THE SOCIAL CONSTRUCTION OF DISPLAYS

Coordinate Displays and Ecologically Distributed Networks

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Abstract: We employ ethnography to consider the nature of existing non-electronic 'displays' in the home. The word display is placed in scare quotes to draw attention to the *act of displaying*. Seen from the point of view of action it is evident that displays are socially constructed by people in their routine interactions with the material technologies available in the settings where their actions are situated. Through the use of a setting's material technologies to construct mutually intelligible displays for one another people come to coordinate their actions. Our ethnographic studies show that these 'coordinate displays' are distributed across a variety of locations within a setting. Taken together these displays articulate an ecologically distributed network elaborating the unique needs of particular environments and requirements for the development of computer support for cooperative work. We elaborate this point of view through an ethnographic study of the coordinate displays implicated in mail use in the home environment.

Key words: Ethnography, home, mail, coordinate displays.

1. INTRODUCTION

When we consider the topic of technological displays we find ourselves confronted by that familiar and perennial topic in systems design concerning the essential nature of the interface. Accordingly, a display might initially be thought of as *a site* where interaction and communication are effected and articulated (Grudin 1990). Grudin's classic article 'interface' highlighted the paucity of early cognitive conceptualisations of the interface, which focused on the computer's relationship to the user, rather than the user's relationship

to the computer. The distinction drew attention to an ignored and revolutionary phenomena:

> Consider the two faces to the user-computer interface. Is the user's interface to a computer the mirror image of the computer's interface to the user? It may seem that it should be, but on reflection it is not, unless one defines 'interface' extremely narrowly. The user's interface to the computer may *centre* on the software-controlled dialogue, but it also includes any documentation and training that are part of using the computer. It includes colleagues, consultants, systems administrators, customer support and field service representatives, when they are available. These artefacts, processes, and people are so significant in shaping our interactions with a computer that it is myopic not to see them as part of a user's interface to the computer. (Grudin 1990)

The ignored phenomena was this then: the organizational context of use and with that, the *social shaping* of the interface. Seen from this point of view it was and is inappropriate to construe of 'users' as information processors. Rather, they are competent practitioners or 'doers of activities' situated in their work with other competent practitioners in real world settings. 'The user' is embedded, then, in concrete constellations and arrangements of collaboration and cooperation and it is in these arrangements of *work* that the user comes to interface with the computer.

Grudin turned design's concern with the interface inside out. Drawing attention to the social shaping or construction of the interface, a more comprehensive model was offered that instructed design to attend to the wider social environment in which the interface is situated and where interaction and communication are effected and articulated in real time. Bowers and Rodden (1993) moved the concern with social construction of the interface further on, 'exploding' a unitary conceptual entity into many fragmentary sites where users construct interfaces out of the material technologies to-hand in the course of their cooperative work. Bowers and Rodden radically reconceptualised the interface as a heterogeneous body of situationally constructed work sites where the workaday trajectories of a setting's staff 'collide' or intersect and interfacing goes on to provide for the coordination of their activities within the organizational division of labour. This point of view was arrived at by suspending 'received wisdom' and consulting the work of a central government department in the UK, where a new computer network had been installed. As a result it was found that *in practice*, rather than in theory, no single interface to the computer exists for an organization's members but rather, that there are a number of *heterogeneous sites* where interfacing goes on (the number being contingent on the organization in question and its workaday activities). The multiplicity of different interfaces dispenses with the conceptual fiction that there is one boundary between users and the computer, namely *the* interface. Instead, a

variety of interfaces to the computer are constructed by users at sites where workaday trajectories intersect and where work gets 'articulated' or coordinated (Schmidt and Bannon 1992).

When addressing the topic of displays we adopt a similar position. That is to say, we consider displays as heterogeneous collections of fragmentary sites constructed where workaday trajectories collide and where *displaying goes on* to provide for the articulation of practical action. Accordingly, we to wish consider a number of issues that we believe radically effect technical considerations of situated displays. These issues include addressing

- What displays already exist in a setting?
- Where are displays currently located?
- How are displays situated in a setting?
- Why or for what purposes are displays constructed?

When addressing these issues we caution against employing restrictive technical concepts that reify the notion of a display. Instead we are concerned with the skilful, craftful or competent ways in which the inhabitants of a setting address the above issues in their working practices. It might be said that instead of employing some conceptual formulation to address these issues we are concerned to establish where the participants in a setting's work see displays as residing? What *they* treat them as being? With what material technologies to-hand? Having what properties? And to what ends are they employed? We consider the use of mail in the home environment in order to explicate these issues and our orientation to the study of situated displays more generally. We do not expect this study to furnish some generic definition of a unitary conceptual entity, however - like the interface before us, that is a myth we would explode. Instead we recognise that the word 'display' is a **verb** rather than a noun and so refers to a diverse array of practical accomplishments, to a multiplicity of things *done*. Accordingly, our orientation draws design's attention to situated acts of displaying in a setting and thereby makes it visible that multiple technological displayers (screens, interfaces, etc.) will be required to support the ecologically distributed network of displays constructed by participants *in situ* to articulate their work.

2. MAKING THE SOCIAL CONSTRUCTION OF SITUATED DISPLAYS VISIBLE

We have suggested that displays are essentially social constructions and more specifically, that they are constructed 1) in organizational arrangements of collaboration and cooperation at 2) a diverse array of sites by 3) people in their working practices with 4) the material technologies to-hand. This is not a definition of what makes something a display but rather, an analytic sensibility that furnishes us with an orientation to the study of situated displays from *within* a setting and in terms of that setting's work. Such studies will be 'system-specific' then, which is to say that they will be tied to the particular types of setting which they elaborate and make no claims to further generality. Thus analytic emphasis is placed on attending to the particular and unique needs of a setting in order that design might be responsive to those needs and that solutions might resonate with and support the work that goes on there (Crabtree 2003).

The study of the social construction of situated displays may be undertaken through ethnographic investigation. Ethnography has become a staple feature of research in Computer Supported Cooperative Work (CSCW), where it was initially configured as a 'method' of requirements analysis (COMIC D2.1). In its home disciplines of anthropology and sociology, by way of contrast, the term denotes little more than a distinction between quantative and qualitative research. Here ethnography is construed of as a naturalistic approach to social research. In a design context, the 'naturalism' of the matter often consists of a fieldworker documenting the work that goes on in a setting from the point of view of its *performance*. Attention is paid to the ways in which work is observably and reportably carried out and *ordered* by participants, and to the material technologies (whether computer-based or not) employed in the ordering of the work (Suchman 1983). Documenting the performative, technologically mediated ordering of a setting's work is often achieved today through video recording (Suchman 1991) and the materials gathered are then subject to more detached assessment or 'analysis'. Ethnography may, as such, be put to the service of virtually any school of thought and analysis is more often than not carried out through the use of general anthropological and sociological theories, which cast analysis in terms of an *a priori* ensemble of universal constructs. The setting becomes, as such, yet another site where the workings of the theory are played out, "regardless of what the actual order is, perhaps independently of what the actual order is, and even without the investigator having detected the actual order" (Garfinkel 1967).

An alternate approach to the analysis of ethnographic materials, and one that has enjoyed considerable success in CSCW by providing rich

descriptions of work-in-context (Kensing and Simonsen 1996), is provided by ethnomethodology (Garfinkel 2002). As Shapiro (1994) puts it,

> … ethnomethodology sets for itself a strict agenda which separates it in certain ways from most mainstream social science. It insists on a rigorously descriptive rather than theoretical program, or an explanatory one (in the sense that most social sciences would understand it). This lends it its strength in producing rich descriptions of work-in-context.

Ethnomethodology is 'indifferent' to theory (Lynch 1993), which is to say that it suspends the use of theories to analyse ethnographic materials and elects instead to examine those materials in their own terms for their orderly or socially organized properties as made visible by participants in their technologically mediated performance of work (Suchman 1995). The concern with orderliness, to be explicit, is this: ethnomethodology assumes, with evidence in hand (Garfinkel 1991), that the orderly ways in which participants perform work are *identical* to the ways in which they construct work. It follows, then, that observing and analysing the orderly ways in which work is performed by participants will illuminate the system-specific ways in which situated displays are socially constructed by participants in various settings in the course of and for the purposes of their work.

3. THE SOCIAL CONSTRUCTION OF SITUATED DISPLAYS IN THE HOME

The home is not usually thought of as an organized work setting, indeed even with the emergence of mobile computing and more flexible labour patterns 'home' and 'work' are often contrasted and seen to be in competition. We caution against what the later Wittgenstein called a 'one-sided diet of examples' however, which in this case construes of work as paid labour. By invoking the notion of work we are not asking design to recognise such topics as "women's work" in the home either. Ours is not a political or moral use of the word, however laudable those uses may be. Rather, what we have in mind when talking about work in the home - and any other setting beyond the workplace – is a fundamental phenomenon from which there is no time out or possibility of evasion. We illuminate the phenomenon by example. In order to get to work in a morning many people set an alarm clock. When the alarm sounds they turn it off. They get up, wash, dress, feed themselves and others and to do that they move around the home, go from room to room and use a variety of material technologies to get up and get ready for work, to get the kids to school, and get themselves

to the workplace. Insofar as people do such things then they 'must' – i.e., they have no other choice than to - *work to accomplish* these and the other everyday activities they engage in, no matter how ordinary, repetitive and routine those activities may be (Blumer 1967). When we invoke the notion of work, then, we do so not in a political sense of the word or a financial sense but in a practical sense. There is no time out from *practical action*, and the practical actions that take place in a setting constitute its organized 'work', paid or not (Venkatesh 1985, 1996). When addressing the social construction of situated displays in the home we will do so then in terms of the observable work of the home.

To this we would add that the work of the home and other settings consists of the use of material technologies. By this we do not refer to computing technologies, although they may be included in the category. By material technologies we mean the range of artefacts that people use in their work to get that work done. Material technologies range from the pen and paper, to everyday objects like tables and desktops, to electronic and computing systems. As design moves out of the workplace and into new domains it is important that the material technologies 'at work' in a setting are taken note of. As Venkatesh and Nicosia (1997) put it with respect to the home, and the same applies elsewhere,

> … in order to understand the adoption / use issues of computers, one must view the total technological space of the household … very little insights will be gained by looking at computers alone.

This perspective recognises that computing *has yet to reach out* into the home and a great many other domains other than in the most preliminary of ways which see workplace technologies transplanted wholesale into settings they were never designed for. Consequently 'user' needs are poorly met in these novel domains (Hindus 1999) and there is, then, much for design to learn from the use of existing material technologies in the home and other settings (Tolmie et al. 2002).

3.1 Learning from the Use of Existing Material Technologies: Mail Use in the Home

Long-term ethnographic research in 22 family homes in the UK shows that mail handling is a routine activity not only of relevance to individuals but central to the coordination of domestic affairs. Mail occasions such crucial actions as the timely paying of household bills, attending health checks or school meetings, taking the children to parties, and a host of contingent yet commonplace events that vary from household to household in accordance with the home's human composition and inhabitants ages and interests. This

is not to say that there are no commonalities in the collaborative handling of mail across households. The following empirical instance allows us to explicate the socially organized work involved in the collaborative use of mail across the range of households in our study. We provide only one instance as space constrains what can be shown and because one instance suffices to make the socially organized work involved in the collaborative use of mail visible and available to design reasoning. Further instances add nothing to the *visibility of the phenomenon* (Sacks 1984). Accordingly, the instance makes it visible that the coordinate accomplishment of a host of contingent and divergent activities occasioned by the arrival of mail relies upon a taken for granted orderliness of action and material technology usage in which displaying is essential.

Mail is typically collected from some central point, whether that point is located at the front door, in the grounds outside a house, or from a post box located elsewhere in an apartment block. Depending on the contingencies of location, the collection point for mail is one at which displaying may go on. The displaying simply consists of this: seeing that mail has arrived. Mail may be collected by any household member - in some homes the same person might do the job all the time, whereas in others it simply depends on who gets up first or who is home first. The point to note here is that the collection of mail by household members is not coordinated through the nomination of a 'collector' but through the public availability of a shared and known in common collection point and, contingently, on the visibility of mail. Any household or group member can collect the mail (not anyone can open it, however).

Display 1. The porch: a shared and known in common collection point.

Having collected the mail, it must be sorted (even one single piece of mail requires sorting). The person acting as collector has certain taken for granted rights and expectations attached to their position. It is assumed by members that persons acting as collectors who are also 'householders' (i.e.

persons who are responsible for the running of the household) have the right to open mail concerning the maintenance of the home (e.g. bills) and formal matters concerning junior household members (e.g. letters from school concerning children). The opening of mail is not necessarily ordered by recipient name on an envelope, then, but by entitlement to open such mail. The point here is that there is often a visibility to mail that displays and so announces its practical character: what it is about, who it is from, and who may thus be an appropriate recipient and so be entitled to open it. This is often conveyed by a logo, organizational stamp, postmark, or the printing of the sender's name on the outside of the envelope.

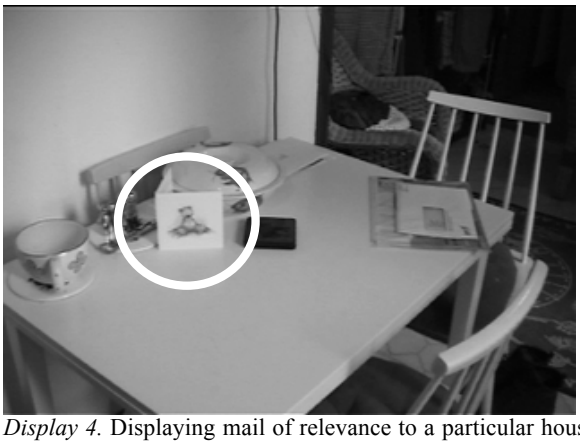
Display 2. Displaying and announcing the practical character of mail (phone bill arrives).

The visibility of the practical character of mail allows the collector to make judgements as to the relevance of mail to the home and to household members. It is in this respect that members come to categorise certain mail as 'junk', to do so at-a-glance, and to respond to the categorisation by throwing the designated mail away. Junk mail is not always so easily spotted however, as categorisation is a matter of judgement rather than being given in advance. Consequently, the collector may open mail and browse through it to establish its relevancy status.

Display 3. Placing mail of relevance to others in general (corner of kitchen table).

Mail that is deemed relevant to other household members is organized in a variety of unique ways. The recipient may decide that the mail received might be of interest to other household members. The relevance of mail to other household members is organized through particular assemblages of display, with each assemblage articulating particular relevancy statuses. Mail which a recipient deems to be of relevance to others in general is displayed in a public location, again shared and known in common, where it is plainly visible (see Display 3, for example). The precise location for such displays varies from household to household as display is contingent upon the particular material arrangements of domestic space. Common places include mantelpieces, bureaus, or tables, but other places may be used as the contingent arrangements of domestic space allow.

Mail that is deemed to be of relevance to a particular household member is often displayed in a different location that is relevant to the member in question: e.g. at the place he or she usually sits when relaxing, at his or her place at the kitchen table, or even outside a bedroom door. The recipient designed and accountable character of mail displays enable members to see at-a-glance that mail has arrived that requires their attention and action.



Display 4. Displaying mail of relevance to a particular household member (recipient's seat at kitchen table).

Opened mail that has been viewed is also displayed according to its relevance to practical action. The display of opened and viewed mail is ordered by the temporal flow of sorting work and the organization of mail into discrete groupings that reflect the actions required at-a-glance. Again, these displays are contingent on the material arrangements of domestic space. Mail for external use, such as they payment of bills for example, is placed in a location that reflects the need for external action: e.g. on a desk in the hallway, at the front of the kitchen table, or next to a bag that is

routinely taken along when a person leaves the house. Postcards, birthday cards and the like may, in contrast, be placed on the mantelpiece or windowsill.

Display 5. Displaying mail for external use.

Display 6. Displaying cards.

Mail for internal use is displayed in an alternate location: e.g. on top of the stereo, on top of the bureau, or at the back of the kitchen table. While particular locations vary from home to home, this latter arrangement is effectively a 'pending pile'. It may contain mail for external use if it is not of immediate relevance. When sorting through the pending pile it may also transpire that particular items are no longer relevant and so they may be thrown away.

Display 6. Placing mail pending further action.

Opened mail may accrue in the pending pile until it is felt that some further action should be taken. Further action may lead to the display or movement of mail to other discrete locations that are tied to the projected relevance of mail. Accordingly, mail may be displayed on a noticeboard (which may be nothing more than a designated space on a wall). Noticeboards are used as a place to display mail of short-term relevance: things like invoices, concert tickets, appointment cards and invitations, and longer-term information that is frequently consulted, such as school term

dates, restaurant menus, etc. Mail of longer-term relevance, such as mortgage statements, legal paperwork, financial affairs, etc., is filed away in dedicated location organized for storage and retrieval: e.g. in a bureau, drawer, or filing cabinet.

Display 7. Placing mail of short-term relevance.

4. THE EMERGENCE OF COORDINATE DISPLAYS AND DISTRIBUTED ECOLOGICAL NETWORKS

The instance makes it visible that household members construct a series of discrete yet interrelated situated displays at various sites around the home: at various positions on the kitchen table, on the mantelpiece in the living room, and on the noticeboard on the kitchen wall, *for example*. Not all displays have the same properties. The construction of display sites on the mantelpiece is qualitatively and purposefully different to those constructed on the kitchen table and noticeboard in this particular household. Here the mantelpiece is used only as a display site – no work is done there. Displays constructed at the kitchen table and noticeboard are, in contrast, designed by household members to *support collaboration*. Thus, and for example, on walking into the kitchen a member can see at-a-glance whether or not mail has arrived that requires their particular attention and action by its placement by another at particular sites – on the corner of the kitchen table, for example, or at the recipient's seat. Items placed on noticeboards may facilitate collaboration in subtler ways – invitations, invoices, concert tickets, and the rest are kept there and may be drawn upon as and when the occasion demands. However, and more importantly, like pending piles on tables, the contents of noticeboards articulate a *schedule of tasks* yet to be

completed and the visible presence of those contents maintains members concerted *awareness* of that fact. We think there is a distinct class of situated display in the home then (and we speculate in other settings too) that are designed by members to support collaboration. We call this class of displays **'coordinate displays'**, a category intended to convey the design and use of situated displays in and for the express purposes of collaborative action.

The instance also allows us to make the following observation about coordinate displays: 1) They are *ecologically distributed* or distributed at various physical and architectural sites around the home – in porches, on kitchen tables and walls, in living rooms on mantelpieces, etc. 2) these sites are interconnected and form in their connectedness discrete *networks* of coordinate displays, as can be seen in Figure 1.

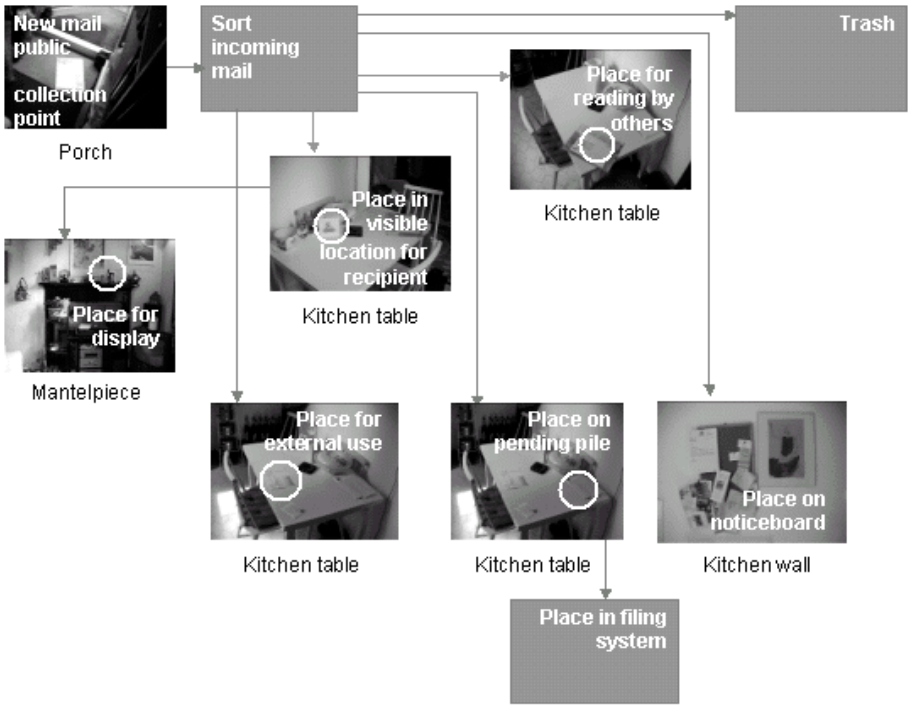


Figure 1. Coordinate displays and the emergence of an ecologically distributed network.

There is, then, a distinct phenomenon underpinning mail use in the home. It is one that we find across the homes in our studies that sees household members coordinate their activities amongst themselves and with others through the manipulation of the physical fabric of the home. This recognition complements and moves us beyond existing research on the spatial and temporal distribution of technology in the home (O'Brien et al. 1999) to draw our attention to a range of interconnected sites where displaying is done to support coordination. The distribution of mail across a

variety of distinct display sites, each reflecting the *action status* of mail, provides for *awareness* amongst household members and the *timely coordination* of activities. Items do not simply come into the environment and 'reside' at a particular site, but instead *move around* the environment from coordinate display to coordinate display according to an item's place in an unfolding order or *schedule of work*. Thus, and for example, a household bill may move from the porch to the bill payer's seat at the kitchen table to the front of the table from where it will subsequently be taken out of the environment and paid.

The instance offers a further observation too: 3) The social construction of coordinate displays is invariably subject to the dual contingencies of *architecture* and *aesthetics*. Even in 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 coordinate displays. We cannot say, then, just where or in just what places coordinate displays will be manifest in domestic settings generally, though over the course of time it may transpire that certain places such as the kitchen table or noticeboards are of reoccurring significance. We would suggest, however, that such a level of generality is not the issue. People do not live in homes in general but in their own particular environments and, as in the workplace, there is a need then for design to be responsive the particular needs of particular settings. Explication of the *locally organized* sites where coordinate displays are constructed through ethnographic study enables design to respond to the unique needs of particular settings and may help designers to identify candidate application 'areas' for design – i.e., to find *places* where new and future technologies might be best situated to meet local needs.

5. CONTINGENCY AND DESIGN

Although we cannot generalise specific local arrangements of coordinate display as a result of the dual contingences of architecture and aesthetics, we can nevertheless offer some broader insights informing the design of future technologies on the basis of the general existence of ecologically distributed networks of coordinate displays. In other words while we cannot generalise specific instantiations of the phenomenon as a result of the local contingencies to which it is invariably subject, that the phenomenon is generally available allows us to make some broad recommendations. In the context of home-oriented design, which our studies have been concerned

with, the construction of coordinate displays articulates potential application areas for design that *transcend* the individual and idiosyncratic arrangements occasioned by the dual contingencies of architecture and aesthetics. While sites for the construction and distribution of specific displays may change from home to home as a result of architectural and aesthetic differences, the actual construction of coordinate displays *is not so plastic*. Regardless of architectural and aesthetic contingencies members routinely construct coordinate displays to organize their activities (e.g. the paying of bills, attending school meetings or a party, etc.). It might be said that the coordination of action is conducted through the 'methodic' construction of coordinate displays, where the method of the matter is understood to refer to the routine construction of coordinate displays in such ways that regardless of architectural and aesthetic contingencies members can see, and see at-a-glance, that items so displayed (e.g. on the mantelpiece, stereo, or that part of table) are items for others in general, particular others, for internal use, and external use, etc. The methodic construction of coordinate displays is an essential feature of mail handling's orderly character and transcends the idiosyncratic and individual, illuminating the different and often subtle *types* of coordinate display (e.g. noticeboards and positional displays on tables) that are constructed by members to order particular *types* of activity (e.g. handling mail) in particular *types* of system-specific setting (e.g. a family home) and in such detail serve to articulate potential application areas for design.

Consider the development of electronic mail for domestic settings, for example, where existing displays are largely confined to a single screen situated in a fixed location in a corner or some other outpost of a room where the computer, transplanted wholesale from the workplace, often lives. Clearly, such interfaces ignore the spatial and temporal construction of coordinate mail displays across a variety of ecologically distributed sites in the domestic space. Projected arrangements of email utilising 3rd Generation mobile technologies promise to support recipient designed displays but, in being personally rather than ecologically situated, such displays do not support the collaboration afforded by the construction of publicly visible coordinate displays. In short, existing and projected displays of electronic mail are inadequate when faced with deployment in the home and they are inadequate as they fail to appreciate and respond to the orderly ways in which mail-based communications enter home life and are practically managed therein.

It is not fair to say that designers are unaware of the spatial and temporal properties of mail use when it comes to the design of email applications. In one of the earliest studies of email use, Mackay (1988) highlighted three essential functions of mail use: information management, task management,

and time management. The study made the point that these functions are essential features of mail-based communication and the spatially and temporally distributed construction of coordinate displays instructs us that the same applies to paper-based mail in the home. Attending to the temporal attributes of email use, Gwizdka (2000) also observes that emails are used to organize people's external memories, "they are 'knowledge in the world' and, thus, they should be designed to reflect the *actual life-cycle* of information in different tasks". Harper et al. (2000) concur and elaborate the essential nature of the 'actual life-cycle' in considering the implications of paper-based mail use for the design of electronic alternatives:

> … a letter in the geography of the home is a marker of what point a job-to-do has reached. Email might support this if the screens are located in places that equate to locations within the domestic workflow.

Members construct mail displays so that they can see at-a-glance where-they-are-now and what-needs-to-be-done-next in the *overall flow* of some job of work in an ethnomethodological sense of the word (e.g. receiving and paying bills, receiving and replying to a letter from a family friend, receiving tickets to and attending a concert, receiving legal letters and storing them for later use, etc.). The need to support workflow has already been recognised by researchers in the field (Venolia et al. 2001). However, this line of research construes of the user's primary 'habitat' (Duchenaut and Bellotti 2001) as the existing computer interface and seeks to implement solutions through the design of more sophisticated applications that support workflow at that interface. Our studies suggest that support is required in the wider environment - in the habitat *concretely*, not metaphorically, to augment the existing ways in which coordinate displays are constructed by members to handle mail and to get their work done.

What we are suggesting is that the development of computer support for the cooperative work implicated in mail use in domestic settings requires designers to move beyond the desktop and the monolithic interface to consider the design of ecologically distributed networks of interfaces that may be situated in a variety of places within the physical environment of the home to meet local needs. Figure 1, for example, has elaborated the main elements of an ecologically distributed network of interfaces constructed by household members to handle their mail-based communications. The network instructs us that workflow is ecologically distributed across the domestic space through the social construction of visible displays that reflect the current coordinates of a range of ongoing tasks in an unfolding schedule of work. Explication of the network raises the issue of developing a range of ecologically distributed interfaces exploiting both static and mobile displays

that may be situated in various contingent locations to support the spatial and temporal ordering of the flow of work in the home.

6. CONCLUSION

We have suggested that the topic of situated displays might best be appreciated in the context of the historical evolution of the interface. Accordingly, cognitive notions of the interface have been 'exploded' or respecified: from a site at which communication and interaction are articulated through the software control dialogue, to a multiplicity of socially constructed sites where workaday trajectories collide and where the act of interfacing or displaying goes on to provide for the coordination of work. These fragmentary sites are assembled by the members of a setting, who are embedded in concrete arrangements of cooperation and collaboration, through their working practices with the material technologies to-hand. Seen from the point of view of the act of displaying, a number of study questions that are foundational to CSCW research have presented themselves. These include establishing

- What displays already exist in a setting?
- Where are displays currently located?
- How are displays situated in a setting?
- Why or for what purposes are displays constructed?

We have suggested that these issues may be explicated through ethnographic study. That is, through the immersion of a fieldworker in the work of a setting and through ethnomethodological analysis of that work, where theorising is suspended and replaced with a concern to understand work in its own terms and in the orderly details of its material accomplishment.

Such studies are 'system-specific'. Tied to the settings they elaborate, they articulate the various types of display (e.g. noticeboards, positional displays on tables, mantelpiece displays, etc.) that are constructed by members to order particular types of activity (e.g. handling mail) in particular types of setting (e.g. a family home, in contrast to an old peoples' home). The system-specific character of situated displays illuminates potential application areas for design, as we have demonstrated through a consideration of future developments of email in the home environment. Furthermore, by attending to the act of displaying and the socially constructed ways in which that gets done, such studies draw our attention to a distinct class of situated display constructed by members to support

collaboration and enable us to furnish answers to the foundational questions of CSCW research posed above.

- The what of the matter: This consists of a variety of different displays constructed by members to coordinate the work of a setting. Coordinate displays are constructed out of the specific material technologies to-hand in a setting.
- The where of the matter: Just where coordinate displays are constructed in a setting depends upon the dual contingencies architecture and aesthetics the setting is physically composed of.
- The how of the matter: The coordination of a setting's work is made possible by the distribution of coordinate displays across the ecology of the setting to form a distinct network.
- The why of the matter: Ecologically distributed networks of coordinate displays are constructed to enable the collaborative management of work in, and flow of work through, a setting.

We emphasise these issues as they provide an orientation to the study of and design for situated displays. They also allow us to address the contemporary research agenda, which is concerned to transcend the monolithic interface in order to merge the digital with the physical. The ecologically distributed and networked character of coordinate displays draws attention to the physicality of settings and draws our attention to important features of cooperative work in novel domains. Explicating or making the social construction of coordinate displays visible opens up a fruitful avenue of research then, where design may explore technical ways in which digital technologies can augment, be embedded in, and otherwise support the orderly ways in which a wide variety of displays are constructed by members to coordinate their activities in a wide variety of practical settings beyond the workplace.

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