

Domestic Legacy and Design

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Abstract. A great many approaches to the design of domestic technologies are revolutionary in character, seeking to construct the home anew. By way of contrast we articulate a post-revolutionary perspective, which seeks to build the future on top of the domestic legacy. Treated as a legacy problem, design for the domestic environment is seen to rely on an appreciation of the social organization of the domestic space, within which systems are embedded and used. We address the methodological problem of making the domestic legacy available to design, advocating the adoption of a pattern language framework derived from the architectural evaluation of the uses of buildings. We consider the role of patterns of technology usage in a design context.

Keywords. Home, domestic legacy, patterns of technology usage, ethnographic studies.

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Introduction

The domestic environment is currently receiving a great deal of attention from commercial and academic computing sectors alike. Many approaches to design in a domestic context adopt what might be called a “revolutionary” approach to redesigning the domestic space through technological innovation. By this we mean that many approaches to design treat the home as something to be constructed anew. By way of contrast, we suggest that this “year zero” mentality ignores domestic legacy. The home is not a new institution but an ancient one whose organization changes gradually over time to meet the quotidian needs of its inhabitants. We suggest that rather than ignore this organization design should instead strive to build upon it (Mitchell 2000), not least for the reason that future technologies will inevitably be answerable to that domestic legacy. Indeed, the success or failure of technological innovations for the home might be seen to rely on their fitting into and adding value to the quotidian organization of domestic life that is our domestic legacy (Keeley 2001).

We are suggesting, then, that rather than construe of the home as a site for radical “revolutionary” innovations, a “post-revolutionary” perspective, which construes of the design of domestic technologies as a legacy problem and seeks to build evolutionary solutions “on top of” existing organizations of home life, is more appropriate to the challenge. Readily intelligible examples of legacy problems include the “millennium bug” and the introduction of the “euro”. On each of these occasions designers were compelled to get to grips with the requirements of future technologies by addressing *the constraints of the past and the present*, which are not purely technical in character (Gold 1998). Whatever technical characteristics computers may possess, they are embedded in an organizational context, which is essentially social in character. Naturally, the home is no exception, being a socially organized setting regardless of its non-commercial character (Venkatesh 1996). In dealing with domestic legacy issues we need not only to attend to technical matters then, but also, to the social organization of the home, which sets the constraints and elaborates requirements for technology usage.

We take it that addressing domestic legacy is a methodological problem. A problem, that is, as to how we might explicate, or make available to design, the quotidian social organization of the domestic environment? Workplace study methods appear to be highly inappropriate for

the task. The products of domestic life – people - are exceptionally valuable and their rationalities of production, efficiencies, labour costs, material needs, and the rest, cannot be adequately appreciated in terms of workplace criteria of production. Developments in evaluating the use of buildings in architecture seem more promising and have attracted considerable attention in a design context of late (Bayle *et al.* 1998, Erickson 2000; Hughes *et al.* 2000). At the heart of the matter lies the notion of a “pattern language” (Alexander 1979). Below we briefly address the architectural notion of patterns and our own adaptation of that notion to include the social organization of domestic technologies. We consider the role of socially organized *patterns of technology usage* in a design context prior to drawing our conclusions.

The emergence of a pattern language

The notion of a pattern language for design has its origins in architecture’s efforts to reconstruct itself through taking the adaptation and use of towns and buildings into account (Brand 1994). It specifically emerges from the work of the architect Christopher Alexander (1977). Alexander observes that towns and buildings are orderly places organized through reoccurring “patterns of events” that people take part in over and over again. Being in bed, having a shower, having breakfast in the kitchen, sitting in the study writing, walking in the garden, cooking and eating a common lunch, going to the movies, taking the family to eat at a restaurant, having a drink at a friend’s house, driving on the freeway, going to bed again are examples used by Alexander to illuminate the point. Although such patterns of events are implicated in the daily lives of individuals, a great many of them are not individualistic but organize “our lives together” as members of society –

they are the rules through which our culture maintains itself, keeps itself alive, and it is by building our lives out of these patterns of events, that we are people of our culture. (Alexander 1979)

Thus, and for example, each morning people get up, shower, eat breakfast, and drive down the freeway to work, where they together engage in other patterns of events, such as checking their

mail, attending meetings, or going for lunch, etc. A great many of the patterns whereby towns and buildings are organized are thoroughly social in character then. Patterns thus make available the social organization of towns and buildings.

Importantly, patterns of events are *tied to particular places* within a society: showering in a morning to the bathroom, eating breakfast to the kitchen, driving to the freeway (and not the sidewalk), for example. As Alexander puts it, patterns are always “anchored in space” –

I cannot imagine any pattern without imagining a place where it is happening. (ibid.)

Furthermore, the patterns out of which any particular place – a bathroom, a kitchen, a freeway, etc. – is made up are “rather small” or finite. The finite and architecturally-bounded character of patterns provides for their generalization. The notion of obeying red and green signals at traffic lights provides a widely intelligible example of the generality of patterns within a society. Gross generalities of the kind that typify a great deal of work in the human sciences are eschewed then. What is generalized and generalizable are the particular patterns of events which occur in particular situations located in particular places in particular societies.

The preliminary aim of pattern analysis in a domestic context is to identify the finite pattern of events that occur in and define particular places. In kitchens, living rooms, studies, and the other sub-environments that taken together comprise the home. Thus patterns provide a rich portrait of the social organization of the home, within which future technologies will inevitably be embedded and in various ways be answerable to. Identifying patterns of events is not the primary focus of pattern analysis, however, but the starting point for the explication of the domestic legacy. The primary aim of pattern analysis is to identify the socially organized *pattern of relationships* that obtain between events and the material arrangements of place: between cars and pedestrians crossing the road, between a person entering a building and the physical entrance, between people doing individual activities in a communal living room, etc. (Alexander 1979).

We extend the notion of material arrangements of place to include household technologies, which we construe of in the broad sense of the word to include such things as the humble pen and paper as well as sophisticated computing systems. As Venkatesh and Nicosia

(1997) put it, we need to look at a whole range of technologies in the home no matter how mundane,

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

Thus, and for example, in the course of “making breakfast” certain pragmatic day-to-day patterns of relationships become apparent and make technologically mediated organizations of domestic life involving kettles, toasters, microwaves, radios, TVs, newspapers, and the rest, available to design. Patterns of relationships reveal *patterns of technology usage* then. We take the explication of these patterns to be the goal of pattern analysis in a design context as they make the real world, real time social organization of the sub-environments that comprise the home available to consideration in the design of future technological arrangements of place.

Identifying patterns

It is one thing to theorize the characteristics of patterns, another to identify them as real world, real time features of the domestic legacy. How are real world patterns of events to be located and how are we to explicate the patterns of relationships that obtain between events and technology in real time? Being designed for the needs of architecture, Alexander’s observational framework is not adequate for the task. One potential solution is articulated by Venkatesh (1996). While agreeing with the ethnographic approach to the study of “actual patterns of use”, we have certain reservations regarding the analytic emphasis placed on the sociological functions of technology in the household/ technology model however. We are specifically concerned with the substitution of members’ formulations of meaning for analytic formulations of functional value. As Venkatesh and Nicosia (1997) quite rightly point out

technologies are not passive objects in the technological space, they are live, full of meanings for the members ... who use them.

The meanings members attach to technologies drive adoption and use. The use of desktop computers in the home, for example is motivated and regulated by the meanings members' attach to it - that the computer is an "educational" or "communication" tool or something that the kids "waste time" on, for example. It is not that the computer either assumes one of these meanings or the other but rather, at different times for different members it assumes all of these meanings, and its use is thus woven into the milieu of domestic activities: into the doing of homework, sending emails to friends and relatives, playing games and being turned off to stop the playing of games, etc. Members come to adopt technology and organize its use through the meanings *they* attach to it in the course of conducting their daily affairs. Thus, it seems to us, that analytic attention ought to be paid to members' formulations of meaning rather than be substituted for professionally defensible versions that gloss over the real world, real time social organization of technology usage.

LOCATING REAL WORLD PATTERNS OF EVENTS

Rather than develop a model of the home, we prefer instead to conduct, through ethnographic inquiry, ethno-methodological studies of work (Garfinkel 1986; Crabtree *et al.* 2000). While it may appear strange to talk of studying "work" in the home, we do so in the sense that domestic environment is a site characterized by ongoing practical activity: of getting up and ready for work in a morning, of taking the children to school, of receiving guests, making dinner, doing schoolwork, and all the other mundane socially organized events that "go on" in and "make up" the domestic environment. We take it that it is the sense of ongoing practical activity rather than paid labour in particular that the home may be characterized as a site of "work" then; that the work that takes place in the home is part and parcel of and elaborates the domestic legacy; and that design should, therefore, attempt to be responsive to that work as technologies will in various ways be embedded within the socially organized activities of the home and their use be constrained by them.

In undertaking studies of work in the home we are particularly concerned to locate the work implicated in the *routine construction* of domestic life. The construction of domestic routines enables household members to coordinate and (thus) conduct their daily activities in

an orderly rather than a haphazard way. In getting up in a morning, household members may take the same routine turns in using the bathroom for example, thus ensuring that they get to work on time. As the example indicates, routines are distributed around the various sub-environments that comprise the home and interwoven with the use of technology: the technologies of the bathroom (showers, razors, toothbrushes, etc) and the kitchen (toasters, kettles, radios, etc.) are implicated in daily routines of getting up and getting ready for work, for example (O'Brien *et al.* 1999). In this respect it might be said that routines articulate large or primary patterns of events that define particular places within the home, each of which is composed of smaller component patterns. The purpose of work study is to locate the primary patterns of events that occur in various sub-environments and compose a “base map” making those patterns and their components available to design (Alexander *et al.* 1977).

In our own work we have located patterns of technology usage through “video ethnography”.¹ Specially adapted digital cameras were placed in sixteen volunteer households and used to record everyday domestic interaction. Several key sub-environments (the kitchen, living room, and study where available) were “wired up” to facilitate continuous video and audio recording and constitute the locus of our current inquiries. Up to five miniature, low-light, variable focus remote cameras and video recorders were installed in each of the key areas and up to eight hours of video footage per day, per camera installation, was recorded. Recording equipment was installed in each of the households for a minimum of ten consecutive days per year over two-years. Camera positions and appropriate times for recording were decided following discussions with the families in their homes and with their agreement.

In both practical and procedural terms family members provided invaluable help. In many respects household members acted as adjunct researchers, determining when and where observations should be made. A member of each family was nominated “technical assistant” in order that the quality of the video could be monitored and that tapes could be changed daily. As the location of cameras was determined by members’ intimate “insider” knowledge of the

¹ <http://virtualsociety.sbs.ox.ac.uk/projects/morrison.htm>

setting, then so too, in their capacity as technical assistants, members' decided on appropriate times for scheduling recording. In addition to these activities, each household took part in individual and family wide interviews and viewings to explore ambiguities in the recordings and foster our understanding of their daily activities. Thus, in situations where the meaning of domestic activities was unclear, clarity was established through collaborative examination of the video materials in question.

The volunteer families came from a range of socio-economic brackets in the UK, although neither exceptionally poor nor wealthy families were included in the study (as none volunteered). The result of the "video ethnography" resulted in the capture of some 6000 hours of household activity, which is free from intrusion and bias to a remarkable degree. All but one of the families conducted their affairs without undue concern as to the presence of the video, being concerned to get their activities done rather than worry about what was going onto the video. In practical day-to-day details of "getting activities done", video ethnography furnishes investigators with fine-grained and phenomenally intact *in vivo* recordings of everyday family life. In contrast to a mass of notes, anecdotes, vignettes, and disembodied conversations which characterize traditional ethnography, video footage becomes the primary resource enabling direct investigation of the domain.

Importantly, and in the manner of Sacks' (1984) concern with audio recordings, video has the virtue that it is a "good enough" record of what actually happens in the home (and elsewhere), it can be replayed and so it can be studied in an extended way over a period of time, and others can look at what the researcher studies and make of it what they will should they disagree with the findings. Thus, not only can the researcher inspect the domestic environment in interactional details of actual lived events, anyone else can go and see whether what is said about those events by the analyst is actually so, and that, as Sacks reminds us, "is a tremendous control on seeing whether one is learning anything".

IDENTIFYING REAL TIME PATTERNS OF TECHNOLOGY USAGE

The approach we take to "learning anything" or extricating patterns from the video footage is descriptive rather than theoretical in character. Specifically, we seek to furnish "thick

descriptions” of the actual interactional events that have been recorded (Ryle 1971). Thick description stands in contrast to “thin description”, signifying the difference between mere behavioural accounts that describe only what can literally be seen and those characteristics which identify action as the practical action it recognizably is for members. As Ryle puts it,

[the] thinnest description of what the person is doing, e.g. pencilling a line or dot on paper ... requires a thickening, often a multiple thickening, of a perfectly specific kind before it amounts to an account of what the person is trying to accomplish, e.g. design a new rigging for a yacht.

In order to get beyond the thinnest level of description of what members’ are doing we are obliged to thicken the thin features captured on tape (audio and video alike) and we may do this by attending to and describing the “accomplishment levels” (ibid.) implicated in the production and recognition of meaningful practical action.²

The *prima facie* accomplishment level made available by the molecular sequences of interaction on an audio or videotape is 1) a grossly observable layer of talk and, more specifically, a layer of *conversational formulations* over the unfolding course of which members articulate what it is that they are doing, what event is going on, or what practical project of action they are together engaged in. This grossly observable layer of formulations constitutes the starting point for thick description of the practical actions that are occurring on the tape. The analyst’s first task is to describe those conversational formulations as they are hearably produced and recognized by parties to the talk (as questions, answers, objections, challenges, agreements, and the rest). While special methods of description may be employed (e.g. Jefferson 1978; Jordan and Henderson 1995) they are not required as formulations do not,

² Analytic attention to the accomplishment levels implicated in the production and recognition of meaningful action distinguishes our work from Geertz’s (1973) popular misreading of Ryle. Geertz employs the notion to inscribe generic conceptual or theoretical “structures of signification” upon everyday settings and activities. Like so many approaches to the study of social life, Geertz’s is a top-down approach whereas ours is a ground-up one that attempts to identify formal structures of practical action (patterns, processes, structures of signification, etc.) in the practical actions of members, rather than impose such structures upon action regardless of local orders of work.

in themselves, display the orderly work through which practical actions come to assume the recognizable character that they do for members (Garfinkel and Sacks 1970).

In order to explicate the meaningful character of practical action, the analyst need attend to a second accomplishment level and describe 2) the routine *work performed* by members' formulations. This is a feature of naturally occurring interaction that is partially eclipsed through the use of specialized methods of description, which focus on the way in which members' organize their formulations through various "turn-taking" mechanisms at the expense of the work done by members in taking-turns (Lynch 1993; Garfinkel 2001). Describing the routine work performed through members' formulations makes available for description a third accomplishment level, which consists of 3) the *reoccurring courses of practical action* or the "work-practices" whereby members order their work and which furnish the work its recognizable character (Button and Harper 1996). A fourth and final accomplishment level is made available by members' work-practices, namely 4) the *patterns of technology usage* constituted in the reoccurring courses of practical action through which members' order their work so that it comes to assume its recognizable character time and time again: as practical actions implicated in "making breakfast", "doing schoolwork", "entertaining guests", "watching TV", and all of the rest.

The notion of thick description of accomplishment levels is not to be taken as a claim to have furnished a complete and exhaustive description of all the factors that constitute the interactional dynamics of technology usage. As Ryle reminds us, "there is no top step on the stairway of accomplishment levels", hence there is a possibility to extend any description, infinitely. For purposes of our research, we believe that description of the four orders of accomplishment level outlined above are practically adequate however, as they serve to make visible just how and with just what material technologies domestic routines are "put together" or constructed in the real world, real time actions of members. Thick description of these accomplishment levels are adequate, then, as they make available for consideration in design the real world, real time interaction and concomitant patterns of technology usage glossed over and missed by analytic accounts that substitute members' formulations of meaning for professionally defensible ones (Button and Harper 1996).

Although essentially simple, this compact methodological account might be more readily appreciated by practical example. Take the following molecular sequence of interaction, for example.

1. Conversational Formulations

The mother of a young child (age three approx.) is cleaning the kitchen. She sits the child (Levi) at the kitchen table and gives her some junk mail to open.

Mum: Look, you've left your apple.

Levi is grumbling unintelligibly.

Mum: Stop making all that noise.

Levi: Will you get me some piece of paper?

Levi: Will you get me some piece of paper?

Levi: Will you get me some piece of paper?

Mum: Go and get your own up stairs.

Levi: No, I want you to get me some.

Mum: Oh wait a minute, I've got some down here.

Mum puts a couple of sheets of paper on the table along with a pencil. Levi picks the pencil up and starts drawing on the paper. Mum carries on with the housework.

Levi: Can I paint?

Levi: Can I paint?

Mum: No, not today 'cause we've got to keep the house clean.

Levi: I want to paint.

Mum: Not today.

2. The Work Performed by the Formulations

This simple interactional sequence begins with mum issuing a mild admonishment to Levi for not eating the apple she has been given. Levi responds in grumbling in an annoying childish way, which her mum instructs her to stop. Levi complies with the request and soon after asks in a very insistent way for some paper. Her mum instructs her to go and get her own paper but Levi refuses to comply, instructing her mother to get her some paper instead. Mum notices some paper close to hand and passes to Levi along with a pencil. After drawing quietly for a few minutes while mum gets on with the housework, Levi makes a request to paint, which is denied.

3. The Work-Practices Ordering the Work

The work is ordered, as one might expect given the age of Levi, through several rudimentary practices. First off, Levi is 1) sat at the table and given something to occupy her in order that mum can get on with the housework. Levi soon tires of the junk mail and 2) makes a request of her mum to get her some paper. Mum 3) turns down the request and Levi 4) restates it. Mum 5) complies with request and hands Levi some sheets of paper and a pencil. Levi starts 6) doodling while mum carries on with housework. Levi then 7) makes another request this time to paint, which is 8) denied. The work is basically ordered through issuing and responding to a series of rudimentary requests, a technique of interaction that many three-year old children have mastered.

4. The Pattern of Technology Usage

Although exceptionally simple and very unsophisticated, this simple molecular sequence of interaction makes a common pattern of technology usage observable. The kitchen table is a technology in the home and one *used as an activity center*. Rather more specifically, the kitchen table is a device *employed to coordinate activities* in the home. In the case above it is used to coordinate the actions of mother and child, being employed as a place to do drawing, and on other occasions, painting while mum gets on with cleaning the kitchen. Importantly, in this respect, the placing of the child at the kitchen table allows mum to monitor the child and so *maintain awareness* of the child.

Coordination and awareness are integral features of various patterns of table use in the kitchen. Other sequences of routine interaction make patterns of mail use visible and show that tables are used to display new mail and mail requiring action to household members, for example. Alternatively, the table is often used for doing schoolwork, enabling parents to assist, coordinate, and monitor the actions of children. In short, the table is an activity center around which many patterns of usage revolve. In attending to the molecular sequences of interaction that take place in and latch together to make up the various sub-environments of the home, a

corpus of empirical patterns may be assembled locating design in the quotidian patterns of socially organized events and technology usages that comprise the domestic legacy. The development of a common format for the presentation of patterns will enable the sharing of patterns across various “work” domains within a culture and across cultures.³

Patterns and design

In the context of software engineering patterns assume a prescriptive significance, directing the work of design (Gamma *et al.* 1995). We place patterns in a different part of the design process – the requirements phase – where they come to assume a different order of significance. Used to identify functional requirements for future technologies, patterns work as *resources* with which we may think about design. Used as resources rather than prescriptions for design, patterns play two roles or functions in the design process. On the one hand, they identify discrete *domains for design*. In the context of the home and our own work to date, the identification of patterns has enabled us to identify a number of discrete domains for the design of domestic technologies. These include: household management, security, awareness and coordination, education, and children’s activities. We have no doubt that as our investigations proceed further domains will be identified.

On the other hand, patterns work as resources for design in some very familiar ways, being easily assimilable into design practice in supporting *the construction of scenarios*. Take the pattern provided above, for example. As part of our work we have sought to design an arrangement of technology that is sensitive to the core needs of the pattern. A central feature of the pattern is the role of the surface as a place of coordination and activity. The children sought to play on the kitchen table (or the floor near the table). The location of the surface was a significant feature of this pattern and the surface played an important everyday role in the routine work of the home. The challenge then for designers is how to provide technology

³ See Hughes *et al.* (2000) or Martin *et al.* (to appear) for example. We are currently devising a similar format for the presentation of patterns.

which is sensitive to this legacy and which can be readily interwoven with the routine work of the home.

DESIGNING DEVICES FOR LEGACY SETTINGS

We have addressed this by considering how we may develop technological arrangements that can be readily configured to augment existing surfaces and spaces. Thus rather than develop a new table that incorporates some digital technology we articulate the problem as “how to we provide tools that allow people to augment their existing environment with new possibilities”. Rather than directly change the environment the shift to augmentation layers new functionality on top of the existing domestic legacy and aims to support the process of change by users.

In terms of the particular arrangements described in the pattern of the previous section we have designed and prototyped a device that allows users to make existing surfaces interactive. The device takes the form of a portable projector which can be moved around the home and which has an associated mimio device that allows existing surfaces to be made interactive (Figure 1).

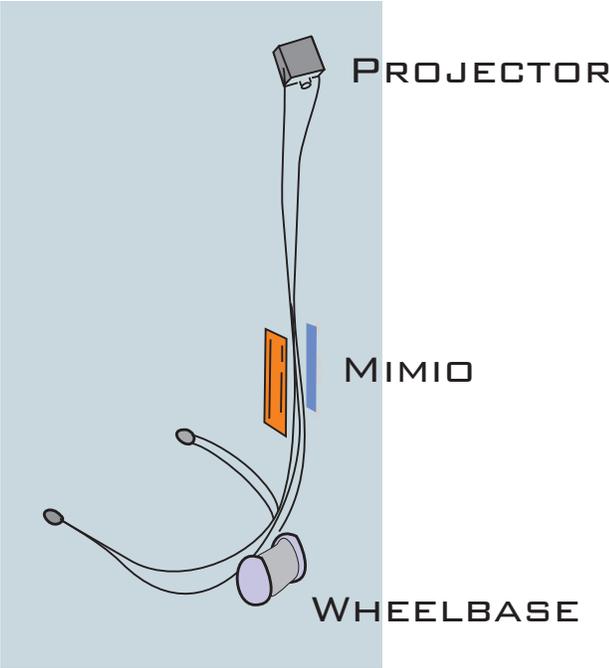


Figure 1. The interactive projector

This device seeks only to augment existing surfaces and exploits the legacy inherent within these surfaces. It builds upon the kitchen tables place within the domestic setting rather than replace it. The device is designed to be portable and to be readily configurable to add interaction to a range of different surfaces including floors and walls (Figure 2).

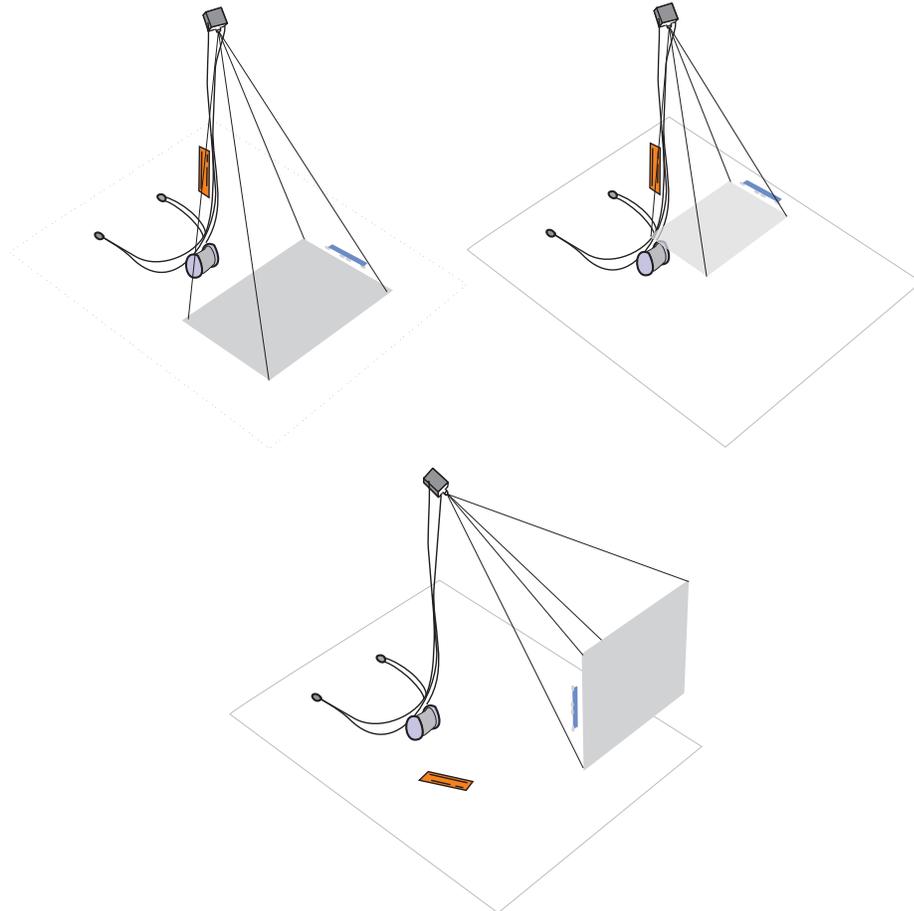


Figure 2. Different arrangements of the projector

By being sensitive to domestic legacy the projector represents a different class of device for the home. Existing information appliances are self contained artifacts to be added to the home. These include electronic notice board, smart fridges and electronic picture frames. In contrast the project builds upon the legacy of the home by adding to the existing practices that are anchored to the places and artifacts within the home. The projector makes no sense within the existence of the kitchen table and the practices surrounding it and seeks to support and augment these established routine practices that make up the domestic environment.

Conclusion

In this paper we have presented a approach to understanding domestic environments in order to inform design. We have presented an adapted pattern language framework to help in understanding the domestic environment. We have also developed a set of simple methodological policies to aid in the analysis of material drawn from the home. We have applied this approach to a series of video material from a range of domestic environments. As part of our on-going work we have started to design a range of devices that are sensitive to the notion of domestic legacy and are designed to augment our domestic arrangements rather than revolutionize these. In this paper we have presented one of these devices in the form of an interactive projector that can add computational features to existing surfaces within the home. The design and development of this devices represents a shift in the nature of devices for the home to consider the development of devices that are to be used as resources in the design of the domestic space by users themselves.

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