container.

8.3.4 Surface ecologies

Arguably, other augmented surfaces, such as tabletops and walls, offer a technically more feasible solution to the problem of digital media containment and storage. The problems involved in projecting onto and detecting interactions with tabletops and walls has been subject to extensive research and to some extent solved. What is clear, however, is that tables and walls do not lend themselves to the same types of containment and storage functions afforded by bowls and drawers. This point is best illustrated by example. Consider how horizontal surfaces such as tables play into the patterns of home life. Tables are ideally suited to the display and organisation of materials, particularly with collaborative activities; the physical nature of the table lends

itself to having content spread over it and people arranged around it for the purposes of sorting, organising, viewing, playing, eating and so on. Usage is thus driven by bounded activities, something all the more pertinent in the family home where table-use is regulated by a household's daily rhythms and negotiated by family members. Any containment afforded by tables is consequently constrained by who and what has overall rights to the table. The table has a social as well as physical character in the home that means any storage is time limited and bound by an established social order.

Bowls, in contrast, serve a very different function. As suggested in the earlier empirical chapter, one of the reasons why clutter bowls and drawers exist in the home is to keep disorder at bay, to contain and store it, and often to keep it out of sight. Tables and walls place clutter on show, revealing our house's disorder to others and as well as acting as a reminder of our own untidiness. As Olivia demonstrates in placing her bottles of ointment out of sight, the-need-to-put-away can be a moral imperative. A sensitivity to the actions and activities afforded by tabletops, walls, containers and the like gives an indication of how bowls might operate within the larger environment. In essence, bowls can be seen to be part of a wider ecology of surfaces in the home. This notion of surface ecologies—of different surfaces working together and sometimes competing—stands in contrast to the multi-purpose solution of the PC, where effort is focused on centralising virtually all operations. Thus, the presented sketch is conceived as something that should be used only under certain conditions, with a constrained range of operations working in concert with the surroundings— both physical and social. That is it was intentionally designed to be part of a wider ecology.

8.4 Beyond Clutter

Above, I have explained some of the reasons for designing an augmented bowl, and hopefully shown how some of the motivations for the design were inspired by the fieldwork. This design exercise neared the end of the empirical research contributing to this PhD, leaving me with some time to reflect on the relevance it in fact had for design. Both the augmented magnet and bowl projects seemed

to me, in these latter stages of my research, to be very literal translations of the fieldwork I had undertaken. They were very functional interpretations, loosing in many ways what felt like the fieldwork's primary contribution—that is, the rich description of families' daily routines and what I have termed the moral ordering of home life. Indeed, the designs felt unnervingly like the kinds of technologies that had motivated me to begin the PhD in the first place. Yes, they had been informed by real-world studies of home life and the observed practicalities of organising things around the home. But they, at the same time, failed to capture the subtleties and nuances of what the homes I studied seemed to be about.

The two sections that follow were my attempt to address this concern subsequent to the design of the augmented bowl (Swan et al., 2008). Because, as mentioned, the clutter research was the last of my empirical studies, I chose to return to these empirical materials and reflect on what I had observed and in a more elemental way the findings might have some bearing on design. First, I have used the studies of clutter to develop a line of thinking around the socio-material making of places. The emphasis here has been to reassert the importance of how things are arranged and organised in the production of places, places like homes. Second, I build on some of the recent ideas of ambiguity discussed in HCI and suggest that technology design, especially in places like the home, should accommodate for uncertainty.

8.4.1 Making Place

In recent years, several projects have sought to address the fluid and sometimes idiosyncratic ways in which people classify their electronic data. Xerox PARC's *Placeless Documents* project (Dourish et al., 2000), for instance, explored various mechanisms allowing users to categorise their electronic content based on those 'active properties' relevant to the user, rather than the rigid and sometimes arbitrary structures enforced by file-folder hierarchies. Using the Placeless system, documents could become entities with multiple classifications. They could exist and be grouped together in different ways, an

approach which did away with some of the limitations of the physical world, which was the basis of the file-folder metaphor.

The developments made in the Placeless Documents project, and the progress in data indexing and computer performance, have contributed to research and commercial projects that do away with a need for manual classification altogether, at least in principle. Dumais et al's *Stuff I've Seen*s (Dumais et al., 2003) system offers an almost real-time indexing of anything viewed by a user, enabling content to be retrieved using a single interface; the computer's file-folder hierarchies are made redundant. E-mails, calendar events, Web sites, word processing documents, spreadsheets and so on can all be searched by entering a search string into a single field. In this way, all documents are treated equally, all seemingly placeless.

Solutions like the Placeless Documents system and Stuff I've Seen have been designed for the personal computer (PC) and in this case we can imagine numerous benefits over the limitations of traditional desktop computing. The trouble arises, though, as we move to distribute computing, embedding it into our physical environments and around our homes in everyday appliances. Using the fieldwork in Chapter 6 as a basis, I want to suggest that by configuring classifications, at least in a social/material realm, people are in fact producing place. Place—and more especially people's understanding of it—is a by-product of how people group things in the world, including things that fall betwixt and between. Particularly relevant in the domestic realm, the ways of classifying things are integral to what homes look and feel like, and how they become special to people. For design, this is of interest because it combines the processes of classification and people's shared and negotiated *ideas* of place. In contrast to the premise of organising around placeless documents, it would seem that in the physical world, classification and place are irrevocably bound.

When designing for computing beyond the PC then, it may not be helpful to dissociate the judgements and decisions we make to classify and categorise things. In the home at least, it seems we should be wary of embracing technological visions that promise complete classification for us, or no classification at all. Electronic sensors and tags that inform us where things go, and even where things are, are technologies to be designed with sensitivity

and judgement. Similarly, we must be careful of how space is oriented to. Having information stored in one central place, displayed throughout the home, and smartly following us from room to room begins to disassemble the choices we have made in where to put things. As suggested in chapter 6, it is these kinds of classification practices that constitute what it is to make a home, and to which we give such importance in doing ourselves. After all, we go to some trouble to choose sites for prompting and reminding, as well as sites for forgetting.

The broad lesson to be taken from this first point is that if, as suggested, people's processes of classification are integral to producing their ideas of home, we should be looking not to do away with the possibility of place in our digital solutions. Instead, we should be investigating how we might more easily assign our digital, usually disembodied, content to specific sites—to drawers, bowls and all the other places we give over to material things. We should be considering how we might instead give the digital physical attributes so that it can be grouped, displayed, hidden and so on in our material homes.

8.4.2 Places for Uncertainty

Bowker and Star, in their book *Sorting Things Out.* (2002), have mirrored much of Douglas' and consequently Durkheim's foundational work on classification. Examining organisational practices, particularly medical, they discuss what they call 'technologies of classification'. They suggest that classification schemes, by their nature, are made up of the inexorable layering of structures—structures that are material, technological, informational, organisational, social, political and so on—and that these structures continually fold back on themselves to sustain their old relations and also create new ones in their own image. A primary lesson they draw out of their field materials is that unorthodox, 'dirty' solutions are sometimes necessary in organisational life because they disrupt assumed conventions. They suggest that the structures we inhabit are, at times, organisationally, socially and morally counterproductive and that we must build for "open spaces" that enable the emergence of alternative classification schemes.

In spite of using quite a different language and subject matter, there are parallels with this line of reasoning to the points outlined in this thesis: in materially ordering things, we unavoidably order ourselves and our systems of classification in the home keep sacred a certain idea of order (whether you call it informational, organisational, social, political or all of the above). Using Bowker and Star's terminology, the domestic 'structures' are self-sustaining through our 'powerful technologies' of classification.

Crucial to this is our mechanisms for allowing things to remain loosely classified. Allowing loose classifications in chosen drawers and bowls means that we have mechanisms to keep our social structures intact. Piles of clutter de-mark the boundaries between structured and unstructured, ordered and disordered, even the sacred and profane. Key here, though, is that these 'open spaces'—ones we have referred to as liminal—provide a measured tolerance to disorder. They give leeway to what Bowker and Star see as the forces of conformity. This then is a form of 'the dirty solution': clutter bowls and junk drawers supply systems of counter-classification in action. Moreover, we find this practice, no matter how immersed in the social and moral, inexorably tied to the material.

The value these points have for design are in raising questions around how we enable such leeway in technology and how we provide material space for uncertainty and nonconformity. Work from London's Royal College of Art (RCA) has addressed this particular question in their ideas around *designing for ambiguity* and specifically, *ambiguity of context*. (Gaver et al., 2003). Gaver and his colleagues on the UK-based *Equator* project put forward a case for design that disturbs our commonsense assumptions about things and how we neatly compartmentalise them. Writing about the ambiguity of context, they use examples from recent artistic movements (i.e., Dadaism) to reveal how the placement of objects in unexpected and sometimes unsettling contexts can disturb our ordinary preconceptions and provoke new ways of thinking. Ambiguity is thus one way in which we might think of designing technologies to test out and revitalise old schemes of classification. Through ambiguity, the sites where we materialise the digital, might also hint at or blatantly exhibit the

possibilities of fracture, of things being out of place—just as I have argued containers like clutter bowls and junk drawers can do.

Clutter bowls and junk drawers might also inform other design possibilities. For example, we know that a balance is continuously being struck between order and disorder at particular sites. Clutter drawers and bowls, as solutions for destabilising known classifications, allow for a movement between states. This juxtaposition is in part what gives rise to the possibility of things moving between categories—how an object can move from questionable to sentimental value, or *vice versa*, merely by its physical placement. Similarly, this transformative power is enabled by giving things time to sit out of sight. Thus we have material sites where things of different or uncertain classification rub up against each other and are unstable as a result. In addition, these sites can allow for things to sit in waiting, concealed, and of little or no immediate interest. Like ambiguity, these ideas of *instability*, *concealment* and *disinterest* are things we do not ordinarily think about in designing computers. Indeed, they seem antithetical to the design of PCs and have little traction in projects of ubiquitous or pervasive computing, which are more commonly concerned with consistency, visibility and engagement.

Clutter containers are often situated to facilitate minimal effort and thought on a family's part which is a key feature. Things go into entranceway bowls and kitchen drawers because that is where clutter amasses. The classification scheme that bowls and drawers afford is not one of formal structure, but something more casual and less purposeful. This is not to suggest that household members give no thought whatsoever to where and how these containers are situated—rather, that such apparently mundane choices are part of the making of a home. We see that bowls, drawers and other receptacles are immediately useful in a home because they help family members achieve, in an offhand, lightweight manner, some semblance of order. This could be considered as another starting point for design; i.e. how could we design technology to be treated in a casual, indifferent fashion? The possibility of building technologies for ambiguity, instability, concealment, and disinterest, and to be treated casually, provides a position from which to re-think design for homes in a way that is hopefully more true to how they are lived in.

8.4.3 Summary

Section 8.3 focused on a practical solution to the management of digital media. Informed by the fieldwork presented in chapter 6, the augmented bowl was an attempt to replicate in the digital domain some of the casual ways households organise their things. Central was the idea that there are times and, critically, places where loose and informal systems for categorisation are needed. This section develops this line of thinking, with the aim of drawing out some broader implications from the insights into households' clutter. As mentioned previously, the motivation here was to reflect on how the apparent persistence of clutter in people's homes and their efforts to manage it have implications that go beyond the merely functional. Thus the aim was to consider whether there were broader lessons that could be drawn from the fieldwork, lessons that took into account the fundamental nature of how families organise themselves socially, as well as materially.

8.5 Conclusions

In conclusion, there are a number of general design concerns that have emerged from the presented work. These are concerns that I found to be consistently apparent in the field materials and that also emerged in the design exercises presented above. The reasons for presenting them here are twofold. First, one aim of this thesis has been to provide some general directions for the design of domestic information technology within HCI and HCI-related fields and hopefully the following concerns will offer a small but concrete step towards achieving this. A second aim is to illustrate how the fieldwork findings might go beyond informing the design of a set of augmented magnets or a digitally augmented bowl, as a means of demonstrating that they also have some general applicability.

8.5.1 Design Concerns

In conclusion, then, the following is a set of general design concerns informed from the preceding fieldwork and design exercises. For clarity's sake, they are listed here under eight categories. The first four categories are somewhat broad-ranging, concerned with issues that have been given, in some cases, considerable thought within HCI; the second four are more specifically oriented around the fieldwork presented in this thesis. Several are related and have overlapping aspects, but the loose categories are meant to give a sense of the motivations of my thinking around design in this thesis. They are as follows:

1. Lightweight, appliance-like design

Many of the fieldwork findings suggest a design approach based around lightweight and simple artefacts and interfaces, as opposed to all-encompassing or computationally complex devices. There is a history within technology-led design to pursue computationally complex solutions, presumably because doing so is seen as a way to exhibit technical expertise; the approach to designing PC operating systems is a case in point. The observations from the fieldwork illustrate that households are able to achieve effective functionality using simple, hand crafted solutions. As discussed below, the key appears to be in how household members combine or assemble these bespoke solutions.

2. Material Instruction

Related to the previous point, the findings suggests a design ethos that exploits the material properties of a socially situated artefact or interface. In the previous chapters, the households employed and created various methods for organising and managing home life. Often, these methods made use of the 'instructions' inherent in the materials used – that is, the physical properties and arrangement of the materials in the homes 'instructed' the 'user' as to their use. This of course is related to concepts of affordances outlined by Norman (1998) and oft invoked within HCI. However, the fieldwork shows how it is not

only the artefact's design that can be instructive (or hold affordances), it is also how materials are situated and arranged in social contexts.

3. Adaptation and appropriation

Virtually all the examples of management and organising activities reported in the fieldwork reveal the interest household members have in adapting and appropriating artefacts to their own ends. Things ranging from the backs of envelopes to fridge magnets and bowls were enlisted in creative and often idiosyncratic ways to plan activities and arrange materials intelligibly. This suggests information technology for the home might be purposefully designed for adaption and appropriation and that the design of information technology might afford a degree of flexibility or versatility in its application, enabling it to be re-purposed in ad-hoc ways.

4. Ecologies of appliances/artefacts

Another feature of the reported organising and management activities was the rich and varied ways households made use the particular properties of artefacts. There appeared a sensitivity, albeit implicit, for the range of artefacts households put to use, and when and where they did so. As others have noted (Crabtree, 2003; Buxton, 2001), this suggests the idea of designing for an ecology or society of information appliances that in some way operate in concert. Building on the lightweight, appliance-like approach to design, the value of a technology might emerge through its relationship with other artefacts.

These four concerns have some traction in HCI and, to some extent, have found their way into the lexicon of HCI design principles (for example, see Neustaedter et al., 2007; Chetty et al., 2007; Wakkary and Maestri, 2007). In contrast, the following four sets of concerns are more specific to the reported fieldwork. They emerged through the research introduced at the beginning of this thesis concerning how households socially order themselves in practical but at the same time distinctive ways. Their emphasis is thus on the part

artefacts play in both supporting home organisation *and* the activities that constitute home life.

5. Systems of social organisation

The most significant point here is that the kinds of individual tasks households perform to organise and manage their activities are part of larger systems. That is, individual tasks are bound up with social systems that have broader motives (some of which have little to do with productivity or efficiency). Thus, it is not enough to design technologies that optimise the performance of particular tasks; thought must be given to how technical solutions contribute to the coordination of a home's activities which in turn make up larger assemblages or systems of social organisation.

6. The socio-material

There is a material character to the socially organising systems observed in the fieldwork. Hopefully evident in the previous chapters is how social order is instituted and preserved in an ongoing fashion through the routine use of material things. In Chapter 7, we used the term 'artful systems' to capture the idea that the idiosyncratic and creative use of artefacts in households serves to order homes, socially as well as functionally. A particularly important feature of this in thinking about design, then, is that the material and social organisation of the home are deeply bound up with one another. In effect, the two are inseparable, so the social is configured in the material and *vice versa*. The implication of this for technology design goes beyond point 5, above, by drawing attention to the interplay between the social and material properties of the home. The design frame is unavoidably the socio-material.

7. Home making

Bringing points 5 and 6 together provides a way of thinking about the home as a place that is routinely produced through everyday activities. As seen in the fieldwork, especially in Chapters 6 and 7, the home is a place that is actively constituted—by placing things in certain parts of the home, setting up certain rules around them and so on, the home takes on a distinctive social, even moral

character. These are the ways that homes become the unique places that they are. Technology design should allow for or at least be sensitive to this ongoing making or production of home. There should be an acknowledgement in designing for the domestic setting that technologies have the (moral) values of home and family asserted in and through them.

8. Ideas of home

Finally—and again building to the previous points—there should be a sense from the latter fieldwork chapters that the socio-material organisation of home life is not merely an unintended consequence of putting things here or there, and instituting particular systems. Households also suggest an aspirational quality in some of their ways of organising. Calendars, family books, photos on fridges, and the sorting of clutter involve an idea, and often a wished-for ideal, of what a home might be. Technologies, then, might be designed to enable this hoped-for idea of home. This is not to say this should be technologies' sole purpose, rather that they might in some cases be designed to recognise that the product of organising the home and putting things in place is to embody what could be.

9. Conclusion

9.1 Introduction

This final chapter addresses how this thesis has contributed to the larger body of research within HCI and CSCW. It briefly discusses the original motivations and how these related to the subsequent contributions of this research. The section after that concerns some of the challenges faced in undertaking the fieldwork, analysis and write up of the thesis, as well as a discussion of what I would have done differently. The third section describes some areas related to this research that I would find particularly interesting as topics for future research and the final section is a brief conclusion.

9.2 Contributions

To recap then, one of the main goals of this thesis was to draw attention to the home as a place of study for informing novel information technology. Prior to 2004, the home as a site for research was relatively understudied compared to other topics in the HCI/CSCW canon, and what there was tended to be of the techno-centric smart home variety. As this technology-led vision didn't ring true to me based on my own observations and experiences of family life, I was interested in exploring other ways of representing the home.

I was also interested in whether the considerable effort expended on organising and maintaining family lives had ramifications for the design of novel technology. By focusing on a selection of domestic artefacts, I hoped to uncover the embodied practices that gave these items significance beyond their functional capacity. In addition to this, I was interested in uncovering the ways the mundane behaviours and household routines contributed to the overall sense of what makes homes special to the people who live in them.

Therefore, based on these initial goals, a primary contribution of this thesis was the examination of the home in detail and in particular, drawing

attention to taken for granted routines in the home and the patterns and behaviours of family life. By focusing on the mundane and unremarkable, things like lists and household clutter, the broad result was to uncover the artfulness of a home's inhabitants, and the small but often ingenious arrangements and solutions that household members devise to get on with their daily life. Individually, the preceding empirical chapters (chapters 4 to 7 inclusive) formed the foundation for a series of studies on the home that have been presented in a variety of conferences and publications (Swan et al., 2008; Taylor and Swan, 2004; Swan and Taylor, 2005;Taylor and Swan, 2005; Swan and Taylor, 2004; Taylor et al., 2006; Swan et al., 2007; Taylor et al., 2007; Swan et al; 2006). As a whole, however, the thesis is intended to synthesise and draw together the disparate themes and outcomes of the individual studies as a means of developing a richer picture and fuller understanding of the artful work that goes on in homes, work that is often overlooked.

Based on the above, it seems fair to say this work has achieved, at least in part, the aim of helping to sensitise HCI and CSCW audiences to the work that goes into organising family life. It has helped reveal the role that mundane items ranging from lists and calendars, to fridge doors and clutter play in families' everyday lives, and how practices based around these artefacts offer alternative ways of approaching the design of novel technology.

Another primary goal was to offer some insight into the social organisation of the home. By examining the arrangements and solutions that families conceive to manage everyday life, I have shown that these routines and behaviours work to do more than simply manage the family's daily activities; they also work to make each home particular and unique. In this sense, we see that the home is a done place—that how families manage the organisational aspects of their daily lives contributes to a very particular sense of home. This in turn has implications for the design of novel technology for the home, in that families' artfulness and ingenuity should be taken into account, and if possible, reflected and accommodated, in such design.

Gauging my success in achieving this aim is difficult. However, over the course of my PhD I have had some indication of its influence on people within the HCI and CS community and their ideas of home. An introduction to my

work, given before a talk I had been invited to present, struck me as somewhat bizarre at the time, but in hindsight seems apt. The moderator said "This work shows computer scientists how real people actually live their lives." Besides seeming possibly overstated, having the talk framed in this way seemed unnecessary—surely computer scientists, being people, already understood how people live their lives. However on more than one occasion, audience members have approached me after talks to say things such as "I had no idea that... (putting things like that on fridges, or arranging photographs in that way, etc.) had that role for families." Although somewhat surprising, this sort of reaction has helped to reassure me that this work wasn't blindingly obvious, and that this sort of research, in the particular context of HCI and computer science, did serve a purpose.

An auxiliary result from this thesis has contributed to what could be loosely called the design ethos of 'less is more'—that is, an approach to design aimed at building simple and intuitive forms of information technology. From this perspective, complexity is not thought of as something inherent in the technology, but instead as something the user constructs by assembling an array of simple technologies (Taylor et al., 2007). The less is more ethos parallels arguments by others in HCI, most notably Norman (1988; 1998; 1999) and his ideas on appliance design and Buxton (2001). It also builds on one of the few commercially available internet appliances designed for the home, namely 3Com's Audrey. Although not commercially successful, the Audrey was an interesting foray into rethinking domestic technology design. Thus, although not precisely appliances, the design of both the augmented magnets and the bowl were informed by a less is more perspective and were conceived of in the spirit of the appliance design aesthetic. They also shaped much of the design work that came out of the Socio-Digital Systems group in Microsoft Research between 2004-2009 (Taylor et al. 2007).

*9.3 **Challenges Faced** (Or What I Would Have Done Differently)*

Although my overall sense is that this work has contributed to HCI, some of the most difficult aspects of this thesis involved design. A major difficulty lay in translating the ethnographic detail into concrete design recommendations and then trying to realise those designs. This of course is a well-documented issue within HCI and CSCW and has been discussed at length in the literature for several years (Dourish, 2006; Randall et al., 2007). The fact that it is well documented did not, however, make it easier to avoid or overcome, although it was somewhat comforting to know it was not a problem unique to the work presented.

Being partial to fieldwork and ethnography, initially I was happy to focus on the qualitative research and leave designing to designers. However, due to various circumstances, this was not an option. Attempting to produce designs based on the ethnographic findings was a very eye-opening, as well as humbling, experience. It also brought home to me the gulf that can exist in HCI between research and design; prior to this experience, I had been happily ensconced on my side of the shore, and the gulf didn't appear quite so wide nor so problematic. Wading into it was another matter altogether. A selection of some of the more difficult aspects follows.

As discussed at length in the previous chapter, I found the issue of how literal the designs should be in relation to the fieldwork probably the most challenging. In particular, I found the whole concept of the interpretation of the data, that is, how the findings from the data are used to inform the design, to be extremely problematic. In hindsight, I believe this was in part because the whole notion of interpretation is so difficult to specify. This belies my training during my masters degree, which was based on trying to create an engineering conception of HCI informed by cognitive psychology. On the one hand, it was easy to see how the designs could have had a completely literal mapping; i.e. we could have taken exactly what we saw in the fieldwork and attempted to reproduce it using digital technology. This might have been well received by HCI researchers concerned primarily with evidence to validate why certain design choices were made. For us, however, it was a deeply unsatisfying

solution, far too close to the smart home paradigm and lacking in imagination or creative spark.

Another pitfall, related to the above, was to try to translate the findings too literally, for example, to simply augment the various analogue artefacts that were being studied. This was closer to what we did do, and one could make the case that this was one of the failings of the augmented bowl. In some ways, our choice was too constrained by the physical properties of existing bowls; that is, in theory, we could have used the intangibility of digital technology to experiment with other conceptions or form factors. For example, we might have tried to expand on the idea of a bowl, or used it as a jumping off point for a different form factor.

A different approach to the design would have been to be less constrained by the findings, and more creative in our interpretation of them. This would have been a harder case to make for an HCI audience, as design choices based on loose interpretations are more difficult to defend and justify. Perhaps more importantly, this would have required a different mind set and set of skills than we had available amongst us, in that none of us were designers by training, nor were we in the habit of thinking that way. This experience made me think about the issue of design within HCI, how it gets done and by whom. These questions around design continue to intrigue me, and have spurred further research which has led to a post doctoral fellowship within the Design Interactions Department at the Royal College of Art. This position has involved being embedded within the department for the past two years, observing how design gets done in this particular environment. Although this department is known for its unorthodox approach to interaction design, there are various aspects of its design practice which are held in common with other design departments. The circuitous approach and tangential nature of the students in the department, and the variety of different processes used have been of particular interest to me (Swan et al., 2010).

If I were to redo this doctorate, there are several things I would do differently. The first would be to be less avowedly against the smart home. Although it was useful as a foil to react against, I came to realise over time that this was too simplistic, and that there were aspects of the smart home

paradigm which deserved more consideration. Introducing novel technology into any setting is a complex negotiation, and whilst there were several aspects of the smart home paradigm worth questioning, this did not demand the wholesale rejection of the concept in its entirety.

Also, I can see in hindsight that having a range of different types of families might have made for richer research. Although, as explained in the methods section, there was a rationale for the choice of families, it would have been fascinating to have studied a more diverse grouping. Including more non-traditional family groups would have been interesting, as would have studying males who were running households. The narrow focus on managing and organising the home could have been broadened, which in turn would have yielded possibly richer or different research results.

A final difference would have been to experiment with a more interventionist stance in my research approach, which parallels some of the work undertaken at the Royal College of Art and Goldsmith's, amongst others (Gaver et al., 1999; Dunne, 2006). This approach offers the opportunity to have a more direct impact on the empirical fieldwork, as well as allowing the designer/researcher to investigate more specific questions than simply how people react to particular artefacts. Work such as Dunne and Raby's speculations on how it might be to live with robots (2009) and ways we might work to change ourselves to accommodate technologies (2010) are examples of interesting ways this approach has been used.

I did in fact experiment with further studies of the home using design interventions. After the research in this thesis was complete, I carried on for a period with the empirical fieldwork in family homes, specifically looking into how families display photos in the home (see Swan & Taylor, 2008; Taylor et al., 2007; Durant et al., 2008). This research was not included in this thesis for two reasons. The first was due to practical considerations, in that the size of the thesis threatened to go beyond a reasonable length. Perhaps more importantly though, the research was not included because the fieldwork and its subsequent develop took a markedly different approach. Instead of using the analysis to inform design recommendations and potential prototypes, we used the fieldwork to inform a series of design interventions, which we then used for

further fieldwork. This of course of which a brief description follows. To have adopted this orientation at the onset of this research would have made for a very different thesis, but arguably an interesting one.

9.4 Areas for Future Research

The subject of studies of the home is a rich one, and the research detailed in this thesis is by no means an exhaustive nor comprehensive coverage of the myriad topics of that area. Indeed, if anything, the research in this thesis might be thought of as barely scratching the surface, more offering glimpses of this rich arena than being all encompassing. There is a variety of further research could be explored using this thesis as a starting point. The following are a few possibilities that I find particularly interesting. Although not necessarily linear continuations to the research in this thesis, I include them because the topics exhibit certain related parallels, such as how the organisation of mundane tasks and activities is achieved and how this sort of family organisation contributes to the making of a home, and how everyday activities work to reinforce family's particular moral orders, which I consider to be in keeping with the spirit of this thesis.

One area I find particularly promising is how internet usage, and specifically search engines, has changed the landscape of mundane behaviours in the home. It would seem that domestic information retrieval, that is, looking up small pieces of mundane information, such as how late is the chemist open and what the address of a particular restaurant is, has been radically transformed by the internet and search engines.[7] This is one area where it appears that the expectations surrounding a technological configuration have lived up to, and even exceeded, their promise. Rather than simply replacing the yellow pages, search engines have added countless layers to the activity of tracking down mundane information. Using the example of searching for a restaurant, whereas in the past one might have used the yellow pages to look up a phone number and possibly an address, with a search engine

[7] Although I use the term search engines, the majority of these possibilities were brought about by the ascendancy of Google, which was still in its nascency in 2004.

and the internet, one can still look up the phone number and address, but also interactive maps, detailed personalised directions, photographs of the location and its surroundings, reviews of the said restaurant by both professional food critics and 'citizen' diners, and even get the financial status of the establishment. One can also find other restaurants like it, or in the vicinity, as well as lists of other activities and venues nearby. The point is, information retrieval in the home, as elsewhere, has radically changed in the past five years, and it would be interesting to examine the social and organisational implications of this.

Another aspect of home life I am interested in is hobbies, and how the introduction of new technology and behaviours are changing how they are practised by families. Bird watching is a particularly cogent example. Bird feeders, bird tables, birdbaths and bird boxes or some combination thereof are not uncommon fixtures in family gardens. Relatively new, however, are the miniature surveillance systems that can now be bought in bird boxes and birdfeeders, engineered specifically to watch the secret lives of birds. In spite of having read about these systems in the technology press (e.g. http://www.gardenature.co.uk/), I was nonetheless surprised when the mother of one my daughter's friends proudly showed me theirs. She was quite enthusiastic about it, and felt it gave her two daughters a much more intimate understanding of birds and their life-cycles, which no doubt it does. She described how exciting it had been to see baby birds being born, and that on more than one occasion, the family had sat enthralled for some period of time, watching the baby birds being fed via webcam. The mother didn't seem to find the introduction of a webcam into a bird nest to be at all disconcerting; on the contrary, she felt it reinforced the family's connection to nature. I find the idea of information technology enhancing a sense of the natural quite intriguing and slightly problematic; I also think it's an interesting example of the fine line between 'watching' and 'spying', and allows yet another perspective on some of the uneasy tensions in the relationship we have to nature.

A related area is that of pet surveillance. At first glance, it would appear to have similar problematic issues, and yet I don't feel the same sense of misgiving about this topic. Indeed, I'm terribly interested in knowing what my

dog gets up to all day. Why I find this acceptable, whilst thinking it slightly intrusive to see baby birds being born and fed, is intriguing to me. This topic seems related to technology in domestic settings because family pets are important components of family units. Studying their behaviours using surveillance technology would be a fascinating means of uncovering some of the relationships and roles that pets play in families, as well as exploring the shifting nuances of my own ethical responses.

A final area that would be interesting to explore is how the rise of social networking has affected family organisational practices and dynamics, particularly with regards to relationships between teenagers (and pre-adolescents) and their parents. Social networking via information technology was in its very early stages in 2004. Sites such as Friendster existed but there was nothing approaching the scale or impact of Facebook at that point. Again, similar to the search engine example above, the ascendancy of the particular phenomena appears to have crystallised around a particular application, in this case Facebook. It is difficult to say whether this is due to an inherent quality of the application versus it being the right point in time. Doubtless it is a combination of factors, but in any case, Facebook and other social networking sites have become embedded features in family homes. Several mothers I know make a habit of logging into their teenager's Facebook account, with and without the teenagers' knowledge. These practices raise the obvious issues around privacy and surveillance, but also more interesting issues around how parenting gets accomplished via digital mediums. The proliferation of parents with Facebook accounts is another interesting aspect, in that it allows for a potentially uncomfortable overlapping of social and familial spheres. It would be interesting to study the organisational and social ramifications of this, and see how or whether this affects family dynamics.

9.5 Conclusion

In summary, I began this work at a period when the home was relatively understudied and underrepresented in the HCI and CSCW canon. Studies of home life and domestic settings have now branched out in all sorts of ways,

encompassing a wide variety of approaches and topics, ranging from Woodruff et al.'s study of Sabbath Day Home Automation (Woodruff et al., 2007) to Bell and Dourish's studies of sheds (2007). In comparison, the research that comprises this thesis appears relatively mainstream, in that the families it examines are not particularly extraordinary, and the way they organise their domestic lives are not especially unusual. In spite of this, it would appear that this work has played a part in what now feels like a well established direction of research within HCI and CSCW, that is, the management and organisation of home life (if only judging by the number of citations the work on artful systems has received in the past five years) and I feel fortunate to have been able to contribute.

Finally, given the fact that my own experience as a carer in the home inspired the undertaking of this research, it seems fitting to conclude with some of the ways in which this research has influenced that part of my life. To quote Ruth Cowan Schwartz, housework's seminal scholar (1983):

> As art mirrors life, so does scholarship, and a thoughtful scholar opens his or her life to the insights of scholarship. I am a scholar who has studied the history of housework, and also a working mother and housewife who lives in the suburbs and has three children. People frequently ask me- indeed I have frequently asked myself- how my experiences as a housewife have shaped my research, and, conversely, how my research has shaped my experience as a housewife. I think that these are important questions, deserving of an answer, because they are but special cases of the more general question, Can the study of history teach us how to live better?

In this particular context, perhaps a better question might be, "Can the study of people's behaviours teach us to how to live better?" In my own case, I can offer a resounding yes, if only by replication. In keeping with the theory that imitation is the sincerest form of flattery, I find myself drawing directly upon many of the techniques and organisational methods that my participants displayed. In several cases, I have built upon some of the systems that were described to me during the course of the research, and have tailored them in bespoke ways to meet my individual needs. For example, one of the mothers in the fieldwork on lists was particularly pleased at having devised a way to re-use

her old Christmas cards. She used them to write grocery lists, and consequently whilst shopping in the supermarket, she would find herself, in amongst the vegetables and fruit, thinking about people that she used to see regularly but now heard from only on an annual basis at Christmas. Building on this, my artful approach to list making has been to recycle the endless reams of paper generated during the creation of this thesis, as well as print-outs from other research papers that I am either writing, reviewing, or have read but no longer feel the need to keep. Ripping the A4 pages in half, I then staple them to create neat little stacks of scrap paper, which I encourage my whole family to use. Thus maths problems are worked out on them, notes for various people are left on them, and of course, lists are composed on them. I realise I could easily buy notepads for this purpose, and simply recycle the unwanted paper, but that wouldn't be nearly as satisfying. Instead, my 'system' saves me (a nominal amount of) money, reduces guilt about the impact on the environment of printing out rough drafts, and gives me the opportunity to flip over a list and re-read (or not) parts of old papers whilst sitting on the bus. And thanks to this thesis, I can now identify that the sense of gratification that this system gives me is connected to a larger human instinct, that is, the desire to artfully craft idiosyncratic solutions to fit one's own personal needs.

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Appendix 1 - Field Note Extracts

This appendix consists of some of my typed up notes and transcripts, collected over the course of my field research. I have included these data to situate the materials I present in chapters 4-7 in the broader context of my fieldwork. Thus, excerpts from the notes and transcripts will be found in the thesis, but included below will be additional detail.

List Making – Moral Orders

(See chapter 4)

On close inspection, it would seem that what lists provide is a way for mothers to negotiate a complex and often competing litany of demands. For mothers, the running of the home is achieved through the careful orchestration of the fragmented worlds of family members, activities, events, household chores, etc. Lists offer a means of marshalling these people and things so that they can 'neatly' operate within the established order of the home.

A serious hurdle to what is ostensibly the organisational component of mothers' work is the divide between the demands of childcare and the myriad of other activities that make up domestic life. What is sometimes overlooked, or possibly unapparent to non-parents, is that children do not fully understand the social rules that govern ordinary behaviour and/or are not altogether willing to conform to the established social order of home (and adult) life. Thus, there is sometimes an element of chaos that can make the accomplishment of routine tasks and activities a serious challenge. For example, most mothers will think twice about a grocery-shopping trip with a two year old who is near to either a nap or meal time. In this context, lists act as a repository, a means of catching and fielding the various bits and pieces of information that go into the running of the home. They also function as markers, bridging the divide between the 'outside', adult world and the chaotic world of children. This subtle but crucial role of the list and its relationship with the arrangements of home life is what we now turn to.

Form and Content of Lists

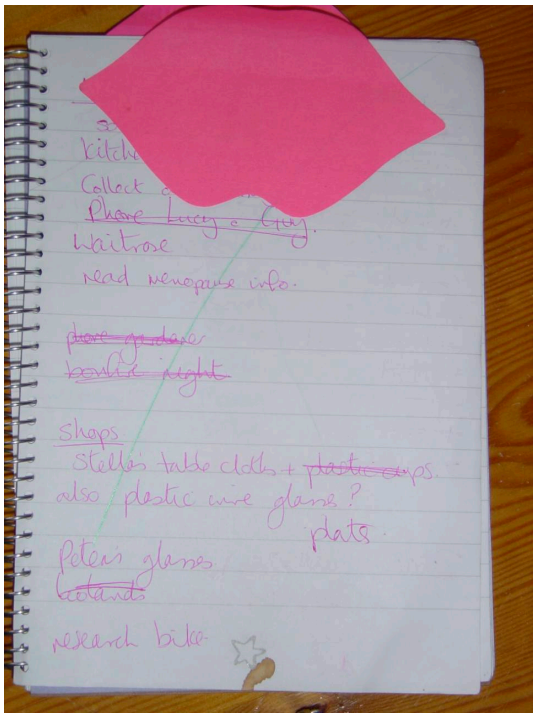
Anya (six months pregnant and the mother of a son of 4 and daughter of 2) has several legal pads and a diary, which she places strategically within her home, forcing her to walk by them several times a day depending on her activity, to act as constant reminders. Carrie (with a son of 1 and daughter of 4), on the other hand, rarely uses paper and instead relies on calling her home phone from her mobile (cell) phone and leaving herself messages on the answering machine. Kate (eight months pregnant and the mother of two daughters, 2 and 5), scribbles notes down on to the backs of envelopes, which she explains invariably disappear. She finds the act of making lists, however, helps her remember what needs to be done.

As for the content of lists, the ways in which items are recorded and arranged can appear, at first sight, muddled. We find, for instance, that household chores are clumped together with doctor's addresses, reminders for husbands, phone numbers, shopping lists, and arrangements for children's birthday parties. Indeed, it appears to be one big collection of miscellany. There can be method to this apparent disorder however. To examine this further, let us consider the use of notebooks by Amanda, the mother of two girls.

Amanda typically has several notebooks at any given time dedicated to a variety of activities. The determining factors for whether an activity warrants a separate notebook seems to be how much information is being generated on the particular subject. For example, her house is being renovated, and she has a notebook dedicated solely to that project. She also runs the parents association at her daughters' school and is involved in fundraising and has a separate notebook relating to that. However, in the interests of compactness, portability and convenience, she deliberately limits the number of notebooks she has at any one time. Through this use of notebooks, we see a simple means of categorising or dividing up some of the activities which Amanda engages in as a mother, one that relies on the material features of paper and specifically notebooks.

In a page from the notebook Amanda carries with her when she is out and about—her daily, catch-all notebook for jotting things down that come to

mind during the day—there is a mixture of items, beginning with "Sort out summer clothes" and ending with "read menopause info". Apparent from this list is that the categorisation system Amanda uses by having separate notebooks does not apply. Rather than categorising by activity, she uses a chronological means to group items—items get clumped together on the basis of being important for that day or the moment-in-time in which they are written. Through this we catch a glimpse of how the methods employed to categorise items are open to change and are situationally dependent; categories can be produced, if you like, on the fly and to suit the occasion.



Categories and the Moral Order of the Home

In itself, this way in which lists are 'occasioned' for the situation at hand is not news. Numerous other researchers examining systems design have made similar observations. Specific to mothers' work are the ways in which items are divided (either into separate diaries or sometimes into groups within lists) and how this does a special sort of 'reconfiguration work' through which a morally

implicative order to home life begins to emerge. In illustration, let us turn to an excerpt taken from a discussion with Anya.

> I tend to have one big page, a column on the left, a column on the right. There's what you might call the kind of financial and administrative stuff, and that's usually the main column, pay x bill, sort out car insurance, the sort of stuff which really matters if you don't do. And then I would probably lower down the page have the kind of 'where are Tom's socks?' I kid you not.

For Anya, we see how the list can be used to classify particular types of tasks and activities. By separating out household finances from mundane chores like finding her son's socks, Anya is quite deliberately carving-up and configuring home life. Dividing the page into columns and rows, she sections out home-work into orderly slices, a broad collection of tasks and activities that get done in the home, grouped and ordered into things that 'really matter' and those less important 'to-be-dones'. The list then serves as a helpful delegation device, configuring home-work and transforming it in to its right and proper order.

Through this prioritisation of listed items, a moral order of the home emerges. From Anya's description we hear that socks get placed lower down on the page than "financial and administrative stuff"—a clear reminder of their status. Anya's last four words in the excerpt above, "I kid you not", do quite a bit to show where things stand in this hierarchy and go some way to explaining why. By using this phrase, Anya confirms that she is well aware of what we all know to be true (i.e., common sense)—that socks come after bills and insurance. The list then, in being used to prioritise work, reaffirms the moral character of the things that need to get done in the home.

The Hidden Work of Mothers

A final line of reasoning that emerges from the argument we have presented is that through employing the organisational systems and methods we have so far discussed (as well as many others), mothers can obscure the complexity of their own work. That is, by rendering the chaotic worlds that revolve around family

life in the form of lists, mothers conceal the considerable undertaking that is needed in the smooth running of the home. To unpack this possibly controversial point, let us take a look at an excerpt from an interview with Kate.

Asked whether her husband transfers the content of her written lists to his PDA, Kate replies:

> No, not really. Often they're quite domestic lists which I have. If I involve him in the list, it's because I'm expecting him to do something, effectively. And which sometimes works quite well, if he's in the mood. Umm, or sometimes it's because I've been asking Nick to do things, certain things, and I've given up and I've decided that I'll have to do them. I mean, on our kitchen table at the moment, there is a humungous list which I wrote when I got bored with cleaning cupboards this morning. I've got a feeling this is going to metamorphose into a bigger list that's got something to do with feeling a baby coming and wanting to make sure that you've done a whole load of filing, paid bills, you know, make sure that everything's up to date and being scared that you'll forget things because I know, if the baby turned up tomorrow, um you know, 90% of my lists would be erased from my brain because I couldn't help it because that's what happens. So you know, thinking actually I need to keep it all down somewhere. It's funny, lists. The world feels better when I have a list, maybe just because I don't have to remember it all but the world feels... the same way the world feels better when the house is tidy and all the toys are in the right place.

What we see in this excerpt is that for Kate, like Anya above, lists are delegated the job of making the world orderly. Kate, of course, is well aware that 'chaos' is an ordinary feature of the home. In composing lists, not only does she make the world feel "better", she tidies up the chaos by putting things in their "right place". However, what she also does is diminish the efforts of her own labor, sanitising the real messiness of her work behind the supposedly 'natural' rhythms of home life. This is apparent not only in the carrying out of her duties but also in the delegation of work to other family members. In talking of how her lists "come out" to alleviate the stress of having so much to arrange, Kate explains that lists also provide a means of communicating the orderliness of the home to her husband:

> Something often gets put onto a list by the end of the weekend cause nothing's got done and I've got stressed about it. And then, eventually, a list comes out. So

> generally speaking, the lists come out when I'm with Nick. It's also a way of communicating to him what needs to be done cause he hasn't got a clue.

Describing how a list can be used to delegate "something", presumably some task or activity, Kate reveals that the list is more than a mere itinerary of what must be done, but also serves as an implicit reminder of who has got to do what. Kate though, in both her excerpts, is doing more than merely describing how lists can be used to assign duties. In her first excerpt, notice how she assigns certain sorts of lists to the "domestic" world and, within the same turn, depicts this world as under her authority. Kate takes possession of lists of the domestic variety and places herself in the position of managing who has access to the tasks and activities they refer to. Similarly, in the second excerpt, but in a more emphatic manner, Kate implies it is she, and not Nick, that has a "clue" on the matters that lists pertain to—on domestic matters.

The point here is not whether Kate is right or wrong in her delegation of domestic-work, nor whether she is right to assign herself as an authority on such matters. What is revealing is that she is quite specifically delegating the right and proper place for this work and that, in this case, it is the list that is mobilised to do this delegation. What is central is that Kate's carving up of the home's activities into manageable lists and her subsequent division of labor to undertake those activities sequentially transform what was once chaos into the taken-for-granted arrangements of the home. By invoking these taken-for-granted arrangements, home life is seen to have always been orderly and, thus, the (mothers') work needed to achieve that order is rendered inconsequential, quite simply invisible.

Embodiment

One of the main points I wish to raise that the work related to the home can be seen as highly embodied and that, by adopting this position, we can begin to see where technologies might further contribute to home-work.

This sense of embodiment was particularly evident in the work done in the past and made it apparent where technology could ease the highly manual

demands. Again, laundry serves as a case in point. The actual manual process of washing clothes using either tubs and a washboard or with the later introduction of the wringer was a very time consuming activity. One facet of the laundry, for example, was the scale of the undertaking and the equipment required. Several tubs were necessary, one for the soapy water, another for rinsing and a third for the bluing rinse. Wringers were also large cumbersome objects, taking up a good amount of space, all of which means that other household members would have been aware of the process, as the majority of the kitchen would be given over to washing. The process and equipment involved made laundry a highly visible undertaking, and even for those not directly participating.

The point to this historical account is to show that by looking at the way work was physically embodied in activities such as laundry makes it clear what went into the work, the ways in which it was systematically undertaken and, specifically, where the most effort was called for. Now it is my contention that by considering lists in a similar way we can get a handle on some of the less explicit features of work in the home.

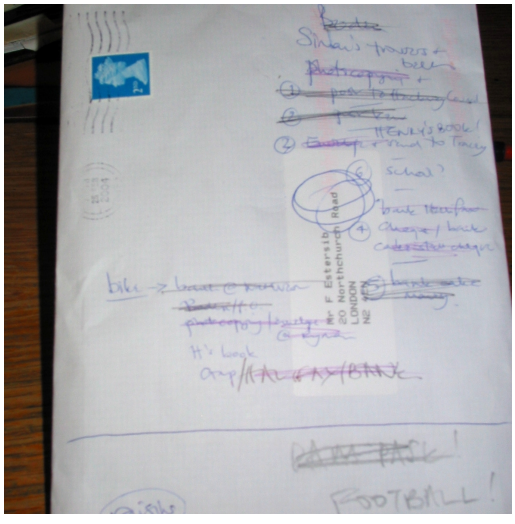
To begin, then, I want to demonstrate how lists, as an organisational artefact, embody some of the work related to housework and childcare. At first sight, the ways in which household lists are recorded and arranged can appear muddled. We find, for instance, that household chores can be clumped together with doctor's addresses, reminders to husbands, phone numbers, shopping lists, and arrangements for children's birthday parties. Indeed, lists appear to be one big collection of miscellany. There can be method to this apparent disorder however. Consider, for example, the use of notebooks by Amanda, the mother of two girls.

Amanda typically has several notebooks at any given time dedicated to listing a variety of to-dos and activities. The determining factors for whether an activity warrants a separate notebook seems to be how much information is being generated on the particular subject. For example, her house is being renovated, and she has a notebook dedicated solely to that project. She also runs the parents association at her daughters' school and is involved in fundraising and has a separate notebook relating to that. However, in the

interests of compactness, portability and convenience, she deliberately limits the number of notebooks she has at any one time. Through this use of notebooks, we see a simple means of categorising or dividing up some of the activities that Amanda engages in, one that relies on the material features of paper and specifically notebooks. In short, the lists and the notebooks in which they are contained embody, to a greater of lesser degree, the ordered system of arrangements Amanda has imposed on her housework and childcare.

This sense of embodiment can also be found in the content of lists. Below, Jane describes a list she has scrawled onto the back of an envelope:

> ok, well I had a morning where... I had lots of little things that I needed to do. Cause I was working I took... I thought I'll have one morning where I'm going to get all these little things done, silly little things. And it was things like... I had photocopy documents cause I had to get the residents parking permit and things like that and I also had cheques that I needed to take to the bank. Umm, what else did I have to do? So there were kind of little itty bitty jobs like that and I wanted to get as many done as possible and I had a limited amount of time so I did a list and I did the list in a kind of geographical order. I worked out where I needed to go to first so I could do everything and then come back and be back at the right place to get to pick up Henry from school. I had to go to a bank, to the NatWest, because I had to bank the money from the cake stall because once a week I have to bank the money from the cake stall from school and then I had to go to the post office...



In this excerpt, attention should be drawn to the role the list serves in Jane's miscellany of tasks. Jane reveals how the list is 'done' to reflect her work and, specifically, to operate in coordination with the spatial-temporal

constraints she finds herself operating within. She explains that her list is ordered so that she is able to sequentially move her way through the tasks and this is done so that she might pick up her son, Henry, on time. Jane's numbering scheme from 1 to 6, applied to each item, transforms them into a marker guiding her progress in terms of geography, time and the tasks she must do. Each of the hand-written items inscribed onto the front of the envelop thus serve as a referent to the geographical movements necessary and the list, as a whole, delimits the work that can be accomplished before picking Henry up from school; the list is a tangible or embodied instantiation of not only of the work that must be done, but also artfully expresses how it should be accomplished under certain terms.

Manual and organisational

As well as illustrating how lists come to embody the work of the home, what is immediately evident from Jane's description is that the list is made up of what she refers to as "bitty jobs" making up a miscellaneous collection of home and family related tasks that she needs to accomplish. The residents parking permit, the depositing of cheques, the post office, and so on are all organisational matters related to the smooth running of the home. They are the sorts of things that go unnoticed so long as they are done, but can be the cause of consternation when overlooked or simply forgotten. Jane, for instance, later tells us that when putting together her geographically ordered list of items she had forgotten to add a reminder to buy Henry's lunch box from Woolworths and that this has meant he is still without this no doubt much needed accessory.

Although I am, of course, sympathetic to Henry's woe, my concern here is with how the list and the items that are both on it—and off it—relate to the arrangements and running of the home and childcare—namely organisational matters—and how multiple and often disparate tasks and activities must be marshalled in this work. Despite Jane's move to trivialise her work by describing her items as "silly little things" it should be apparent that the

aggregate of all the things that can be referred to on lists and if they were not done some sense of mess would likely ensue.

An excerpt from an interview with Kate further alludes to this:

> ... on our kitchen table at the moment, there is a humungous list which I wrote when I got bored with cleaning cupboards this morning. I've got a feeling this is going to metamorphose into a bigger list that's got something to do with feeling a baby coming and wanting to make sure that you've done a whole load of filing, paid bills, you know, make sure that everything's up to date and being scared that you'll forget things because I know, if the baby turned up tomorrow, um you know, 90% of my lists would be erased from my brain because I couldn't help it because that's what happens. So you know, thinking actually I need to keep it all down somewhere. It's funny, lists. The world feels better when I have a list, maybe just because I don't have to remember it all but the world feels... the same way the world feels better when the house is tidy and all the toys are in the right place.

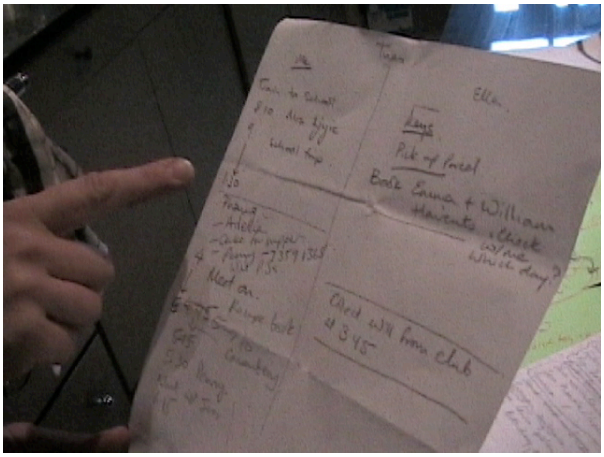
Kate's talk of lists reminds us that although the work needed to manage the home is by no means as manually demanding as it has been in the past, it persists as a time consuming and taxing feature of home and childcare. Kate expresses the enormity of the housework she must keep abreast of by placing the "whole load" of organisational tasks she must keep track of in opposition to her approaching labour and the immanent arrival of a newborn baby. Lists are mobilised as a means of countering the looming chaos because they tidy up the world, putting things into their right and proper place.

What we see here is that the list comes to be a material instantiation of the tidying up that necessarily figures in organisational work. Kate's mechanism for expressing this is to parallel the list with the actual manual work of tidying away toys. Her reliance on this rhetorical device, hints at how the list is not explicitly seen as an embodied tool for doing housework, but nevertheless, operates as just that. Where appliances such as the wringer or washing machine were once or exist now as the material instantiation of the work put into doing laundry, the list emerges as a witnessable testament to the work that goes into organising home-related tasks and activities.

Complexity

By turning to lists, and their organisational role, we can again catch a glimpse of how this materialises in the practical arrangements of the home. Below, Claire describes how complicated days that require the planning and coordination of multiple people, activities and tasks necessitate the making of lists. In this example, it is worth emphasising how Claire has made a considerable effort in thinking about the organisational arrangements that she has inscribed onto her paper list.

> When days get very complicated I will do a day list just how I'm going to get everybody in the right place... So this is Tuesday. What I'm doing [points to left column], what Ella's doing [points to right column] and who has to be picked up when... This was one day [Points to the left hand side and talks us through the items]. This was Jessica's school trip so I had to take the train to school rather than the car because I had nowhere to leave the car for 4 hours. I had to meet Mrs Anderson, Jessica's teacher, at 10 past 8. Then I went on the school trip. Then, I had a whole lot of stuff that I wanted to do that I was taking with me with the phone and I was going to hang out and phone people and do all the bits and pieces in a café outside the school. I then I was going to pick up Jessica and we were all meeting on this recipe book we making at school for her class to raise money. And then I need to get Jessy from that to errr her extra English lesson in Cannonbury and I was working out the timing and I had to wait outside so I needed stuff to do for me. Simultaneously Ella needed to... I had some things I wanted her to do... And what time she the [inaudible]



Claire provides an example of the effort needed to arrange the ordinary routines of home-related activities. She demonstrates how a great deal of forethought is needed to plan the seemingly simple operations of bringing her daughters to school and to their respective activities. Her list captures how her children's movements must be coordinated with her own presumably personal and household "bits and pieces" and arranged in such a way that they can be systematically accomplished (this type of coordination is by no means rare).

An interesting feature of the list Claire describes is how the paper is broken up to refer to different times in the day and the different family members' activities. Her own timeline is juxtaposed with those of her daughters but conspicuously ordered so that the children's movements and activities take precedence. This reveals how lists are arranged and sometimes divided to manage the complexity of organising housework and childcare. To further illustrate this point, let us turn to an excerpt taken from a discussion with Anya.

> I tend to have one big page, a column on the left, a column on the right. There's what you might call the kind of financial and administrative stuff, and that's usually the main column, pay x bill, sort out car insurance, the sort of stuff which really matters if you don't do. And then I would probably lower down the page have the kind of 'where are Tom's socks?' I kid you not.

For Anya, we see how the list can be used to classify particular types of tasks and activities. By separating out household finances from mundane chores like finding her son's socks, Anya is quite deliberately carving-up home life. Dividing the page into columns and rows, she sections out home-work into orderly slices—a broad collection of tasks and activities that get done in the home are grouped and ordered into things that 'really matter' and those less important 'to-be-dones'. What might be called Anya's 'prioritisation scheme' is evidenced in her explanation of the list. In her description, we hear that socks get placed lower down on the page than "financial and administrative stuff"—a clear reminder of their status. Anya's last four words in the excerpt above, "I kid you not", do quite a bit to show where things stand in this hierarchy and go some way to explaining why. By using this phrase, Anya confirms that she is well aware of what we all know to be true (i.e., common sense)—that socks come after bills and insurance.

Anya's list, and specifically the way it is divided, points to a further level of complexity present in the organisational arrangements of the home. This complexity centres on the processes of dividing and prioritising household work. The trouble with this (re)configuration and ordering work is that it by no means emerges as a natural consequence of combining the various activities, events and people that are a part of home life. On the contrary, the work of organising a home does not only demand the coordination of multiple and disjointed activities, but can also demand the fusing of what are, for all intents and purposes, 'worlds' operating in stark opposition to one another. We get a sense of this in a conversation with Claire (mother to children of 8, 4 and 2):

> I find switching between child time and normal time the worst. The days I just do children, and can just slow down... do things the way they do instead of rushing around, getting things done... Sometimes it's better if I just have child time, or just have normal time. I have the least patience when I've had a day when I've been getting things done and then I have to switch back to their time.

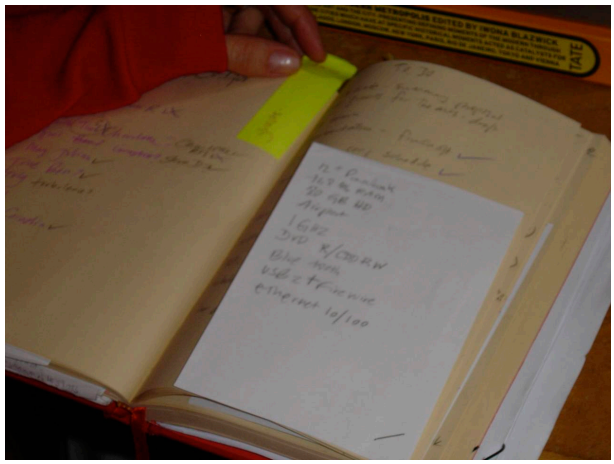
Claire invokes a palpable division between the world in-habited by children and that of "normal time"—the world where things get done. We can glean from this that there is no simple fit between the demands of childcare and the rest of domestic life, and that a considerable amount of work is demanded to coordinate the two. In a sense, we might see lists as a reification of this achievement, embodying the substantial mental thought and physical effort that must put into planning, arranging and pulling off the running of the home and the care of children.

Complexity in home/work

Of course, this issue of complexity and the effort involved in the separating out of different activities is not only confined to the worlds of housework and childcare. The increasing prevalence of home-based work and specifically, the significant increase in working mothers, contributes to a further division that has to be dealt with.

The tension between work and home is captured in an excerpt from an interview with Luci, the mother of three boys. In the excerpt, Luci describes the use of the primarily work-based notebook that she carries with her and explains how she has been trying out a system where she adds personal to-dos and notes in one half of the book and items related to her work as part of an art collective in the other:

> I've started actually working on the other side of the book but I've done this before and it's really really irritating [laughs]... because you're then invariably turning the book around and trying to divide your life up so that one's upside down and one's the right way round... it's a really lousy system I have to say and it will fail and what I will do is I'll add, without any doubt I will add, umm... so it's a lousy system because I have to remember which way my book is when I've got which hat on and what I've done in the past is... [laughs] fail to do that. So then I have to like rip pages out from this side of the book and then turn them round and then stick them in later. It just makes a real mess of my book. It would be fine if I thought a little bit and opened the book the right way up at the right moment, but invariably I seem to create a system and then not quite stick to it.



Despite her efforts to the contrary, what is clear from Luci's description is that it is not all that easy for her to separate the tasks and activities from her personal and work worlds. Luci vividly expresses how the material properties of her notebook—having no clear indication which side is 'up' or which side is 'down'—do not afford the neat separation of her two-hatted life. The underlying subtext to what she says, however, reveals there is somewhat more to this problem. For Luci it is the system, and not only the material features of

the book that fail her. The system requires 'a little bit' of thought to ensure that the right hat corresponds to the right side and to avoid having her life, itself, turn upside down.

A plausible interpretation of Luci's confusion is that her separation system—or to be more technical, classification scheme—is not all that good and, in fact, it may not always be clear to her which side of the book her tasks and activities should be listed. As with the division of household and childcare, the separation between Luci's personal life and art work is not a natural consequence of their innate characteristics but rather something constituted (although sometimes poorly) and reified in her notebook. This point comes across more forcefully in another excerpt taken from Luci's interview. In the excerpt, Luci is sifting through several loose scraps of paper that she has in her notebook and chooses to talk about one on which she has sketched out a program for weaning her 6 month old son, Jonah.

> Luci: I quite like this one, this is trying to get from breast-feeding to bottle-feeding and working out… this is basically how I was going to wean Jonah.
>
> Interviewer: That looks incredibly complicated!
>
> Luci: [Laughs] I know! I have to visualise things so anything like that I'll write down… What I was trying to work out was whether I could get to… I was trying to get down from seven feeds to five feeds. I think I realised there was no point in doing that, but I did get down to six feeds… It's snuck into my work book because I don't want to throw it away. I don't know… it's sort of, it is… it's this… this is completely sentimental. That's a page that represents his weaning. Which is… on bright pink paper!
>
> Interiewer: So why does it go in here?
>
> Luci: There are some things. The thing is in here there's umm, there are some little things. There's a [scrap] book that Felix made for me which I haven't used yet but this is another book that I'm going to be able to use and I have pictures of my children [in a white envelope] in here as well. So the thing is there are a few… it's a bit like my office I think in that it's basically a work space but then it's not quite as clearly defined as that.

Luci reveals that even in her 'work book' things to do with family "creep" in. What is more, the logical division she has sought to establish by dividing personal matters from matters related to her art collective is, yet again,

under threat. This time, it is the sentimentality of items that degrades the categorisation scheme, transforming her notebook into a device for storing papers she has an emotional attachment to, far removed from its original purpose of supporting her work.

Forms of collaboration

Another feature of the manual work that dominated domestic work in the past was that of collaboration. The nature of the work being done, and the technologies that enabled it, demanded the cooperation of multiple people. For example, because the labour involved in lugging washtubs, wringing clothes, and hanging wet laundry was so labor intensive, it typically required some form of participation from other people. This ranged from women hired specifically to help with the laundry to children hauling water for the washtubs. The work in these activities thus tended to be clearly delineated around specific duties that came to embody particular orderings.

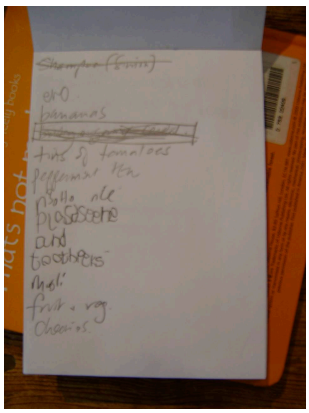
Turning to contemporary home life, we again find that lists shed some light on how the sharing of duties is still retained and very much related to, or even embodied in, material artefacts. Let us consider the use of household lists by Luci and her family. The family keeps a communal notebook on their kitchen table that contains an ongoing log of to-dos, shopping lists, etc. spread over a number of pages. On the day we visit the house, there are four pages of lists in the notebook, which is purposefully placed at one end of the table. One contains reminders of questions Luci must ask the family's babysitter, Alice, who visits three days a week. These were things Luci recalled and made a note of over the weekend. The second list has household purchases that Luci and her husband, Simon, decided they needed over the weekend, such as buying grouting and blinds for their youngest son's bedroom. The third list is made up of things that need to be purchased for the home and consists, mainly, of food items. Finally, the fourth list contains several titles of books that a friend of Alice's wants for her daughter.

In discussing this notebook with Luci, it is immediately evident that there are a number of interesting collaborative facets related to its use. The

most obvious of these is that all of the lists contained in the book are designed to be shared—shared either between the entire household or between specific members. What may not be so apparent, however, is that all but the first of the lists were jointly authored.

Of course, this cooperative authoring and sharing mirrors other collaborative activities that have been studied. For instance, the ambiguity of listed items like found at the bottom of the second of the lists, point to the ways in which the product of cooperative work can be co-constructed and situationally dependent. The reference to past forms of manual work in the home, however, turns our attention to how the making and use of the list, as a tool, embodies and serves to sustain specific features of home life. To examine this point further and for reasons of brevity, I shall look specifically at the third list from the communal notebook I have been discussing, because it presents a particularly interesting example of how lists can be authored collaboratively and in doing so how they can come to reflect the arrangements of the home. Below, Luci explains the workings of what she calls the household's 'shopping list' and her reasons for putting the system in place.

> So I try to make it so that there's a shared responsibility... the other thing is we have people staying here a lot and we're lucky to have a spare bedroom... and so we often have other people in the house, and so things get finished and the sort of rule is that you can eat anything or finish anything but you have to put whatever it is on the shopping list so that I know to replace it. Cause I don't mind anyone eating anything but I find it really really annoying when there's no... I just find it really irritating when something gets finished and nobody's... as if I'm meant to monitor what everyone else is eating and using and somehow know that we need more...



Luci describes how the family, as well as any guests, are all meant to pitch in when it comes to keeping track of what is needed. What is notable in her explanation is the way in which work is delegated to the shopping list, so to speak. Because of the system Luci has adopted, responsibility is distributed amongst all those in the household and not just placed on her. The list is assigned the role of intermediary because it is through it that responsibility is devolved. As Luci talks us through the list's items, however, we find that this devolved system of rule is not altogether simple.

> And the boys add to... and Alice adds to this as well but she hasn't... so the boys add... that's Aero, that's an aero bar [spelt wrong, she laughs...] and this one is Plasticene and toothpicks because Oscar wants to make some more models. So it can end up being slightly random and also it can end up with things that I refuse to buy and the boys really want and so sometimes there are things on here to do with, umm... meat —we have a completely vegetarian household—meat sometimes creeps onto the list... and there was an extended period where chewing gum was on the list.

By exerting her authority in refusing to buy things such as meat and chewing gum, Luci is enacting the time-honoured parental prerogative of laying-down-the-law. What is relevant to us is that it is the list that is enrolled in this system and that it is the system that gives rise to a mechanism for the children to test out their rights and privileges in a systematic way (e.g., through their concerted and extended acts of attrition for the rights to chew gum). By inscribing their choices onto the list in their own hands, Felix and Oscar are thus offered a degree of responsibility and, at one and the same time, infused with Luci's, and presumably Simon's, system of values—vegetarianism and non-gum-chewing.

As a final point on collaboration, it is evident that shared lists such as those from Luci's communal notebook also sanction value systems at a more implicit level. In speaking of the second list above, itemising things to be purchased for the house, Luci describes how she and Simon worked, jointly, through the items and how it was he who actually wrote them down (even though Simon appears to be far less active in the other home-related list making duties). Luci's reasoning for this was that it was Simon who was going to have to put up the curtains and do the grouting. Through the list, then, we

catch sight of the division of labour in the Luci's home, and how Simon has quite a specific role assigned to him. In two excerpts from one of the other interviewees, Kate, we get a stronger sense of the position lists take on in this respect.

Asked whether her husband transfers the content of her written lists to his PDA, Kate replies: No, not really. Often they're quite domestic lists which I have. If I involve him in the list, it's because I'm expecting him to do something, effectively. And which sometimes works quite well, if he's in the mood. Umm, or sometimes it's because I've been asking Nick to do things, certain things, and I've given up and I've decided that I'll have to do them.

> Something often gets put onto a list by the end of the weekend cause nothing's got done and I've got stressed about it. And then, eventually, a list comes out. So generally speaking, the lists come out when I'm with Nick. It's also a way of communicating to him what needs to be done cause he hasn't got a clue.

Describing how a list can be used to delegate "something", presumably some task or activity, Kate reveals that the list is more than a mere itinerary of what must be done, but also serves as an implicit reminder of who has got to do what. Kate though, in both her excerpts, is doing more than merely describing how lists can be used to assign duties. In her first excerpt, notice how she assigns certain sorts of lists to the "domestic" world and, within the same turn, depicts this world as under her authority. Kate takes possession of lists of the domestic variety and places herself in the position of managing who has access to the tasks and activities they refer to. Similarly, in the second excerpt, but in a more emphatic manner, Kate implies it is she, and not Nick, that has a "clue" on the matters that lists pertain to—on domestic matters.

The point here is not whether Kate is right or wrong in her delegation of domestic-work, nor whether she is right to assign herself as an authority on such matters. What is revealing is that she is quite specifically delegating the right and proper place for this work and that, in this case, it is the list that is mobilised to do this delegation. What is central is that Kate's carving up of the home's activities into manageable lists and her subsequent division of labor to undertake those activities sequentially transform what was once chaos into the

taken-for-granted arrangements of the home. By invoking these taken-for-granted arrangements, home life is seen to have always been orderly.

Refrigerator and their Surfaces

(See chapter 5)

Space and Form

It is the fridge door's physical properties and its location that immediately distinguish it from other surfaces in the home. Specifically, its physical design and placement mean the fridge door lends itself to being used as a shared, multi-purpose surface. Usually flat, large and tall, refrigerator's exteriors are easily appropriated for the display of multiple and varied items. Placed within a common area, the kitchen, they also provide a surface that is readily available to all household members.

The use of the fridge also contributes to its success as a shared surface. Unlike a bulletin board or diary, for instance, no regimental system has to be instituted to look at it. The routine use of the fridge—to store and retrieve foods over the course of a day—means that its surfaces are seen on a regular, and nearly continual basis. Indeed, it would be fair to assume that the fridge's surfaces are amongst the most visited in everyday home-life.

Two examples nicely capture how families capitalise on these features of the fridge. In the first example, we see how the regular use of a family schedule relies on its placement on the fridge door. The schedule, divided into days of the week, is meant to remind family members of routine, recurring activities. In practice, it is the mother in the family, Aimee, who commonly refers to the schedule—usually in the mornings, when preparing breakfast. Notably, it is the very activity of breakfast preparation that draws attention to the schedule, reminding Aimee she must have her eldest daughter's dance outfit ready or that her sons should have their swimsuits for swimming lessons, for example. The sight of the schedule is an unavoidable consequence of the use of the fridge.

In the second example, the expanse of space and the orientation of a fridge's surfaces are used to give some order to what is attached. Affixed to the fridge, are an assortment of letters, notes, lists, invitations, train tickets, etc. all placed in and amongst a scattering of magnets of various shapes and sizes. (In

this particular case, the retro-styled door of the fridge is clear because it is moulded plastic, i.e., non-magnetic, specifically chosen for its aesthetic.)

In describing the arrangement of the attached materials, the mother of the family, Amanda, explains there is a "theoretical" order to the surfaces. The top left of the fridge is designated for things associated with the children's school and family's social activities, as well as other home-related chores such as grocery shopping. The family's two daughters, primarily due to their height, are given reign over the lower areas, and have covered their sections with a magnetic Barbie and her extensive wardrobe. The father, Peter, has assigned himself a space, albeit limited in size, on the top right side of the fridge. Again, what is key is that this shared and multi-purposed use of the surface is afforded, in part, because of the fridge's size. Likewise the location of the fridge has a bearing on what is attached to its surface; its location and use by all family members immediately assigns its content the status of "public" and thus shared.

Function

This last example, in which an area is given over to school and family arrangements and home related chores, hints at what might be termed 'working' fridge surfaces, where a surface or region of a fridge is enlisted for the express purpose of supporting the practical matters of organising home life. To operate in some orderly fashion, these working surfaces again rely on specific material features. In another of the household's visited, we found the side of the fridge to contain items associated to practical matters such as cooking, shopping, school-related activities, etc. In contrast, the fridge's upper and lower doors are decorated with pictures, postcards, family memorabilia, etc.—operating more as a display than an interactive surface. This delineation is made clear through a party invitation that now sits on the upper door of the fridge. With attendance to the party confirmed, the invitation has been moved from its original position on the "working" surface; in doing so it has been transformed from an item that requires action to a material reminder of the upcoming event.

As well as relying on the relations between the fridge's surfaces, what we see here is that the fridge has been appropriated with respect to its surroundings. The "working" side of the fridge adjoins a kitchen counter, effectively combining the horizontal and vertical surfaces, extending the functional possibilities as well as the dimensions of the entire workspace. In a similar way, the fact that the fridge faces the kitchen table makes its display available, as a matter of course, during activities such as eating and homework.

This apparent coordination of surfaces parallels the relations between the items on the fridge and other household artefacts. For instance, the shifting party invitation (above) is tied to the use of the phone; once the invitation has been accepted over the phone its place is altered, as is its function. Likewise, on other fridges we find displayed items which are also noted in household calendars or diaries. Rather than being redundant, these distributed records serve multiple purposes; for example, a notation in a calendar reserves a time slot for the family member who manages such things, whereas the event's record attached to the fridge stands as a visual reminder to all family members.

In sum, a fridge's surfaces can come to make up and/or be assembled into a home's organising systems. Particular features of the fridge make it successful for some aspects of this organisational work and not others. Because of its expansive surfaces and its central location, we see that items on a fridge can be configured in visible ways to express their purpose or to be clearly associated with surrounding objects and activities. However, where items are linked to entries in calendars and diaries, for example, the relations are less apparent, even opaque. This limits the effectiveness to the instituted relations between objects; the relations are only readily available to their inventor and even then they must, with no visible help from the system, be remembered.

Temporality

In some respects, that fridge surfaces have this sort of 'working' information affixed to them is not surprising; indeed, from a functional perspective it seems commonsensical. More curious is the juxtaposition of other items in and amongst this information. Whether a fridge's surface is intended to serve a

specific function or not, we find that working items are often set against photos, postcards, magnets from holidays, children's artwork and various other memorabilia.

Interesting here is why fridge surfaces lend themselves to such mixtures of materials. People do not typically affix appliance manuals into their photo albums, nor put party invitations in toolboxes, but on the fridge functionality and everyday routine mixes with sentimentality with no apparent contradiction. It would seem that fridge surfaces behave as a catchall for household miscellany when there is no other obvious place or where something might be forgotten if stored or filed. An illustration of this is evident in the following excerpt from a mother, Tracey, referring to a piece of Chinese calligraphy of her son's name that is prominently displayed in the middle of her family's fridge.

> Every so often I do think about taking stuff off this fridge and there are things here that, you know, every so often I do a sort of mental clearout, or more than a mental, I do a clean out and I say ok we don't need this anymore, that voucher isn't valid or whatever but for some reason this one always stays, because I can never think of anywhere else to put it. It's so crumpled but I feel like I can't really throw it away.

Remarkably, the calligraphy she is referring to has been on her fridge door for seven years, which leads us to another quality of items on fridge doors, i.e. their temporal variability. Examples from our data show that some items on fridge doors can linger for years, whilst other items can be up for a day or less. Thus, a school trip notice will be discarded after the trip, a school's term dates will stay up for the semester, and a piece of children's artwork or postcard may remain indefinitely. This range of lifespans, as it were, further contributes to the incongruity of the items on the fridge door and underlines another key point; that is, the piecemeal creation of the display. Although the presentation of what is on the fridge door may appear all of a piece, (or not, in some cases), it typically has been created bit by bit, over time, and each item that goes up is not necessarily meant to go with whatever else is already residing on the fridge. Thus, it is more an assemblage than a preconceived collection; more a collage pieced together over time than a canvas.

Fluidity, Informality and Reconfigurability

In examining the surfaces of a fridge, then, we find a location where practical, sentimental, historical, functional and playful items come together. The myriad items overlap and interleave with one another, competing for attention, sometimes having their functions and interrelations transformed over time. Probing further though, one is compelled to ask, why the fridge? Yes, the fridge offers a relatively large surface available to all and, yes, its surfaces provide a space for the haphazard arrangement of multi-functioning and ever changing items, but still, why the fridge? There are bulletin boards, doors or even walls that can be equally expansive and allow for things to be affixed to them using thumbtacks or tape.

Missing in these surfaces is, of course, a magnetic quality. It is this that allows fridge surfaces, with their handy counterparts, magnets, to be inordinately easy to interact with. Although attraction is achieved because of the material properties of the magnet, the sense to the human is of ultimate simplicity. Critically, it is the distinctive qualities of the magnet that afford a fluidity and informality that characterise the assemblage of items on fridge

surfaces. Magnets allow both a persistence in display (like the bulletin board), but also an easy and somehow compelling means of continuously reorienting and reconfiguring what is attached.

Instructively, magnets are decidedly different to thumbtacks or tape. Thumbtacks require a piercing of the surface and a slight effort—both suggesting more permanence—as well as a lasting damage to the surface in the form of a hole. Although in the larger scheme of things both the effort and damage are fairly minimal, they nonetheless instil just a bit more thought before placement than the magnet. Tape is slightly different. Although its initial placement has a similar ease to magnets, it can be hard to remove and leaves a residue. Thus, when something is taped, it is, by tape's nature, meant to stay.

By contrast, magnets lend themselves to being put up, taken off, reconfigured—on the fly, by virtually anyone. Their magical quality and sheer simplicity promote the shared sense of fridge surfaces. In short, magnets bring specific qualities to the fridge surface, transforming it into a surface par excellence for accommodating the heterogeneous miscellany of things that typify the home.

Social Organisation

Building on this characterisation of the fridge and the importance of the magnet in its use as an interactive surface, we now wish to turn to one final point. We would like to suggest that the very features of the fridge discussed and the ongoing movement and ordering of items on its surfaces make it a site where the relations within a family can be played out and (re)negotiated. Returning to our earlier example of Amanda and Peter's fridge, we see that the overall order to the divided surfaces can be contested. For example, Barbie and her assorted items of detachable clothing have migrated upwards; postcards and photos find their way in amongst organisational matters; and even Peter's tie-clad magnetic man and an event's leaflet it attaches to the fridge have been wrongly placed. It is through these signs of insurrection that we begin to see the possibility of something more to fridges; the fridge, so often described as central in a household's physical geography, can also be fashioned as a central

player in a family's social relations. This possibility is made plain in Amanda's recount of Peter's well-intended contribution to the home's organisation:

> He's put it this side bless him, but I think that's quite... At least he's put it somewhere. I think he thought that's his [points to the magnetic man], so he kind of thought he was to put that there [points to the leaflet attached and laughs]... I think he's trying to get in on the... Cause I must say the one and only thing that has appeared more than once as a point of friction within our marriage has been him not paying any attention to the family diary... The fact that he doesn't refer to it, so I think this is his attempt at... [cut short]

So, over and above its use in the ordinary affairs of house-keeping, the fridge is transformed into a location where Amanda and Peter's one point of friction is to be worked out. Whether intentional or not, Peter's efforts are seen as an initial forée into participating in the family's organisational matters.

For our purposes, the interesting question, again, is why the fridge? The answer would seem to hinge on a point we have already made concerning the fridge's central location and the fact that, because of its frequent use by all, it acts as a display. Any item on the fridge must therefore be immediately accounted for; the act of changing or attaching something is unavoidably one to be held to account. Whether we speculate that Peter's efforts are a public gesture of détente or simply an indication that he wishes to mark out family time to attend an event, the fact remains that his actions are bound up in the practical workings of the home; they are the constituents, no less, of realpolitik in the home life.

Crucially, it is not just the fridge's location and orientation of its surfaces that make is so successful in this regard. The sheer simplicity of the magnet makes the mechanics of interaction trivial. The fluidity and reconfigurabilty afforded by magnets—due to this simplicity—are what allow for this expressive quality. Moreover, the iconic character assigned to magnets enable family members actions on the fridge to be immediately recognised. It is telling that although Amanda's cites the diary as the point of contention for her and Peter, it is the far more visible magnet-friendly fridge and, specifically, the use and positioning of the tie-wearing figure that is where the action is.

Clutter

(See chapter 7)

Displays

The following is some fieldwork material from an interview with Nicola, a mother in a household of four (two sons, 6 and 9, Nicola and her husband). For Nicola, 'junk bowls' figure prominently in the family home. In the open plan kitchen/dinning area, three stacks of bowls sit on a waist-high shelf facing the entrance to the room. Located not far from the kitchen table and near to the work surfaces, the bowls seem to be placed to be used to prepare or serve food. It is immediately apparent, however, that they have been appropriated to act as repositories for an assortment of bits and pieces.

A bowl sat in the middle of two others and stacked on top of another five, contains, in Nicola's words, "what's on at local galleries [pamphlets];... a lock that one day will be put on the front door, but that I promise you has probably been in this bowl for about three years; various electronic things, chequebook stubs, that sort of thing..." Nicola refers to this as her redundant bowl. To the right is her "working" bowl, holding the front door keys, the mobile phone, chequebook, suntan lotion, and other things to be "grabbed" on the way out. Relating how these bowls come to take on their respective roles, Nicola puts it like this:

> I think what happens is you start using a new bowl at some point and then the old bowl becomes- [laughs] you know, it's crying out for a clear out and probably doesn't have much in it that's much use.

Nicola's three bowls contain a collection of paraphernalia, a seemingly haphazard mixture combining suntan lotion with mobile phones, and door locks with cheque stubs. Likewise, the divisions between the bowls can seem arbitrary; new working bowls appear when others become redundant or simply full. Considering these bowls more carefully, however, it emerges that there is a reasoning to their use and how they function. Nicola explains the role of bowls in what she earlier describes as the home's "systems" for organising:

> I suppose it's because you have stuff [said with emphasis in a pejorative tone] and you need to put it somewhere and bowls seem quite a good receptacle in that they just swallow everything up. Ummm,... [pauses] completely without any thinking or planning...

She continues, describing her husband's use of the bowls:

> ... sometimes he'll plug into them. So he knows for example that- it's never talked about, but he'll know that batteries go in that bowl, keys go in that bowl and, if you have paper work that needs sorting, it'll go in that little pile. So I guess he tunes into it almost subconsciously. They are my systems, but they become the home systems I suppose. And they're really not- it's rather a grand word to call them systems actually.

On the face of it, then, we see that bowls are considered useful in a home's organisation because, they are, quite simply, ready to-hand. This to-handedness is twofold. For one, they are readily available receptacles for "stuff"; their shape and form lend themselves to having things placed in them without thinking or planning. Second, their function is openly available to those in the home; once established as part of a system of organisation, their use and operation are obvious—with little to no forethought they are 'plugged' or 'tuned' into. Their placement in immediate view of what is probably the most frequented room in the house adds to this quality.

There is a less evident feature to this to-handedness; by being ever-present and on display, these bowls function as reminders. Like things we leave

out to trip over lest we forget them (cf. Norman, 1988), the bowls summons our attention. The very reason they are used to begin with—their form and visible placement—give the bowls this quality. What is interesting here is that this reminding elicits an irritation in Nicola, an angst. Although she refers to piles in the following excerpt, her remarks are directed at the general clutter on show in her house, including the household's bowls:

> I think a file, somehow, would just get forgotten about more than just a visible pile that's actually irritating me. That's part of it. Part of it is that I don't like clutter, even though you wouldn't know it [gestures around house]. I don't like all these piles of things everywhere so if I deliberately make a pile then it's sort of a motivation to get rid of it as well.

Unlike things that are filed away, visible piles attract attention and motivate action; the deliberate making and display of piles, as with the overt clutter placed in bowls, actually operates as a signal to sort through them. The effectiveness of this appears to hinge on the irritation caused by having things openly cluttered—the uneasiness with having things visibly out of place.

Another of Nicola's bowls, this one tucked out of sight behind the kitchen door, reveals there is some of discretion as to what goes into different bowls. Pointing to the less noticeable bowl, Nicola runs through its contents:

> This is old mobile phones that we're going to chuck out but I think actually I'll get them recycled somehow. Film for the camera, batteries- the inevitable batteries because if you have kids all their toys need batteries, the A-to-Z. You know, sort of bits and pieces but if you dig down to the bottom I'm sure there are things in there that I have long since forgotten about. So it isn't very organised in that respect. The things on the surface are important, but in some sense it's like geology.

This bowl has contents with a longer intended half-life, so to speak. Nicola's suggestion that there are things long since forgotten about under the surface reiterates this. Similarly, her reference to geology conjures up a sense that excavation might be required to access the low-lying sediment. The contents, though, all holds the potential to be of use somehow, possibly at some unanticipated time in the future. Distinct from Nicola's other bowls, there is no immediacy to the items, but there remains a similar sense that there is no

better place for them but a bowl. This latter type of bowl, then, is less about motivating immediate action and functions more as a catchall for things that have no specific place. Salient here is the relatively secluded and out-of-sight positioning of such a bowl; as a container it still affords having things placed in it, but kept out of sight, it no longer acts as an active prompt or reminder.

In Nicola's junk bowls we are given insight into the close relationship between the form of the container, its location and its content. All three intersect, so bowls placed on display, for example, lend themselves to some classes of clutter and not others. The placement of this clutter, in turn, recasts the character of the containers, transforming them from food receptacles into memory joggers, longer-term storage devices, etc. The nub of this point is that, even though one person—namely Nicola—administers the management of clutter, the roles of the containers are, by their very 'design', available to and utilised by all. The bowls, their location and their content imbricate and come to be used in the ways we see because they are made materially available in an ongoing fashion, not just to Nicola, but also to her husband and presumably her two boys. Their success for the family hinges on the visible and known-about features of the containers, where they are located and the things placed in them.

Hidden clutter

To continue along these lines, let me consider the different methods of containing clutter afforded by other containers, looking specifically at hidden clutter.

Emma, a mother of two sons aged five and nine, has a 'junk drawer' with a broken front, located amongst the kitchen cabinets. In contrast to Nicola's bowls, Emma's drawer is not particularly visible; when closed, it looks like any drawer, save for its broken front. Inside the drawer, there is no explicit system of separation or organisation; it appears to be simply clutter, in all its magnificence. However, the description Emma gives of its function indicates that there is some form of order to the drawer, albeit a loose one.

> This is where I just put things where I- you know where you think you really want to throw it away but you don't feel that you can... so it's a combination of those things and little things that I don't have a home for but I should have a home for, like the tape measure, and the rulers, and the paper clips, and things.

This excerpt describes the heart and soul of junk drawers, their raison d'etre: a holding place for the things "you think you really want to throw away but don't feel that you can". Emma's drawer is a jumble of string, spare plugs, cards, sunglasses, bicycle lights, etc. While discussing its content, Emma begins to pull out items and make small piles, separating out the tape measures, rulers, paper clips, etc. Her description above of these objects is testimony to their special status in the household; her use of the word "home" and the fact that they 'should' have one says much. These are 'little' household 'things' that seem to deserve a home, possibly due to their usefulness and ubiquity, and indeed, according to our fieldwork, do have a home, it just tends to be in amongst the clutter. She next pulls out several small string bags (the kind used to hold laundry tablets when put in the washing machine) that she has re-appropriated to keep fridge poetry and magnetic chess pieces together in the drawer. The mixing of laundry accessories with magnets and chess pieces has a playful, slightly absurd quality but when placed in and amongst all the other miscellaneous things in the drawer, the makeshift orderings are in some way more acceptable.

Continuing to rummage through the contents, Emma makes several discrete piles on the table across from the drawer, as well as two large piles above the drawer on the worktop. In the piles on the table, there are amongst

other things groupings of marbles, notebooks, Lego and dice. When asked about the different piles, she explains that the items on the table 'go' places.

> Those are dice, but again they should go, there's a little bag we have upstairs for dice so that should be, they should all be in the dice bag... Lego, that needs to go in the Lego box...more dice, they should all go in the dice bit...

We see that these items are part of Emma's household systems of organisation; i.e. in this household, marbles, Lego, notebooks and dice have a designated spot where they belong. Thus, when found in the junk drawer, they are plucked out and set aside, to be reunited with their marble, Lego, notebook and dice brethren. The important aspect here is that these groupings are parts of various larger collections, stored elsewhere in the house, which mean the items have a 'home' within the home. This then is a very particular type of clutter; it is "matter out of place" but the defining feature is that this matter has a place; it is simply not in it, for a variety of reasons. Emma's description of items "going places" is interesting on another level, because these items are in fact in transit, albeit perhaps temporarily on a stop-over in the junk drawer. Junk drawers, it seems, can serve as resting places for things that have been used but have not yet been put back where they belong, or have yet to find their way 'home'.

Emma also invokes the word 'go' for one of the large piles on the worktop, but uses the phrase 'that can go', as in rubbish to be thrown out. As she throws some trading cards onto the rubbish pile, she explains they were from the last Harry Potter movie and "were terribly precious for a short period of time". An inevitable aspect of sorting through junk drawers is finding things to be thrown away, which is, upon reflection, intriguing. The fact that a sizeable proportion of things in junk drawers can be disposed of suggests that items can go into the drawer with one status and come out with another, that something "terribly precious" can transform into rubbish within the drawer. The following excerpt, this time involving a Yughio trading card, shows us something more complex occurring:

> ... torn up Yughio cards [tossing what looks like part of a card into a to-throw-away pile]. I think there are torn up Yughio cards because when sometimes the boys fight

> and they tear up each other's cards and I have to say: 'don't worry I'll fix it!' which of course I can't do, but I'll say that [laughs]... and then I'll put it in there [the drawer] and it gets forgotten about and then it's all alright because nobody cares and they won't remember.

Here the 'magical' powers that parents hold for their children. When Emma places a torn Yughio card into the drawer to mollify her battling sons, the card transforms over time from a point of friction (or source of danger), to an opportunity for reconciliation and finally into rubbish. In this case, the out-of-sight property of the drawer's contents and its weakness at enforcing classification both aid in the transformations. Relying on the out-of-sight-out-of-mind tendency of children, the torn card can waver between cherished and destroyed until, once safely forgotten about, its status no longer matters.

As Emma continues to empty out her drawer, we see yet another role that junk drawers can assume:

> ... bicycle clip, children's sun glasses, ever so useful, elastic bands, in no particular order- if I wanted elastic bands this is where I would look for them- that is an air freshener for a car that [smells the wooden apple shaped object]- err, smells horrible, but it was in the car when we bought it so we've hung onto it for sentimental reasons... when we bought our car that we have now it was new and for some reason it was in there. I don't know why it was just- I think the kids thought it was exciting that it came with an apple as well. You know 'new car and wooden apple!' [laughing] so for some reason we still have that.

The drawer acts as a repository of a bit of sentimentality and family history. Items such as the wooden-apple air freshener occupy an uneasy space, being at one and the same time junk but also valued. It is unclear when the wooden apple took on this value, but the unclassified nature of the drawer allows the coexistence of junk and sentimentality, embodied in the same object.

Emma, after spending considerable time going through her drawer, eventually stops reaching in to pull things out, peering into the drawer instead. She explains that she has reached the "bottom layer" of the drawer, and that these things never get sorted out, regardless of how determined she is. This use of the word "layer" echoes Nicola's reference to "geology", and suggests some things have a sort of persistence in remaining uncategorised and unorganised.

Loose change from foreign countries, undeveloped rolls of film, a type of string to be used when catching crabs and the back panel of the television remote control linger in the bottom layer of Emma's drawer. She later shows us a different, and rather remarkable, example of this sort of persistence, in the form of an embroidered badge from Powderham Castle, the sort found in souvenir shops. She explains that she visited Powderham Castle with her sons, and that she mentioned this to her mother-in-law in conversation. Her mother-in-law then went and unearthed an embroidered badge depicting Powderham Castle, purchased there thirty years before. The idea that this badge had been floating around various drawers/bowls/boxes for thirty years, besides being somewhat mind-boggling, gives us a sense of the longevity of this unclassified state. When Emma is asked whether she plans to do something with the badge, such as sew it onto something, she laughs and says "Of course not!" and drops it back into the drawer, where it may presumably stay for another thirty years.

Battles

Olivia is a mother to two girls, aged six and nine. Olivia's house is especially tidy and aesthetically pleasing, and is acknowledged by other mothers as such. During our observational fieldwork, for example, Emma comments "Olivia would never have a drawer like this!" In the interest of looking at diverse households and different instantiations of contained clutter, we decide to see if this is the case.

On first glance, Olivia's house does not seem to be a promising arena for studying clutter. There is none visible, and Olivia herself claims that she does not keep "stuff" and that she throws away as much as she can. Delving further, however, we are able to find little hints of clutter, and more interestingly, Olivia's efforts to keep them at bay. Tucked into the corner of a cupboard of wine glasses is a small bottle of homeopathic drops. The bottle of ointment, a gift from her daughter to help unwind, presents a small problem of classification for Olivia:

> I thought well- I couldn't think where to put it actually, and you can't see it when you close the door... I mean really it could be put in another drawer. But this is me, I

> think to myself 'Why is that out? Put it away.' So it may not be in the right place but I put it away because I can't stand stuff lying about.

Although Olivia's gift is placed out of sight in a cupboard, we discover it does in fact have its right and proper place in another drawer. The overriding criteria appears to be that stuff cannot be left lying around and thus a bottle meant for a drawer is put away, elsewhere. Olivia solves this problem by reclassifying her homeopathic remedy. Unbeknownst to her daughter, stress is relieved not by using its content but by hiding the bottle from view.

Olivia's reference in the above excerpt to 'another drawer" is notable because of the number of drawers she has at her disposal. She has recently had her kitchen and adjoining utility room redesigned with banks of closets, cupboards and drawers, and feels that she now has "places to put stuff". Looking in several drawers, we find collections of like things, neatly separated by containers, dividers, trays, plastic bags, etc. Indeed, the drawers are the epitome of organisation, and it does seem as if Olivia has perhaps eradicated the spectre of clutter by categorising it to the nth degree in all its minutiae. Thus, we find a drawer for table mats, and all things table-associated, such as napkin rings, place holders, etc, another drawer for pens, scissors, tape, paperclips and glue, all neatly separated by dividers, and another drawer for sewing paraphernalia, which is again neatly compartmentalised. In a drawer of tools and household implements, however, we get a glimpse that all is not as it seems. This drawer has, besides a tray full of tools and a case of socket wrenches, a biscuit tin of batteries and a plastic tub of keys. Olivia explains that the tub is specifically for keys, separated out into a plastic bag, and keyrings. When the number of keys is remarked upon, she replies: "I have no idea what they're for, but I've kept them because that's where they go."

Olivia has thus taken something of uncertain status found in nearly every household—that is, keys to unknown locks—and has given them a home. In doing so, she has not resolved their status; she has no more idea of their rightful destination than either Nicola or Emma would, but by giving them a designated place "where they go" she has organised them and attended to them, compartmentalising and thereby minimising their ambiguity.

Underneath the plastic bag of keys we find several un-key-like items. Olivia's response is illuminating:

> They're just things, aren't they? I don't know what to do with them so I put them in here... [pointing to a glass sphere]. That's a ball off the garden swing. It's of absolutely no use but it's beautiful so I couldn't throw it away, could I? So I've put it in here.

Here then is the 'bottom layer' that Emma referred to, the 'things' that Olivia doesn't know what to do with. In the glass ball off the garden swing, there are echoes of Emma's wooden apple car freshener, of an item having the dual status of being junk and sentimental at the same time. Fascinating is that although Olivia tackles the business of classifying the miscellany of the household with fervour, and has closets, cupboards, drawers and dividers to help her, ultimately she too ends up with a small tub somewhere full of 'just things'.

Continuing our rummage through her key tub, we unearth an Allen wrench, or Allen key, used to assemble furniture. Olivia's response when we hold up the item is defiant; "That's a key!" This is notable not because of its semantic play on words, but rather because it illustrates a feature found throughout Olivia's organising systems, and that is their inherent flexibility. The following excerpt is presented in full because it gives a nice example of this flexibility, as well as the reasoning behind it. The items under discussion are two key rings of Pinocchio's head, both the same.

> Now really these are broken key rings, so they should be in there [places them into small jar for broken things]. But I know that I shall never fix them, so actually I shall throw them in the bin [laughs]. They were there because they were special... They're obviously flawed because that's why they've broken, we bought them on our way to Italy as a keepsake. I suppose, I suppose, if I ran out of things to do, I might, you know, find a, go to the other drawer, find a ring and put them on, you know,... And meanwhile, they could go in here [opens drawer with pens]. See, this is the thing, they could go in here [gestures to the tray of pens in drawer], and they could go in that one, [points to drawer across the kitchen] and they could go in there [points to jar]. They're a bit big for that jar, aren't they? Really, key things should be in that one [points across kitchen], but then they could be here [points to tray of pens] because there's a ring here, and I could one day fix the ring onto here, you see, so, I think I'll leave them in here [places them in drawer with tray of pens and shuts drawer].

Olivia is grappling with the problem of the right and proper place for a quintessential piece of clutter, broken keepsake key rings. Interesting is that she allows herself several possibilities for where these key rings should go. Although caring terribly about organisation, hers is not a rigid classification scheme; it is much more fluid, which lends itself to the sometimes unorthodox nature of household miscellany. For example, in a story remarkably reminiscent of Emma's drawer, she tells us of having the severed ankle of a Barbie doll in her jar for broken things for several months, because her daughters believed she would someday fix it. This sort of flexibility reflects the personal and idiosyncratic character of household systems, and makes them more robust, to withstand the changing needs of families.

Containing disorder

Reflecting on the prior examples—Emma's drawers, Olivia's categorisations and Nicola's bowls and piles—we see that the containers and the material within have a number of properties, some of which have important implications for the design of tools to manage digital media in the home. By using containers that demand low levels of interaction, like bowls and drawers, our three mothers are able to deal with household clutter with minimal effort. These devices afford at-handedness; their placement near to where clutter

accumulates means they offer a simple and lightweight resource for containing or hiding things. Moreover, bowls and drawers allow the placement of things in them without careful thought or deliberation. Part of their success is due to their visible functionality—anyone can see what they are for, no labelling is needed and no expert training is required before tossing something in; as we have seen, even husbands know how to use them. The self-evidence of these devices is further represented by their layers and the 'geology' of the stuff they contain, both serving to show the history of their use.

We have seen that things belonging in other parts of the home often end up in clutter bowls and junk drawers. In theory, these items are in transit and are in the bowls and drawers only temporarily, on their way back to their collections. This finding underscores our earlier point, that is, that people use bowls and drawers as a low effort resource in their quest to keep some semblance of order. No doubt Emma knows where lego pieces and marbles belong (as she probably decided originally where in the house that was) but she lets small bits of collections accrue in the junk drawer to avoid endlessly putting things away, one by one.

Other things get left in bowls and drawers because they have attained sentimental status, yet not of enough note to warrant formal archiving or display. Olivia's glass ball and Emma's wooden apple air freshener are examples of this—unable to be thrown away because they mean something, yet not meaning enough to be kept somewhere else. Some photos from mobile phones are conceivably of this ilk. Here, the informal quality of bowls and drawers is especially pertinent; these containers do not force any particular decision nor demand that objects within them be dealt with in any particular way.

And finally, there is the stuff that no one knows what to do with. Olivia's tub of keys and Nicola's forgotten "bits and pieces" fall into this category. This material often gets put in bowls and drawers simply because they offer a temporary solution to the question of what to do with them. Bowls and drawers can thus serve as a refuge for the unclassifiable, the outcasts of a home's ordered arrangement.

Clutter design points

- Clutter performs various functions
    - Tracey – active reminder, home for keys and suntan lotion, etc., meant to be visible, so that piled up stuff on top is meant to act as reminder and place holder for various things within the home.
    - Jane- meant to be hidden away, catch-all for things that aren't clear what to do with them, things in transit, as well as for certain class of tools, rubber bands, etc. In this manner, also ends up acting as unintended/inadvertent **family archive**
    - Amanda – clutter is something that defies classification, small receptacles of stuff that doesn't have its proper place but also functions as temporary/liminal holding place for stuff that is in transition (broken Barbies, keychains, etc)

- Hidden or not -Perhaps what we could conclude from the above is that any design should accommodate ways in which families use clutter; i.e. should be either containable, able to be hidden away, shut in a drawer, or it should be on display to act as a reminder (distributed cognition issue in the home: balance between visibility and messiness. Having everyone's stuff out and about is a mess; constant tension between various family members need/ desire to have their stuff out and available vs. being able to live as a group)
- Robustness/Availability – Clutter receptacles as a **family resource** (perhaps didn't bring this out enough in paper). Idea of designated spot for these containers (Amanda's out-loud consideration of where broken key rings go, Jane's designated drawer in amongst everything else, tracey's bowl placement.) These things are family receptacles, and as such, everyone in family uses them. Idea of little tools living in there further reinforces this. None of these were particularly portable, save for Tracey's bowls, and there was a tacit acknowledgement by family members that certain things went in there, even if they were a bizarre amalgamation. Design point being that digital receptacle would need to be available to all, accessible to all- i.e. could **withstand a rummage by an 8 year old** looking for a photo or a

video clip to show a friend. Should have a certain level of robustness, and not be difficult daunting or intimidating to access (as contrasted with pc)

- V. Important to **not enforce any explicit classification**. Seems obvious but is perhaps antithetical to us as a technical discipline (if that's what you can call it). Slightly paradoxical in that we contend that there *is* a form of classifying going on in clutter drawers, but they need to on their most explicit, obvious level be a free space where things can be dumped, in an uncategorized state, which is ***safe*** as it were, for such stuff.

Thoughts on a clutter paper

- For starters, it seems quite reasonable to stick with our basic premises, that clutter in a family home is doing more than just not getting thrown away, that it represents more than simply accumulated junk.
- But maybe we should collect instances/examples of possible digital clutter, firstly to make a more persuasive argument for the chi powers-that-be, as to why we/they should be looking at digital clutter containment, and secondly to inform our study (fairly obvious, this; we should have done it originally, because things are never as they seem in the ethnographic/anthro realm, and we just acted like of course there's going to be digital clutter, and that it will behave like physical clutter but maybe we need to put more thought into that premise. There's a teeny sense that we wanted to write a ethnographic paper on clutter and we tacked on some technology to the end so it could get published somewhere).
- Following this train of thought, what is an example of digital clutter I can think of right now? Digital photos e-mailed to me. This brings us to a fundamental point; anything e-mailed to us can be stored on our computer, and yes, that computer may end up filled with clutter and acting as a junk computer (as opposed to a junk drawer) but it still is within the pc realm, as opposed to the ubicomp/non-pc/out-there-in-the-world realm, and as such, is

more of a sorting/organizing/hierarchical file system for the pc desktop class of problem (perfectly valid, but seriously uninteresting to us).

- Is there really going to be digital stuff that will find its way into our homes that need to be stored somewhere other than our computer? Hmmm. Thank goodness for the mobile phone. That seems like it may act as the collection agent for ubiquitous clutter (ubi-clutter, or better yet, ubi-crap). Photos from a mobile phone. These seem, to me, to have the possibility of being a different class of digital photo, solely because it doesn't exist on the computer unless it's put there. And people can own a mobile w/o owning a computer, for example Deidre.
- Perhaps more informative is someone who could own a computer, or does own a computer, but who might choose not to put their camera phone photo on a computer. That's possibly more interesting. Not sure who that might be, but it seems like a reasonable possibility. Teenagers? People who aren't quite invested in their pc as center of the universe? (Mums?) Hmm. I think this bears some thinking about, as a possible alleyway into designing for digital clutter. Also recommends itself to the home more, because it seems like everyone in work has their own pc, but home is still somewhat pc-free, or at least, not everyone in a household has their own pc, in the house with them at all times (although this is probably changing).
- What about those mp3 snippet thingy-s that hp and Kenton developed? That seems like likely digital clutter.
- What about family video/home movies? This brings us to, in an incredibly roundabout way, the idea of appliance-like computers. That is, should the computer be uncoupled from being able to be 15 different things, so that we could design things that are better suited to being one or two things? I.e. should we embed computers in bowls to act as junk receptacles, embed computers into touchscreens to act as pinboards, have dedicated e-mail/ internet servers, have desks that act as dedicated word-processing/ spreadsheet thingys, etc. etc. Hmm. I don't know.
- Well, in terms of selling more computers, it's a useful concept. More importantly, by moving away from the form-factor of the pc, we can design

better suited instruments for specific tasks, and get away from Windows in the process. That is, if we can hide the computer in things, we might have a better world for it, while still taking advantage of the nice aspects of computers. Essentially, this is an argument for moving the “digital” realm away from the pc, against (existing) convergence and it’s completely predicated on the assumed continuing decrease in computing power/cost ratio, so that people could afford to have computers configured for, and dedicated to, specific tasks (similar to the fact that the washing machine and the dishwasher don’t do the same thing, but probably could be reconfigured so they would).

- I assume this is old hat, and a rather naïve take on the whole thing as well (some day I must read that Weiser article) but it does get down to some fundamental questions about the clutter paper, albeit in a seriously tangential manner, so I think it’s not a complete waste of time, (possibly just a partial one).

Household Systems

(See chapter 7)

Thinking about household systems, I'd like to turn to a published paper by Crabtree, Hemmings and Mariani (2003), in which the authors discuss the design of calendar systems for the home. Specifically,I attend to the first of a series of three empirical examples they present, in which Alex and Sam, two parents, have a somewhat heated discussion about arranging to pick up their son, Jake, from nursery.

> Alex: It's always the bloody same - you leave it to the last minute every time!
>
> Sam: No I don't. Sometimes I don't get enough notice to
>
> Alex: Doesn't Jane understand about Jake?
>
> Sam: It's not her problem is it.
>
> Alex: Oh come on, she's not that bad - and besides, you could have phoned me at work.
>
> Sam: I was busy, then I forgot all about it. It was only when you said what you were doing tomorrow that it reminded me of
>
> Alex: You, you can see - look [Alex points to the row of arrows on the calendar]
>
> Alex: I'm really pushed and Stuart [Alex's boss] will expect
>
> Sam: I know and "Kinda Like" [a nickname for one of Alex's colleagues] can't drive yet, so it's down to you again. And that [causing a conflict in their schedule's] is my fault, again! It's my Alzheimer's coming on.
>
> Alex: That's not f***ing funny anymore!
>
> Sam: It's not that I do it on purpose. You're more organized. I just don't always remember until it's too late.

In their interpretation of the transcript, Crabtree, et al. reveal that the calendar Alex points to (line 8) is enlisted as an 'accountable' social object through which she and Sam negotiate and coordinate their activities. They suggest that its accountable character relies on the way in which the calendar is materially embodied, and the skilled and artful use of notations and annotations that offer an at-a-glance intelligibility.

I want to add to this interpretation by addressing another aspect of the excerpt that we see to be relevant to organisational matters in the home. In particular, we'd like to draw attention to the way in which Sam is mutually assigned to the class of 'being-less-organised-in-the-home'. What's immediately evident is that both he and Alex do some quite particular work to make this an observable feature of their talk. For instance, Alex's first turn, "It's always the bloody same..." (line 1) gives us an emphatic account of Sam's apparently well-earned membership of this class. Similarly, Sam's own "It's my Alzheimer's coming on" does the work of characterising the members of the class as forgetful, and his later "It's not that I do it on purpose. You're more organised" (line 14) places him squarely in the class of 'being-less-organised'.

The classification scheme is also more subtly occasioned in the discussion. Crabtree et al. explain that it's Alex who has instituted the calendar system and oriented the discussion around picking up Jake. In the excerpt itself, it's also Alex who marks Sam's implied forgetfulness as "not f***king funny" (line 13). We see that in producing the class of being-less-organised, Alex has been positioned in stark opposition to it. Indeed, we get a clear sense that it is Alex who's in the business of being-organised-in-the-home.

By drawing on examples from my own fieldwork, I want to develop this point, suggesting, specifically, that the centrality of one person—namely the mother—in organisational matters is common in family homes. Despite the ever-changing patterns of work and family structures, mothers continue to play the central role in managing their family's activities and tasks. What I want to do then is to consider just how this work is routinely accomplished in the home; to recover how one figure in the family gets on with the practical business of running family errands, taking children to and from school, etc.

The School Pickup

Turning, to my own data, I want to show how the ever so mundane activity of waiting at the school gates can incorporate the movement of information and, in particular, its flow through one parent into the home.

[Jenny ushers her only child, Sophie, from the school gates]

Jenny: Come on trouble.

Sophie: I'm a bloody reserve...

Jenny: Excuse me?

Sophie: I'm a reserve for the swimming thing

Jenny: Oh, that's good

Sophie: I'm not going! I don't want...

Jenny: That's not too bad, a reserve.

Sophie: Yeah, there's somebody [inaudible]

Jenny: Well, at least you get to take part.

Sophie: Only one kid from our class has got in.

Jenny: Really... [Addressing researcher:] Typical school letter [reads through it]. When is it, 17th of June?

Sophie: Tomorrow.

Jenny: Tomorrow?

Sophie: ... and we've got to be at school at 8.30

Jenny: What? Tomorrow?

Sophie: yeah

Jenny: ... [reads from paper] Early start, leave school at 8.30. Errgh! Well, you'll have to talk to dad. Alright, let's get out of here.

Back at home, having returned from the school run, Jenny places the letter about the gala on her sideboard. This is the place she temporarily puts paperwork that is awaiting action. As she makes herself a cup of tea, twice, she returns to the sideboard and reads over the letter. Following the second reading, she retrieves a diary from a filing cabinet kept in the living room and steps out on the balcony to talk to her husband, Simon (who's back, early, from his job as a window cleaner). Simon's talk is inaudible but Jenny's side of the conversation speaks for itself:

> You've got Jim at 9 o'clock... yeah, I know it's a pain in the arse, ... yeah, but I don't need to go anywhere tomorrow! [Returning to the living room, she again picks up and looks at the correspondence about the gala]. Hmm, ridiculous, 8.30 start!

Later Jenny reveals it was Simon's diary she had with her when talking to him on the balcony. She explains what it was she was doing.

I knew Simon was taking her to school but I couldn't remember what time his first job was but luckily he can do tomorrow. So he's going to take her at 8.30. Then basically come back have a cup of tea and then go back out again, cause his job at 9 is right opposite the school, so he's going to have to go back and forth [laughs].

There are several key points that we wish to draw attention to from these field notes. First, it's notable that Jenny is confronted with an organisational matter when out on the school run. Whilst her daughter Sophie is busied with expressing her disappointment at being a reserve for a swimming gala, Jenny attempts to get to grips with the practical arrangements. She moves between reading the letter she's just been handed and coaxing the details from Sophie directly. At once, there's the impression that Jenny is attempting to work out the logistics of where, when and how she will get her daughter to the gala, an unexpected appointment that she is none too happy about.

Once home, it's noteworthy that Jenny puts the correspondence about the gala in a place she has established for things that require action. Her solution relies on tasks and chores having some embodied form, taking shape in scraps of paper, printed letters, and so on. It also makes use of the location of her sideboard—located, conspicuously, in the main living space and in full view when either sitting in or passing through the room. Over the course of the afternoon, the gala letter's location serves as a physical point of reference for Jenny. She returns to the sideboard and the letter several times, attempting to absorb its content and figure out how the logistics for this seemingly simple event can be arranged. Jenny interleaves various other chores and activities with this contemplation. She seems to have to mull over the specifics for an extended period, and it's only after some time that she confronts Simon with his diary. Of interest is that it's Jenny who takes responsibility for making the arrangements and she who enlists her husband's diary. Jenny has the assumed role of managing and coordinating Sophie's movements, even when they encroach on Simon's work schedule.

The point I wish to emphasise, here, is how the swimming gala letter, given to Jenny, precipitates a chain of events centred on integrating and arranging the relevant information into the household's existing organisational

systems. The capture and integration of information is part of a larger, ongoing, sequence, the specifics of which are coordinated and marshalled by one central figure, namely Jenny.

Conveyance

The taken for grantedness of this role of coordinating family and household activities is further illustrated in this next example. Mandy is a mother of three girls, aged nine, six and three. To arrange and keep track of her daughters' as well as her husband's various activities she uses a calendar, or what she calls her "family chart". The chart, heavily annotated with the family's comings and goings, is hung prominently on the side of the refrigerator for all to see. Mandy describes her own regular use of it:

> I generally look [at the calendar] at the beginning of the week. So just to remember like when there are tea dates, when I'm going out for dinner, have I got babysitting, and that kind of stuff. But I do look at it every morning. I do religiously come down, put the kettle on, have my shower, come back, look at it while I'm making the tea, and then go up back to bed with tea. And that's what I do every morning, that is my routine.

It's the way in which Mandy describes the routine nature of the morning ritual with her chart that's immediately striking in this excerpt. The chart's fixed place in her morning schedule, in and amongst shower taking and tea drinking, signifies how it is she who takes on the role of overseeing the family's agenda in its entirety: to know who is doing what at any given point in the day. The very ordinary, everyday quality of the described ritual establishes this work as a taken for granted feature of what Mandy does.

Arguably more illuminating is Mandy's attachment to the chart itself. The family have established a practice of using the chart to coordinate their respective activities so that Mandy's husband, [name], might have the entries he has made reshuffled or even deleted in place of an activity Mandy decides as more important. In this way, the calendar becomes a material representation of the socially constituted order of the home—who does what and what activities take precedence over others. Central to this practice is Mandy's accepted role

as overseer. However, not only does Mandy act as coordinator and overarching arbiter of the chart's content, she also has a vested interest in its efficacy as a family resource. A primary concern for her is how well it integrates into the organisational systems the family have in place and, specifically, how well it conveys the necessary information to her family as well as herself.

Mandy, then, has a dual role in managing and organising information in the home. For one, she is the primary person to manage and organise the information surrounding the family's events, activities, tasks, etc. Secondly, she has responsibility for how well the organisational systems operate themselves and to what extent the information is adequately conveyed. To consider this in more detail, let us turn to another quote from Mandy, where she continues on from her discussion of the family chart.

No it's funny, that really is our family time... I think [breakfast] is more a rush, and I think you're trying to get the kids breakfast and get out the door. And actually when we're all sat in the car and you're in a very enclosed space for, you know, ten minutes and nobody's going anywhere and actually you've got their attention... I'm like 'remember you're going to Chloe's for tea tonight', or and 'remember I've got to go pick up Chloe', and you know, 'Flora you're doing this' or 'Caroline Oswald is picking you up tonight and I'll see you at Britannia.' So then they actually know – because I think it's important for them to know.

Mandy explains how her morning ritual, where she absorbs the day's events, feeds into her system for conveying information to the family. In the car, where there is no getting away, the tasks, activities, play dates, etc., inscribed in handwritten markings on the chart, are translated into a verbal listing of where people will be, who they will be with, and so on. Mandy stands in for the chart, conveying the day's schedule and also renegotiating anything unforeseen. Her reeling off of the children's activities brings us back to the items listed on her chart, interweaving one child's schedule with another's, timetabling the day with reference to the chart's structure and order.

In describing this process, Mandy reveals how she has had to contemplate the most effective way of conveying the chart's content. In contrast to the morning rush, the ten-minute school run is seen to be the best space to ensure the family's attention. What's particularly remarkable about

this example, however, is how Mandy's system for conveying information is fashioned in and through the family's practical routines. The system arises and is sustained through these routines and, specifically, through Mandy's matter-of-fact engagement in it. For Mandy there is no time out from these systems and their enactment because this is the very business of 'doing' of family life.

Message board

The distribution and coordination of action and responsibility can become more complex when factors such as the children's well-being and sentimentality come into play.

Amanda's "petal board" is a further example. Amanda keeps what, for lack of a better term, we refer to as a "petal-board" in a room that is by the family entrance to the house, where the family keep their shoes, coats, schoolbags, etc. The board is in the shape of a flower with five surrounding petals, labelled Monday to Friday, and with the centre of the flower labelled Saturday and Sunday.

On one of the days we visit, the petals for Monday and Friday have been written on by Amanda, while Wednesday's entry has been inscribed by Lilly, her 8 year old daughter. Under Monday, the entry reads "Kagoul (L), trip slip signed, music books x 2." Amanda's explanation of these items provides us with an insight into how the petal board is used:

> This was for this Monday, just gone. Because that was Lilly who went on a trip on Monday and so I needed that [points to the "trip slip" inscription] for that day and they both do music on a Monday. And Lilly's Kagoul I knew was at home and it was supposed to be at school and that's why... [moves onto new topic]

Amanda's explanation reveals how the petal-board is enlisted to manage and convey the work and routines that make up family life. . The - list stands as a three part embodied reminder of 1. the Kagoul—a type of raincoat—Lilly (L) must have for a school trip; 2. the "trip slip" that needs to be completed, giving permission for Lilly to go on the trip; and 3.the music lessons the two daughters attend on Mondays.

The petal-board draws our attention to the forethought that is put into how a family's activities are routinely organised and conveyed. Amanda has devised a system that is specifically aimed at her daughters, and one that she actively encourages them to make use of. After careful consideration, she has placed the board in a specific spot, in the entry hall where her daughters can view it as they enter and exit the house. Amanda also continually assesses the effectiveness of the system and tries out various strategies to improve upon it:

It needs updating otherwise people get tired of looking at it cause it looks the same... What happened was we used it a lot, Lilly wrote all over it illegibly, but she could read it and then it kind of got ignored because it was the same things every week. So I kind of wiped it clean and started again and I think wiping it clean's a better thing.

Regardless of the system's success, what we see is that Amanda has constructed a system that not only creatively attempts to devolve some of her own duties involved in reminding her daughters, but also has her daughters, and particularly her eldest daughter, Lilly, take on a degree of responsibility for themselves. As Amanda puts it:

> This should be for the children. That was the theory... I did it to try and encourage Lilly not to forget everything on a regular basis.

Amanda's use of the word "theory" suggests an underlying motivation to her system. Her explanation denotes a moral undertone suggesting her aim is to design more than a simple aide-memoire for Lilly. Her artfully devised solution seeks to instil a sense of responsibility in her daughter, and lessen the reliance she has on her mother. For Amanda, then, the petal-board amounts to far more than an organisational system. Quite simply, it provides a practical method to foster a self-reliance and independence in Lilly which is part and parcel of being a 'good' parent.

The absence of information on the petal board points towards another feature of household systems. A school trip scheduled for Amanda's younger daughter is logistically complicated and requires specific arrangements; in light of this, the school has sent home a sheet outlining the instructions. When asked why there is no reference to that trip on the petal board, Amanda replies

that because it is so complicated, there's not enough room under the day to list everything. When asked how she organised that particular trip, she further elaborates:

My other system is doing everything the night before so I got it all ready last night and went through it in my mind and I looked at the thing [paper with instructions relating to school field trip] and put – on the table I put a note of what I was to remember.

The excerpt above has several notable aspects. The reference to "my other system" gives a clear indication that Amanda thinks of her various methods of arranging children and household business to be systems, whilst the phrase "and went through it in my mind" nicely illustrates the forethought that mothers put into planning children's arrangements. Another element that is evident here is the manner in which one household system can lead into and co-exist with another; in this case, the petal board was not adequate for the task at hand, so the "night-before-with-note-on -kitchen -table" was invoked.

The mention of the kitchen table in this case is also interesting. In another visit, Amanda describes how she uses her kitchen table as a place to physically arrange her paperwork. She has instituted a practice of laying each item needing attention across the table. As an item is dealt with, she takes it off the table and puts it in a pile elsewhere, signifying that it has been resolved, similar to a large-scale solitaire game. Invariably however, there are a few items awaiting resolution or that are perhaps irresolvable, and she describes how she finds herself walking round and round the table, circling her paperwork as it were, as she tries to find one she can take away.

Amanda's use of the kitchen table has other ramifications that extend beyond the obvious, as seen in the following excerpt:

> My main aim is to keep the kitchen table clear because Peter (her husband) can't stand it having stuff on it. But he's away now. Quite frankly you can put what you like on it.

The tension over the designation of where work gets done highlights a feature of the environment of household systems, namely that is a shared space and not typically configured expressly for the accomplishment of informational

work. A system that can be tidied away, or at least co-exist unobtrusively with other elements of a household, are examples of the flexibility necessary to household design.

Multi-functional

Both the artful character of these systems and the ways in which they gradually evolve is similarly illustrated in a book Kate keeps that contains what she refers to as 'critical phone numbers'. The book originally began life as a record of their youngest child's first two years. Because Kate worked outside the home, this was a book kept by the baby sitter, or nanny, to keep Kate up-to-date with her youngest child's routine, schedule and significant occurrences. In describing the book, Kate, like Mandy, gives a sense of the maternal overseeing that she considers her natural prerogative, which in Kate's case is being done remotely with the help of this book:

When our nanny first started, this was like Dotty's book for our new nanny, she would just write in the times of her feeds and nappy changes, but she's grown out of that now. But we had a similar system when the boys were little and it was nice for me just to know when they're small babies what was going on.

We get a sense of the evolving nature of family life as well as the mechanisms devised to accommodate them. Because Dotty had grown out of needing a record of nappy changes and feeds being conveyed, the notebook no longer functions as such. However, a particular predilection for Kate is 'putting things to good use', which makes sure any artefact in her household is truly "useful". Because of this, the book under discussion now serves several purposes:

> The reason it's still in existence is because in the back there's like critical phone numbers for everybody so they're like my mobile, doctor's, Colin's work, the schools. Actually that's defunct cause she's moved to Frankfurt [points to name in book], quite a few of these things are defunct, (pause) so this could be re-jigged really, this system, except the other thing is it's got all our nanny holiday dates.

The fact that Kate refers to this as a system, that's defunct and could be re-jigged, shows that she sees it as something she has constructed, which can be improved upon. Similar to Amanda's petal board, there's an ongoing assessment of how well the system works. And in keeping with other household systems, this evaluation happens in an informal manner, as she runs across it, in the course of looking for something else.

After a moments pause, during which she apparently conducts an ad-hoc evaluation, the book is deemed worthy because it's still serving some function other than simply being Dotty's baby book. Thus, even though it has been deemed somewhat 'defunct' in terms of acting as a repository for critical phone numbers, it is, on final reflection, still serving a 'useful' purpose as written reminder of nanny's holiday dates.

Kate's interest in things having a useful function and/or serving dual purposes extends to other items in her household. Indeed, this system of transforming baby records into current technologies has a historical precedent; her older son's baby notes, recorded in a book from 1995, have been similarly co-opted:

> It has a kind of sentimental value... And I can't bear to throw it away but you know, it's silly to keep, so I've kind of made it into my recipe book where I stick in recipes and stuff. So I can see some of it but some of it's just boring and repetitive and (flips through book) there are lots of useful pages in the back so...

The statement "And I can't bear to throw it away, but it's silly to keep," nicely captures the conflicting dichotomy between sentimentality and a certain degree of functional utility necessary in a household. Because the book relates to a period of her sons' lives that won't happen again, it has personal and sentimental value, yet the book has no immediate purpose other than acting as a memoir of that time. This tension between functionality and sentimentality in domestic life is an important characteristic of this particular environment and we see how Kate has come up with a creative solution to reconcile the two. By turning the baby record into a recipe book, she has managed to reconfigure the book into a functioning artefact which has a justified place on the kitchen shelf, thus allowing her to retain something of sentimental value to her. Her

sense of pride in being able to combine the two is evident, both in the way she displays the baby/recipe book and in the fact that she continued the tradition with her daughter's baby record, albeit in a somewhat different form.

Continuing to examine Kate's statement, the description of parts of her sons' baby book as "boring and repetitive" is illuminating. Ignoring any moral undertones in this description, the significance for our purposes is that Kate uses it to provide a justification and rationale for gluing recipes over memoirs of her sons' baby activities. A secondary consequence of this practical work is that in so doing, Kate ends up acting as family arbiter; by choosing where to glue her recipes, she is determining what is worth keeping a record of and what isn't, which ultimately influences which version of family history is maintained.

Her drawing attention to the "useful pages" in the back is notable; it suggests that this book could be reconfigured for yet another bit of domestic work, the repository of some other household system. The possibility of this book being used for yet another purpose conveys the ad-hoc nature of household systems, reminiscent of lists on backs of envelopes, and the opportunistic combining and reconfiguring are characteristics of their evolution.