The Social Organization of Communication in Domestic Settings *

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Abstract. This study of communication in the household is motivated by a concern in systems design to develop new computing technologies for use in domestic settings. The study reports on purported challenges to 'work' study occasioned by the movement of systems design and ethnography from the workplace to the home. It is suggested that the perceived 'need for new methods' on ethnomethodology's part is a chimera. Ethnomethodology is not a method but a discrete analytic sensibility that is as readily applicable to the home as it has been to the workplace. The continued relevance of this analytic sensibility is articulated through a study of communication in the home. Studies of the 'work' of communication reveal communication to be richly organized by household members. In particular, members' work reveals an ecological system of communication which is designed to order the flow of traffic – letters, bills, cards, phone calls, text messages, emails, and the other communications coming into and going out if the home. The system is subject to the architectural and aesthetic contingencies of place – 'houses' are not uniform, and neither are 'furniture' and 'decorations'. Nonetheless, stable organizational features of the system are identified and consist of 'ecological habitats' (places where communication media live), 'activity centres' (places where communication gets done and media get used), and 'coordinate displays' (places where communication media are situated to facilitate collaboration). These constituent elements combine to form an elegant, locally produced, ecological system of communication that enables members to manage traffic as a most mundane matter of course. Explication of the system sensitises design to critical aspects of the design situation and shows the continued relevance of ethnomethodological analysis as design moves from the workplace into the home.

Ethnomethodology and Systems Design Today

Over the last decade ethnomethodology has developed a close interdisciplinary relationship with computer science in the exploration of foundational issues in IT research, development, and systems design [13]. Interdisciplinary work was initially concerned to understand the social character of work in organizations and led to the development of 'workplace studies' [33]. In the context of systems design, ethnomethodology (or ethnography, as the approach is usually referred to) was construed of as a social science method sensitising design to the social organization of work in organizations and 'eliciting requirements' impinging upon the development of new computing systems [7, 39]. The development of the ubiquitous computing agenda in IT research [42, 41] has seen design move on to consider the potential of computing in a wide range of everyday settings beyond the workplace and in the home in particular, which is predicted by many analysts in the field to be the largest growth sector over the next decade [28]. This move into the home and everyday life more generally has been accompanied by a call from designers to develop new methods capable of sensitising design to everyday life in novel settings and the needs of novel user groups [26]. Gaver [27] describes the rationale underpinning this call with some clarity:

> There is a danger that as technology moves from the office … it will bring along with it workplace values such as efficiency and productivity at the expense of other possibilities.

In other words, the call for new methods is motivated by a concern that the methods developed to support design in the workplace may have dehumanising effects. New methods are required to counter rationalization.

The turn to everyday life in design demands that we move beyond workplace studies to support interdisciplinary explorations of the new geographies of contemporary IT research [3]. While this may hold true for design it does not do so for ethnomethodology, however, as workplace studies are not an ethnomethodological method. Rather, the notion of workplace studies is no more and no less than a convenient label emerging from interdisciplinary work to describe the *focus* of ethnomethodological studies in the historical context of design [37]. As design today moves out of the workplace, ethnomethodological studies may just as easily be re-categorised as 'studies of everyday life' to reflect the original *analytic* impetus of ethnomethodological studies [43] and to acknowledge the absence of ethnomethodological research methods in the process [20]. Ethnomethodology has no methods of its own – no formal procedures, in contrast to policies [25], with which to administer research - but is instead concerned to explicate the methods *members use* to carry out, concert, coordinate, organize and otherwise *order* their everyday activities (hence the nomenclature ethno – folk -methodology). As Lynch [34] puts it,

'Methods' (whether avowedly scientific or not) do not provide a priori guarantees, and the initial requirement for an ethnomethodological investigator is to find ways to elucidate methods from within the relevant competence systems to which they are bound.

Ethnomethodology eschews the imposition of a priori methods on its studies [24] and instead insists that investigators 'find ways' to explicate the members' methods at work within a setting. This insistence highlights the contingent nature of ethnomethodological study and more specifically, that just how the investigator 'finds out' will be contingent on the activities which are the object of study. As Garfinkel and Wieder [23] put it,

We will replace the abbreviation 'studying' with the specific requirement that the analyst be, with others [i.e. members], in a concerted competence of methods with which to recognize, identify, follow, display, and describe phenomena of order in local productions of coherent detail. These [methods] are uniquely possessed in, and as of, the *object's* endogenous local production and natural accountability.

While it has been convenient and useful to describe ethnomethodology as a method for the purposes of interdisciplinary research in design, the 'unique adequacy requirement' described by Garfinkel and Wieder articulates an *analytic sensibility* that is concerned to develop a close familiarity with its objects of study – everyday activities - and to account for their orderly nature through careful description of the endogenous methods observably and reportably implicated in their local production. Just how that is done will depend on the activities being studied and the methods at work in their situated production. There is no need for ethnomethodology to develop new methods of investigation, then, as *it* has no work for methods to do. This is not to say that design has no need for new methods, however, or that we cannot develop new methods for design that incorporate ethnomethodology's analytic sensibility. It is to recognise that ethnomethodology has no methods to offer design, that it never has, and that the demands placed on ethnomethodology by the turn to everyday life in design are, in fact, misplaced. It is important recognise this because of the critical character of current debate, which in rightly pursuing the need for context-sensitive methods wrongly construes of ethnomethodology as a method that also requires reform. The perceived need for new methods is, on ethnomethodology's part, a chimera and one that marginalizes ethnomethodological studies, which are irremediably tied to the methods at work in the orderly production of everyday activities, if left unchecked.

Redressing the Critical Balance

Insofar as new design methods might be devised that incorporate ethnomethodology's analytic sensibility then it will it be on the basis that those methods are sensitive to the methods at work in the orderly production of everyday activities. Yet talk of 'work' lies at the heart of current debate in design

and fuels the demand for new methods. Obviously many areas of everyday life are not work settings in the sense that factories, offices, shops and other settings where people receive money for their labour are. Just as misunderstandings abound concerning ethnomethodology's method, however, then so too they abound in relation to ethnomethodology's understanding of work. 'Work' for ethnomethodology does not imply paid labour but rather, *orderly courses of practical action* from which there is no time out. Consider the daily life of many a working adult, for example. In order to get to the workplace of a morning he or she may set an alarm clock. When the alarm sounds it has to be switched off. Then you get up, shower, dress, feed yourself and the others around you, and to do that you move around the home, go from room to room, and use a variety of material technologies just to get up and get ready for work. You may also have to get the kids ready for school. Maybe you have to take them to school as well, and all that before you even start your paid job of work. Regardless of the unique demands of our individual lives, we have no other choice than to *work to accomplish* our everyday activities, no matter how ordinary, repetitive and routine those activities may be [5]. When ethnomethodology invokes the notion of work, then, it does not restrict its concerns to paid labour but to practical action in general, wherever it may occur. There is no time out from 'work' and ethnomethodology takes the methodical ways in which the practical actions comprising the daily work of a setting are ordered by members as its topic and resource to account for the social organization of everyday activities in the workplace and beyond [21].

Given ethnomethodology's analytic orientation it becomes possible to appreciate that the home might be understood as a 'work' place in the mundane sense of practical action that all household members engage in to accomplish everyday activities in the home, whatever those activities may be. Recent interdisciplinary research agendas in Europe and the US have been concerned to investigate the 'whatever' of everyday life in the home in order to explore foundational issues in IT research. Working under the auspices of the Equator Interdisciplinary Research Collaboration [19], we have undertaken a series of ethnomethodological studies that extend initial interdisciplinary concerns with 'technology in working order' [6] to consider the real world, real time use of a broad range of domestic media. These studies move beyond traditional social science concerns with the home as the locus of generic social processes and trends to explicate the situated nature of technology use in domestic life in order to 'open up the play of possibilities for design' [2]. They demonstrate the continued relevance of ethnomethodological 'studies of work' [22] to IT research and allow us to redress the critical balance occasioned by the turn to everyday life in design.

Our studies of technology use in the home were undertaken in May 2001, have been widely reported in the design literature [11, 12, 14, 15, 16], and are ongoing.

They involve 22 households distributed across England, 16 of which were participants in a previous study [36] and allowed the placement of video cameras in various rooms yielding a large corpus of material, and 6 of which were newly recruited and have been involved in various ethnographic activities, including informal interviews, technology tours, diary keeping and self-administered video ethnographies of daily life in the home. Over the unfolding course of our studies the topic of communication became pronounced and for two main reasons. 1) It was evident in our studies that a great deal of activity in the home is concerned with communication and that a great many of the information resources in the home are implicated in communicative action. 2) Our studies are motivated by computer science research and so must be relevant to major research agendas in the area. Communication has been *the* major area of development in computing, in terms of email and mobile technologies, for example, and early research in the field suggests that the trend might be expected to continue as design moves into the home [29]. Although the corpus of video material sensitised us to many of the subtleties of communication in the home the material was rather piecemeal as a result of the arbitrary placement of video cameras, and so in August 2002 we undertook a number of highly detailed and focused studies of communication in three different homes in order to develop a more coherent understanding of communication and its social organization.[1]

The studies ran for one week each and actively involved the participants. Rather than have an ethnographer 'hang around' the home, we asked our participants to video communications coming into and going out of the home and keep a log briefly describing where the communications occurred, what they were about, who was involved, and what was done in response to them. This strategy had two distinct benefits. 1) It meant that the ethnographers did not have to spend long periods of time waiting around for events of relevance to the research to happen. Over the one-week period of the study, incoming and outgoing communications took up around one and half to two hours of video tape. More time was spent on communication though the details were not always recorded, and understandably so, because of a variety of sensitive household matters. Nevertheless, the approach produced a rich corpus of quality data and was highly cost effective. 2) Enlisting participants as data gatherers provided the opportunity to open up an intimate dialogue with household members. The video and logs became conversational resources, which we used to explore the social organization of communication in the home in collaboration with the parties who actually do the 'work' and reflexively organize household communications in the doing. The approach enabled us to involve the experts in communication in our research then and bring their competences to bear on design reasoning.

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[1] The differences consisted of the following. Household #1 consisted of a professional couple with no children. Household #2 consisted of a family of four, both parents working, two children aged 3 and 5. Household #3 consisted of a family of five, both parents working, with three teenage children.

The result of these focused studies was a corpus of instances of naturally occurring talk and interaction making visible the methodical ways in which household members organize incoming and outgoing communications in the home. One of these instances is presented below to provide a flavour of this fieldwork. The main findings to emerge from analysis of the corpus of instances are presented in terms of a representational format. It is not an a priori format, however, nor does it exploit constructive analytic reasoning to structure the corpus of instances and so make them answerable to the overarching concerns of some social science theory of communication. Rather, the format has emerged from close examination of the corpus of instances as a means by which we have found the social organization of communication in the home in *coherent details* of its local production. We might make an analogy with the 'accordion wave' to articulate our point here: When driving in traffic many of us have had the misfortune to find ourselves stuck in a traffic jam. The cars in front of you grind to a halt, you slow down, stop, then the cars in front of you move forwards again and you move forward in turn. The starting, slowing down, stopping and starting repeat over and over again. This phenomenon may otherwise be called an accordion wave, the movement of traffic in the jam resembling the folding and unfolding leaves of an accordion as it is played. As a driver you don't see the wave, however. It is not available to you as a coherent object, only in *fragmentary* phenomenal field details which you know to be endogenous features of the wave but do not allow you to see the phenomenon as a whole. The accordion wave is available to a helicopter pilot though and many of us have seen it from just such an elevated perspective on our TVs. Our representational format is concerned to develop perspective so that we can see a phenomenon of order that is not otherwise available to inspection other than in fragmentary phenomenal field details of individual instances. It might be said that the representational format is therefore intended to enable us to see the wood as well as the trees.

At the same time, the representational format is an instructed action in interdisciplinary work between ethnographers and designers. While ethnomethodologists seek to explore the world in detail, often assembling significant collections of empirical materials to do so, designers require that the complexity of the design situation be reduced in order to that solutions may be developed and implemented [9]. Consequently, designers need mechanisms that *delineate critical aspects* of the design situation and representational formats are one means of addressing this core concern [4]. Representations do a job of interdisciplinary work, enabling ethnomethodologists to convey their findings in a succinct manner, and enabling designers to digest those findings in an economical way that satisfies their disciplinary concerns. Just what kind of representations are employed is contingent on the activities under study and the *ecological* nature of the social organization of communication in the home makes the need for a representational format particularly salient.

An Instance of Communication in the Home

The following instance of naturally occurring talk and interaction is taken from the Household #1 study. The instance is not presented in terms of the transcription conventions of Conversation Analysis [38, 30] for methodological reasons [35, 10] and as a result of more pragmatic concerns, as few designers understand talk rendered in technical conversation analytic terms.

Dave is in the kitchen preparing the evening meal and Jane has joined him there to discuss the day's events amongst other things over a glass of wine. In the course of their conversation Dave reminds Jane that he has arranged to take her car for a service tomorrow, which means that she is going to have to arrange a lift home from work with one of her colleagues:
Jane: Jonathan might do it, he comes this way.
Dave: Yeah.
Jane goes into the living room and retrieves their address book, which is kept on a shelf next to the phone. She takes the phone and the address book over to the settee and sits down.
Jane: But Jan's more this way, so I'll phone her first.
Jane looks in the address for Jan's number.
Jane: T, T, T … oh! I've not got her in the book.
Dave: Sorry?
Jane: Is it on one these pieces of paper.
Jane leafs through the assorted scraps of paper and notes stored in the front of the address book.
Dave: Have you not got her number?
Jane: No, I'll phone Jo.
Jane finds Jo's number in the address book and dials, turning the television down as the phone rings.
Jane: Hi Jo, it's Jane. I'm just phoning because I need to get hold of Jan's phone number to see if she can give me a lift tomorrow. If you get the message can you give me a ring back? Thanks a lot. Bye bye.
Dave: Nobody home?
The phone rings.
Jane: That will be Jo, she uses the answer machine so she knows who's calling.
Jane picks up the phone.
Jane: Hello? I did, I did. I need to get Jan's number and I don't have it. Yeah, 'cause I'm going to have to ask her to bring me home tomorrow. If you've got it. Right, go on. Yep.
Jane starts writing the number down on a scrap of paper in the phone book.
Jane: Right. Yeah. Uh-uh. Great. Thankyou. Yeah.
Jane and Jo discuss work for a few minutes.
Jane: She says she really enjoyed the food you did.
Dave comes into the living room.
Dave: She's welcome.
Jane: He says your welcome.
Jane: She wants the recipe.
Dave: It's on the BBC website.
Jane: It's on the BBC website.
Dave: But I have a copy she can have.
Jane: But he has a copy you can have.
Dave: Has she got email?
Jane: Yeah, Jo's got email.
Dave: Tell her to give me her email and I'll email it to her.
Jane: He wants your email and he'll email it to you.
Jo relays her email address and Jane starts to write it down on another scrap of paper in the phone book.
Jane: All little letters? Yep. Okay.
Jane: She says thankyou in advance, that would be very nice.
Dave: That's okay.
Jane and Jo chat together a little longer then the call is brought to a close. Jane then calls Jan to arrange a lift home from work. Jan also invites Jane to go for a drink after work with several other colleagues, which she accepts. After the call is brought to a close Jane puts the phone and address book on the shelf where they live. The couple then have dinner, after which Jane tidies up. At the same time, Dave goes back into the living room, starts

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the computer and logs on to the Internet. He searches the BBC Food website,
for which he has a short cut in his 'favourites' menu. He can't locate the
recipe he is looking for however, and goes into the kitchen and takes his
copy off the noticeboard. The copy has a URL on it, which Dave types in. The
recipe is recovered and Dave then sets about emailing it to Jo.
Dave: Where's Jo's email sweetheart?
Jane: Phonebook.
Dave: Can you pass me it please, 'cause I don't know where you put it – you
put in with all those notes didn't you.
Jane retrieves Jo's email address from the phone book, handing Dave a scrap
of paper. Dave sends the email, shuts the computer down, and puts the scrap
of paper back in the phone book. He then takes his copy of the recipe into
the kitchen and puts it on a shelf laden with cookery books.
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While there are many interesting aspects of communication in this instance, such as the informal ways in which information is stored and retrieved, or the filtering of phone calls, or the multi-party nature of domestic telephone conversations, or the temporal incorporation and coordination of communication with the division of labour in the household, etc., what also catches the eye is the *spatial distribution and use of communication media* in the home. Phones, address books, answering machines, notes, computers, websites, paper documents, and a host of other media are implicated in the practical accomplishment of communication and those media are evidently distributed throughout the physical fabric of the home. One way to view this might be to consider the spatial distribution of communication media as inevitable and incidental – how could communication media not be spatially distributed! We think there is more to it than that, however. That there is an ecological character to communication, which is an important and unnoticed feature of the social organization of communication in the home (and no doubt in other settings as well). What we are suggesting here is that the domestic space is not merely a container in which communications take place but a *resource* actively employed by members to organize communication [8]. The instance instructs us that the achievement of communication consists of a great deal more than talk and so we seek to explicate the socially organized ways in which the ecology of the domestic space is *intertwined* with and so permits the orderly accomplishment of communicative activities in the home.

Seeing the Wood as well as the Trees

The instance we have provided is one of 35 collected from the Household #1 study, each of which provided fragmentary glimpses of the various ways in which the ecology of the domestic space was implicated in incoming and outgoing communications in the home. The spatially distributed character of communication was equally evident in our other studies as well, including the corpus of video material. As noted above, we developed a representational format in order develop an understanding of the socially organized character of communication in the home in coherent ecological detail. This consisted of examining each instance for its constituent activities, locations where they occur, and media content. These endogenous features were mapped onto a space plan of

the specific home environment in which they occurred. The space plan also exploited computing technology to provide designers with video of the instance and photographs of the locations where activities occurred and the media used, thus preserving the richness of ethnographic materials while at the same reducing the complexity of the design domain. Figure 1 provides an example of the mapping exercise, showing the space plan for the instance furnished above. The 'media' line describes the media used in the instance and the 'location' line describes the discrete places in an unfolding non-linear sequence of constituent actions where those media were acted upon and exploited. The space plan presents that sequence of actions in schematic form, displaying the sequence within the ecology of the domestic space. Numbers corresponding to those in the 'location' line are used to elaborate the sequential order of activities and coloured discs are used to display the incoming and outgoing nature of those activities.

Arranging a lift to work, etc.

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Media:    Address Book/Phone/Notes → Internet/Web → Recipe → Recipe/Web/Note → Recipe

Location: 1.Shelf → 2.3.4.Settee ---→ 5.Desk -→ 6.Noticeboard -→ 7.Desk ---→ 8.Shelf
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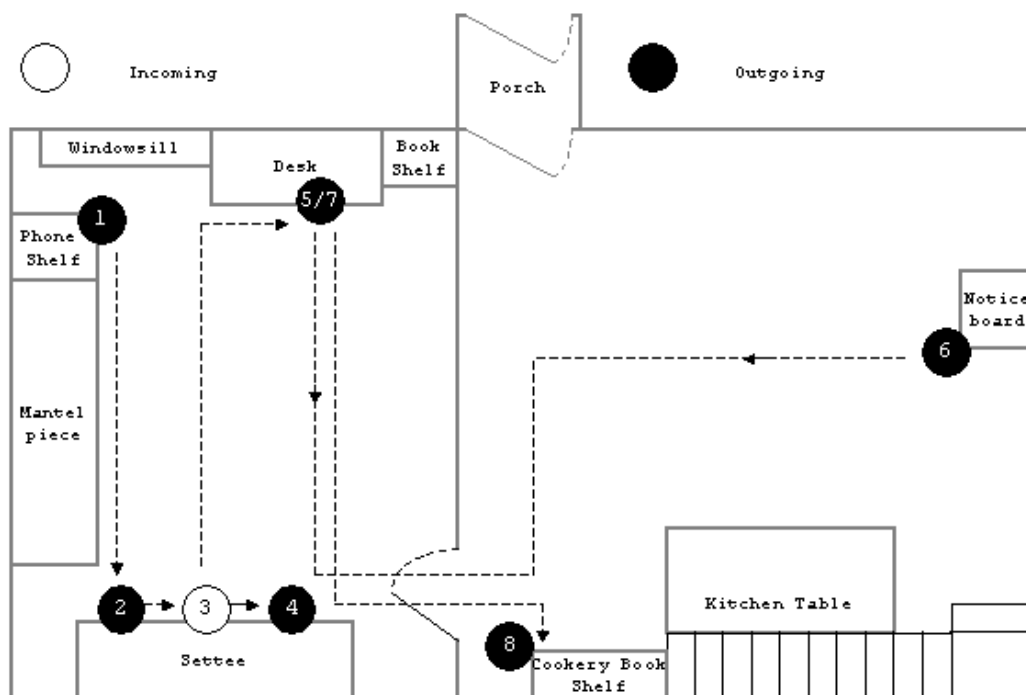

Figure 1. Representing the ecological character of communications in the home.

This format is employed to move our understanding of the social organization of communication in the home beyond the fragmentary glimpses provided by the individual instances. That 'move' is made by mapping the endogenous features of each instance in the corpus and by overlaying those features onto a single space

plan. When we do this, the first thing we notice is the volume and flow of communications through the home.
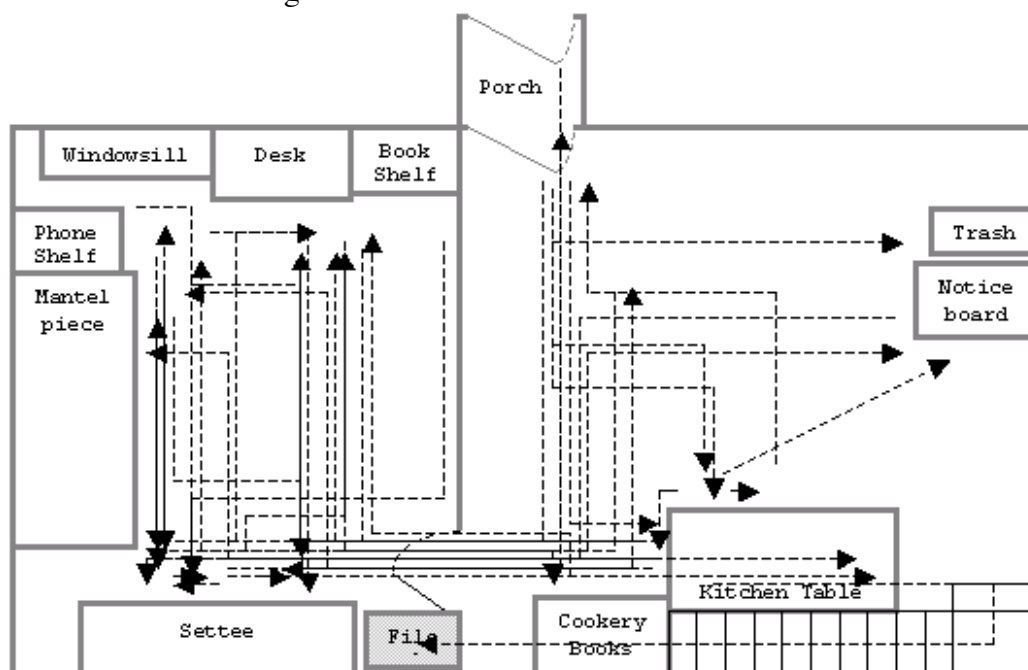

Figure 2. Incoming and outgoing communications over a one-week period.

We mapped 35 incoming and outgoing communications over the week and the participants in our study informed us that this was not unusual, indeed 'pretty typical'. Even a gross consideration of the numbers involved in communication in the home highlight the importance of the research. 35 communications over a one-week period in home with just 2 inhabitants amounts to some 1800 communications over the year. Those 35 communications involved 16 other households. Multiply that by 1800, which would not be unreasonable, and we have some 30,000 communications over a year amongst just 17 homes. National and international figures are obviously massive, which is an apposite descriptor for the phenomenon we are on to. That phenomenon is 'traffic'.

> **traffic** n. & v. **5** the messages, signals, etc., transmitted through a <u>communications system</u>; the flow or volume of such business. *The Concise Oxford Dictionary*

Just as traffic on the highway is socially organized - in terms of lanes which people drive along in agreed directions, of lines and signs that regulate the flow of traffic, of conventional signals that indicate and coordinate the movement and direction of vehicles, etc. – then so too is communications traffic in the home. Naturally communication traffic has its own unique social organization, the primary organizational features of which are made visible when we consolidate the individual instances making up the corpus. Specifically, the following organizational features are made visible and available to inspection elsewhere.

Ecological Habitats

When we examine the corpus of instances for their organizational features it is grossly observable that the various media implicated in communication live in particular places where they are to-hand. Household members do not have to search for the mail, or the computer, or the telephone and address book, etc., because they *situate* communication media in particular places from where they may be readily retrieved or accessed as and when they are needed. This, of course, is not to say that communication media do not stray, that members do not lose things. Indeed, such occurrences demonstrate the rule as it were and may be accounted for by invoking the ordinary notion of misplacing things. The home is an orderly and ordered environment where communication media are situated and live in particular places so that they may be readily located. More formally, we might call these places 'ecological habitats'. The term draws analytic attention to the physical surroundings within which communication media reside. Ecological habitats are readily available to observation. They are in plain view and require no special methods to see. They are elaborated in local detail in terms of fine-grained categorical and physical distinctions of space and place that household members ordinarily make to describe the constituent features of their homes: tables, desks, settees, mantelpieces, chairs, bureaus, windowsills, etc. These fine-grained distinctions make up or are constituent features of gross categorical and physical distinctions of space and place, such as kitchens, living rooms, bedrooms, etc., which in turn make up the home as a whole. In the case of the instance provided above, the phone shelf, the desk, the noticeboard, and the cookery book shelf are ecological habitats.
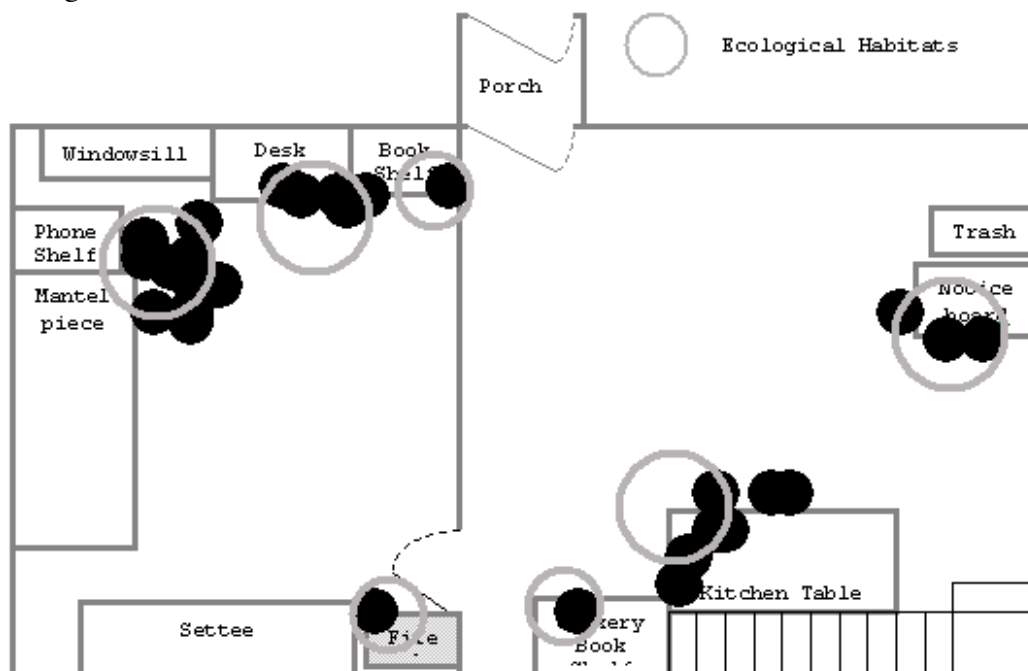

Figure 3. Ecological habitats in the Household #1 study.

The format instructs us that other ecological habitats in the Household #1 study include the kitchen table, living room bookshelf, and upstairs filing system for storing paper documents. Each of these habitats was illuminated or made visible by a single instance (sometimes recurrently where mail or the phone were involved, for example) and through the use of particular media, which the single instance elaborates in detail. What the instances do not show – until they are consolidated – is the make up of the environment as a coherent whole. Consolidation makes an unnoticed social organizational feature of communication in the home plain to see then: namely, that communications traffic is socially organized through *members' local arrangement of domestic space into discrete ecological habitats* where communication media reside.

Activity Centres

It is grossly observable in the corpus of instances that the places where communication media live (ecological habitats) are not the same places where communication media are used. The instance provided above shows, for example, that while the phone and address book reside on a shelf in the living room, they are used on the settee. We call the places where the media implicated in communication are used 'activity centres', as the corpus of instances shows that there are certain places in the home where communication media are *recurrently* employed. Consolidation of the individual instances reveals the following activity centres in the Household #1 study.
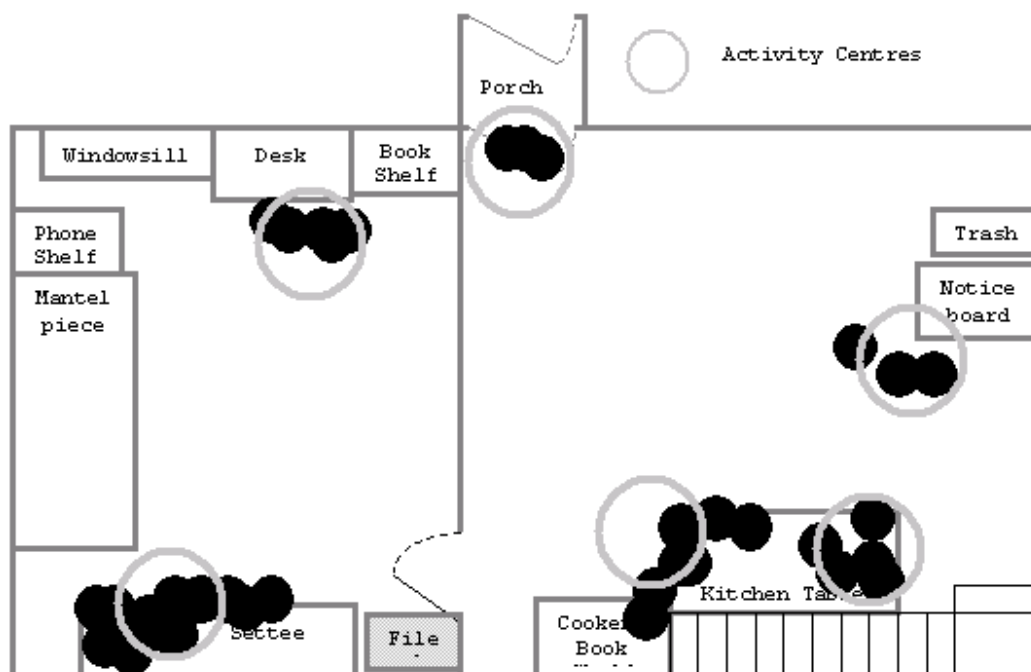

Figure 4. Activity centres in the Household #1 study.

In addition to the settee, consolidation of the instances instructs us that activity centres in the Household #1 study also include the porch and the kitchen table as well as the noticeboard in the kitchen and the desk in the living room. With this it can be seen that while having distinct characteristics, some ecological habitats and activity centres *overlap* (see Figure 3 for comparison). In this home, the desk, noticeboard, and kitchen table are at different times employed by members in different ways. Thus, and for example, the corpus of instances instruct us that the kitchen table is at one time a habitat for mail and at another a centre for conducting phone calls when other members are using the living room space. The noticeboard is at one time a habitat for placing information of short-term relevance (appointment cards, concert tickets, school term dates, recipes, etc.) and at another a centre where the information situated there becomes a resource in social interaction. Or again, the desk is at one time a habitat where working documents are kept and displayed as reminders of ongoing jobs of work and at another a centre where emails are received and sent. The overlap is relevant to design for reasons that will be articulated in due course. What is important to note here is that consolidation of the corpus makes another unnoticed organizational feature of communication in the home plain to see: namely, that communications traffic is socially organized through *members' local arrangement of domestic space into discrete activity centres* where particular communication media are recurrently used.

Coordinate Displays

It is also grossly observable in the corpus of instances that members construct displays from out of the flow of communication media. Recipes, for example, might be printed off the Internet and placed on the noticeboard along with a wide range of other information. Postcards and greetings cards, etc., might be displayed on windowsills and mantelpieces. What is of more interest, however, is the construction of what we call 'coordinate displays' in the home [16]. The kitchen table in the Household #1 study provides us with a prime example of a coordinate display. The kitchen table is a tacitly agreed upon site between these household members for the placing of mail. While mail requiring action in the future resides there, the kitchen table is not only an ecological habitat in this house. Both members know that incoming mail will be placed on the kitchen table. No words or discussion is needed to articulate this as the members can see at-a-glance that mail has arrived that requires their attention by the very act of its visible placement and display at certain locations on the table surface. These 'placements' are recipient designed and 'announce' that some course of practical action, such as the timely paying of a household bill or the renewing vehicle tax or household insurance, for example, is required, *not that the person who opens and places the mail is necessarily the one who takes action*, however. In other

words, the construction of displays at certain sites through the placing of mail and other media implicated in communication provides for the coordination of practical action [14]. The collection of instances reveals the following coordinate displays in the Household #1 study.
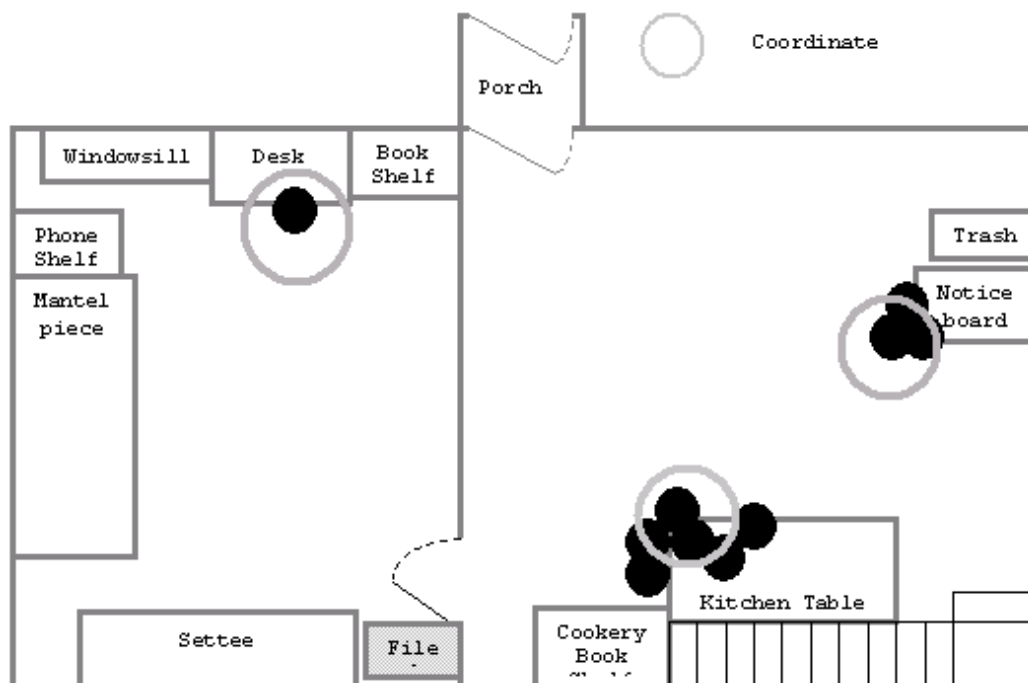

Figure 5. Coordinate displays in the Household #1 study.

In addition to the kitchen table, the desk in the living room and noticeboard in the kitchen are also employed as coordinate displays in this home. It is apparent then that coordinate displays also overlap with activity centres and ecological habitats. Just as some sites in the home may at one time serve as activity centres and at others as ecological habitats, then so too they may also serve as sites for the construction of coordinate displays. Thus, and for example, the noticeboard is at one time a place where information of short-term relevance is kept to-hand, at another a place where that information is employed as a resource in communication (coordinating family visits through consulting school term dates, for example), and at another time a place where the information residing there displays and so provides for the timely coordination of social activities (such as attending a concert or a dentist's appointment, or paying an invoice at the end of the month). Once again consolidation of the corpus of instances makes an unnoticed organizational feature of communication in the home plain to see: namely, that communications traffic is socially organized through *members' local construction of coordinate displays at certain recurrently used sites within the domestic space*.

Flow of Communication and Sequences of Practical Action

The various organizational features outlined above assume coherence through the *flow* of communications traffic around the home, which is produced through the discrete non-linear sequences of practical action recurrently performed by members in accomplishing communication. 'Non-linear' means that the sequences of practical action implicated in communication do not necessarily unfold in a step-by-step fashion. The instance provided above elaborates the point: Dave does not respond to Jo's request immediately. Instead, Jane carries on arranging her lift home from work and then the two have dinner before Dave completes the sequence. Sequences of practical action are non-linear then in the sense that their accomplishment may be suspended and intersect with other sequences of practical action. Sequences of practical action are the fourth and final organizational feature we have unearthed in our studies and they articulate the 'routine' ways in which members locally order particular forms of communication: how phone calls to persons not usually called are ordered by taking the phone and address book from the shelf where they live and moving to the settee or kitchen table if the living room is in use by others, for example, and how salient information is recorded on scraps of paper and stored in the address book for future reference. Or again, how mail is ordered through its recurrent placement at various recipient designed locations on the kitchen table and how it migrates to other sites such as the noticeboard, windowsill, mantelpiece or the domestic filing system depending on its relevance.
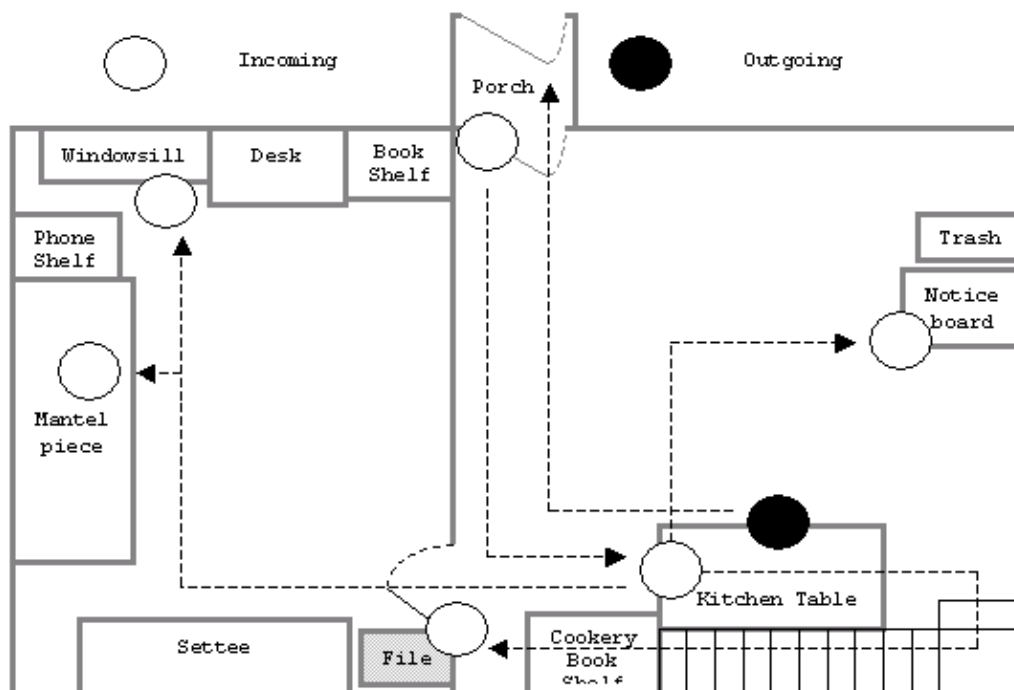

Figure 6. Routine distribution of mail in Household #1 study.

Sequences of practical action are elaborated by individual instances, which articulate the *local rationalities* implicated in the routine, spatially distributed uses of communication media in the home. Instances of mail use in the Household #1 study showed us, for example, that incoming mail was placed on the front of the kitchen table so that members could see when new mail had arrived. Opened mail was routinely placed in a variety of locations depending on its practical relevance. Bills and other items that needed paying immediately were also placed at the front of the table to remind them that they needed to action. Concert tickets, appointment cards, invoices and other items of short-term relevance where placed on the noticeboard. Items that required action but not immediately were placed at the back of the table on a sort of pending pile. Having been read, cards were placed on the windowsill or mantelpiece. And items of long-term relevance, like mortgage statements and other important documents, were placed in the domestic filing system upstairs. Explication of sequences of practical action enables us to identify the ways in which particular media are routinely employed. In endogenous details of action, location and media content these sequences also elaborate the particular ecological habitats, activity centres and coordinate displays implicated in particular forms of communication in particular home settings, which in turn may be consolidated to elaborate the *system of communication* as a whole.

Organizational Features of a Domestic System of Communication

Our studies suggest that the social organization of communication in the home consists of a great deal more than naturally occurring talk and interaction. When we consult naturally occurring talk and interaction we find that communications are ordered by members in their naturally occurring talk and interactions through the situated construction of 1) ecological habitats, 2) activity centres and 3) coordinate displays, all of which are produced and articulated through 4) discrete sequences of practical action. These organizational features are constructed by members *in situ* to handle communications traffic and combine to form a locally produced ecological system of communication.

> **system** n. **1** a set of things working together as a mechanism or interconnecting network **2** an organized scheme or method. > orderliness; method. *The Concise Oxford Dictionary*

While an orderly production, in the terms that our studies have articulated, the ecological system of communication at work in the home is nevertheless subject to contingency. Of particular significance are the *dual contingencies* of architecture and aesthetics. Even in an age of increasing standardization, the architectural character of homes varies immensely. Add to that the particular ways in which people exercise their tastes and furnish their homes and the differences are exponential. The dual contingencies of architecture and aesthetics result in the contingent construction of ecological habitats, activity centres, and

coordinate displays. We cannot say, then, just where or in just what places and through just which sequences of practical action the system will be manifest in domestic settings in general. We would suggest, however, that the system is generally available. That it is to be found in coherent and contingent details of its local production in many domestic settings. It is certainly evident in the homes that participated in our studies, where its production was not only a matter of practical necessity but moral imperative. Ensuring that communications are handled and responded to in a timely and appropriate fashion, that they are not routinely misplaced, lost or ignored, is an important matter for household members and locally organized ecological systems of communication largely guarantee, for most of time, excepting occasional mishaps, that their concerns are satisfied. Accordingly, we would suggest that the explication of the ecological system of communication at work in a setting is of critical importance and relevance to contemporary IT research, which is concerned to situate a burgeoning array of new and emerging Information and Communication Technologies (ICTs) that exploit multiple media in the physical fabric of the home.

Critical Social Aspects of the Design Situation

Considerations of the nature of the domestic space and the relationship and placement of new and emerging technology therein are already of major concern to ubiquitous computing. Research is largely conducted in 'lab houses' to explore the potential for embedding sensing technologies and digital services within the domestic space [32]. Where research has moved out into the real world to consider the potential of ICTs it has been suggested that design will be required to develop a diverse range of media spaces to support domestic communication [29]. Further research emphasises the need to integrate media spaces and digital services with the architectural and aesthetic fabric of buildings via the notion of 'roomware' [40]. Roomware consists of such components as the *DynaWall* (an interactive electronic wall), *CommChairs* (mobile and networked chairs with integrated interactive devices), and the *InteracTable* (an interactive digital table). The potential relationship of new and emerging technology to the arrangement of domestic space has also been explored through the use of Pattern Languages [1] and seen the emergence of *comZONES* [31] which situate ICTs in specific 'social' locations in the home. The development of sensing environments, roomware and *comZONES* share the common feature of being designed for new, custom-built environments. It is not at all clear, however, how this cutting edge research supports the migration of digital technologies to pre-existing environments (which constitute by far the largest sector of the market) in the 'piecemeal' fashion that has been predicted for the adoption of ubiquitous computing in the

home [18]. Edwards and Grinter (ibid.) suggest that the balance may be redressed by attending to the …

> … the stable and compelling routines of the home, rather than external factors, including the abilities of the technology itself. These routines are subtle, complex, and ill-articulated, if they are articulated at all … Only by grounding our designs in such realities of the home will we have a better chance to minimize, or at least predict, the effects of our technologies.

With their focus on recurrent sequences of practical action, our studies draw attention to 'stable and compelling routines' implicated in the local ordering of communication in the home environment. Explication of those routines engenders a critical awareness of the systemic character of communication in the home in details of the diverse ecological arrangements of media usage constructed over the course of their accomplishment. This draws design's attention to the specific spatially distributed technical configurations involved in communication and so delineates critical aspects of the design situation by elaborating the different socially organized forms of media usage that are routinely at work in a setting.
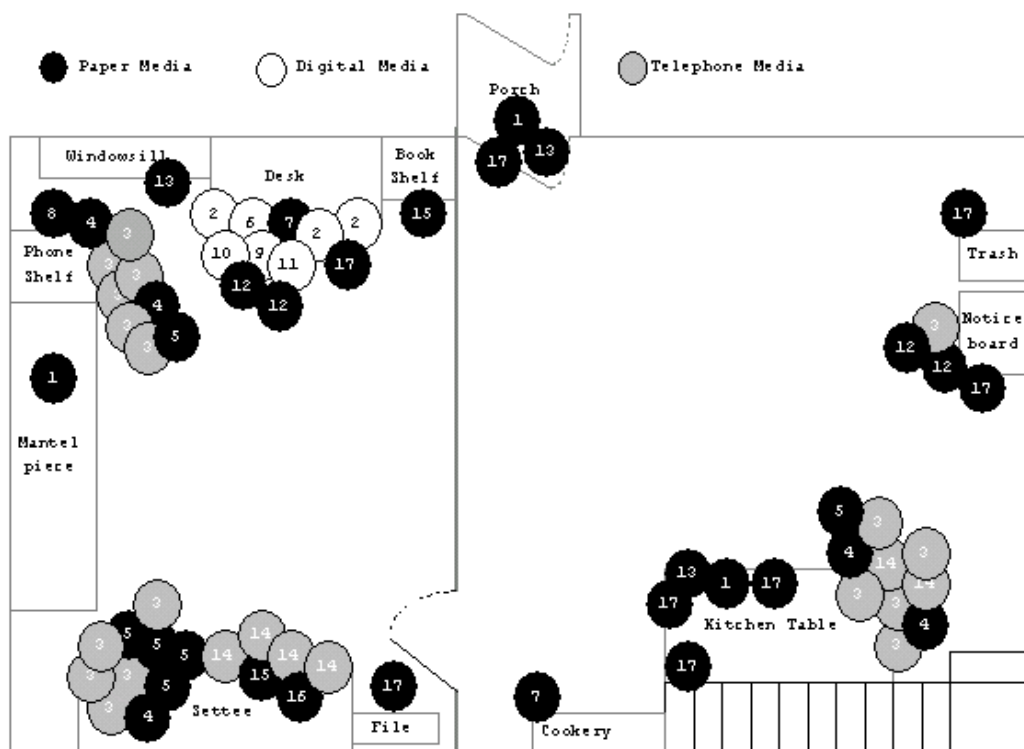
Key to Figure 7

1. Cards	7. Paper recipe	13. Postcard
2. Email	8. Answer machine	14. Text message
3. Phone	9. Electronic documents	15. Book
4. Address Book	10. Hyperlinks	16. Magazine
5. Paper note	11. Digital images	17 Mail (bills etc.)
6. Internet	12. Paper documents	

Figure 7. Ecological arrangements of media usage in Household #1 study.

This representation outlines the sorts of media that coalesce at particular places in the home and allows designers to pose questions as to whether or not they seek to supplement, augment or replace routine arrangements of media usage. Furthermore, given the corpus of instances from which it has emerged, it enables them to make such judgements with some definite insight into the ways in which the technology they are designing might impact upon current organizations of communication in the home.

Developing a critical awareness of the ecological system of communication at work in the home also informs design as to where new and emerging technologies might be best placed to meet the local needs of inhabitants. Consolidation supports this not only by identifying just where ecological habitats, activity centres and coordinate displays are constructed by members but also by highlighting the sites at which ecological habitats, activity centres and coordinate displays overlap.
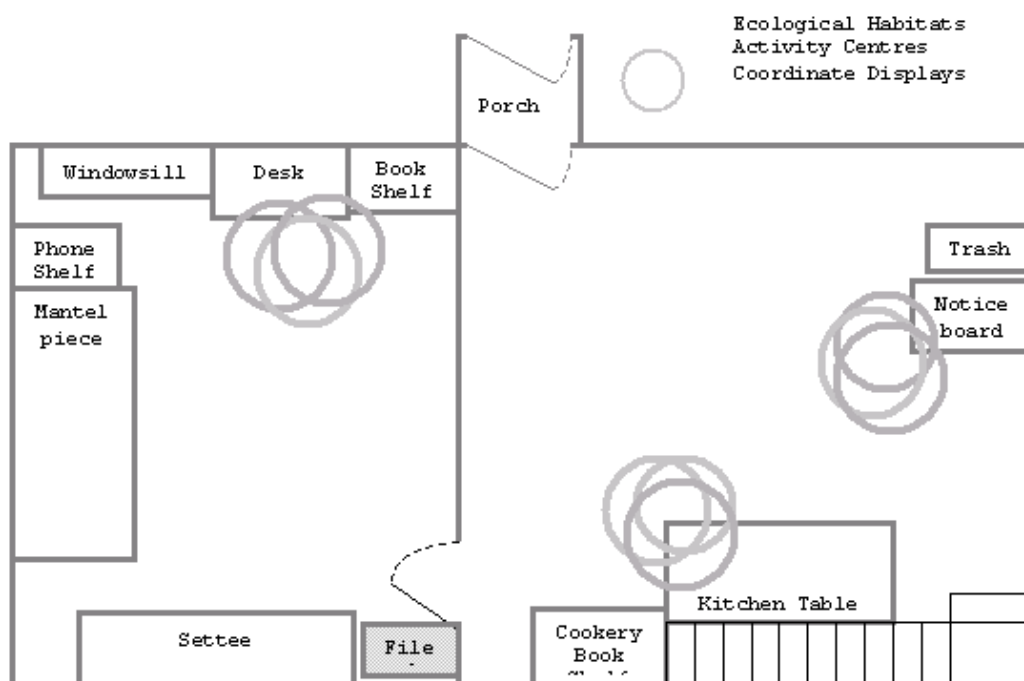

Figure 8. Prime sites for design in Household #1 study.

These points of overlap might be considered as 'prime sites' for design insofar as they identify locations that inhabitants habitually exploit in the accomplishment of communication. Their explication allows designers to reflect upon the nature of these overlaps within particular environments, contrasting the ways in which digital functionality is currently concentrated at the desk in the living room, for example, with the openness and flexibility of the noticeboard and the kitchen table to open up the play of possibilities for design. If we were to consider extending digital functionality across Household #1 through the implementation of a *DynaWall* and *InteracTable*, for example, then the points of overlap

elaborated through consolidation suggests that this would be best achieved by placing those technologies in the kitchen to create a network of digital services and surfaces manifest in locations that Dave and Jane habitually exploit to accomplish communication.

The Emergence of New Methods for Design

Our studies of the methodical ways in which members organize their communications enable us to *devise* a new method for design that incorporates ethnomethodology's analytic sensibility. It is the emergent product of accounting for the methodical ways in which members organize communication in the home and incorporates a sensitivity to communication's endogenous organizational features. The method consists of the following.

- Conducting ethnomethodological studies of work to gather a corpus of instances of naturally occurring talk and interaction in which communications occur.

- Analysing each of those instances to identify their endogenous features, particularly their constituent activities, locations where those activities occur, and media content.

- Mapping the endogenous features of each instance onto a space plan of the setting in which they occur.

- Consolidating the corpus of instances into a single space plan to identify in coherent detail the constituent elements of the ecological system of communication organizing the flow of traffic in and through the setting:

    - Ecological habitats, places where communication media live.

    - Activity centres, places where communication are used.

    - Coordinate displays, places where communication media are situated to facilitate collaboration.

    - Sequences of practical action, elaborating the diverse ecological arrangements of media usage in a setting.

- Consolidation of ecological habitats, activity centres and coordinate displays to identify points of overlap and 'prime sites' for design.

This, of course is a method in the sense that workplace studies [33] and Gaver's cultural probes [26] are methods – i.e. strategies or approaches with associated techniques. It is not a method in an ethnomethodological sense then – i.e., a recurrently produced and accomplished course of practical action (work-practice) - but a formal method or procedure that does not describe the work that provides for its realisation. It is an a priori method of the kind that ethnomethodology

eschews for its own studies, yet it is precisely this that *design* requires: a priori methods that incorporate a sensitivity to important social organizational aspects of the design domain. Furthermore it is a 'hybrid' method not an ethnomethodological method (as ethnomethodology has no methods to offer) – i.e., it is the product of *interdisciplinary work* where ethnomethodological studies of work have come to be handled by ethnographers and designers in such a way as to identify and convey critical features of the design situation. The method is a concerted production that marries ethnomethodological studies of work to the disciplinary requirements of design through the co-construction of a distinct representational format that reduces the complexity of the design domain and highlights relevant social organizational features of that domain. The method incorporates ethnomethodology's analytic sensibility by embedding relevant endogenous features of communication (activities, media content, location, ecological habitats, activity centres and coordinate displays) into the representational format. Thus, the format provides designers with a way of analysing communication in the home that is sensitive to the ways in communication is locally produced and organized in any particular setting. The method enables design participants to conduct studies of communication in the home and to 'find' the ecological system of communication at work in a particular setting for themselves and with no sociological let alone ethnomethodological training. Like the studies from which it has emerged the method recognises and draws design's attention to the fact that talk and interaction are situated in the *physical fabric* of the settings members inhabit and *with which* members communications are evidently and inexorably intertwined. The domestic space is not merely a container for communication but a resource actively exploited by inhabitants to organize and accomplish communication. The method sensitises design to the ecological character of communication in domestic settings and opens up the play of possibilities for ubiquitous computing, which ultimately seeks to embed new and emerging technologies in the physical fabric of the home [17].

Acknowledgements

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