

Technology and the Home: Supporting Cooperative Analysis of the Design Space

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ABSTRACT

The home is a complex and as yet poorly understood environment. Methods developed to analyze the workplace seem inappropriate to the study of domestic life. As a result, a variety of new approaches and methods are starting to emerge that seek to be sensitive to domestic life. In this paper we present an adapted patterns framework for scoping domestic environments, complimented by targeted ethnographic inquiry. Our aim is to provide a means of explicating a social viewpoint that provides concrete empirical insights and resources for parties to draw upon and use in analyzing the design space.

Keywords

Domestic environments, ethnography, patterns of action and technology use, design space, cooperative analysis.

INTRODUCTION

A key research problem in designing for the domestic environment is understanding the everyday character of the home, how people live in the home, what they do when they are at home, and the potential role of technologies within the milieu of domestic activities. The home is a shared environment and many of the core design issues are predominantly *social* in character. Developing a concrete understanding of these issues in practice is central to the formulation of potential designs and over the last few years we have been developing techniques to convey this understanding to those involved in the design of digital technologies for the home.

Understanding the sociality of the design space has been a prominent feature of contemporary workplace design. However, we believe that the insights developed in designing for the workplace with its focus on efficiency and productivity are not easily transferable to the home. New approaches and methods may be required then, which are sensitive to the lived realities of life in the home.

The domestic is a huge domain – every bit as diverse and

complex as the workplace – and one that may be best understood through the use and development of a variety of analytic perspectives and methods. Essentially, it would be naive of us to believe that one single method will emerge to solve of the inherent design problems associated with the home. Rather we see a number of approaches being used in tandem offering a ‘cooperative analysis’ of the design space, where *multiple viewpoints*, including those of end-users, are brought to bear in the exploration, elaboration and resolution of design problems.

Insofar as our own contribution to this collective effort is concerned, then we propose that the sociality of the domestic might be explicated through ethnographic inquiry and the application of an adapted patterns framework. We offer the adapted patterns framework as a means of *scoping* an already complex and divergent domain of practical action and technology usage and, thereby, of identifying potential target areas for (re)design.

We emphasize ‘(re)design’ to point out that the domestic environment is already a complex technical domain, not necessarily in terms of digital IT systems but technical nonetheless (simply look around the modern home; contrast it with those in primitive cultures to see the immense technical and, simultaneously, social differences). Consequently, we take it that the development of sophisticated computing for the home will be required to build upon *existing social-and-technical-infrastructures*, which are as yet poorly understood.

THE ADAPTED PATTERNS FRAMEWORK

Following success in software engineering [8], pattern language frameworks have been championed by members of the HCI community as a vehicle for sharing design solutions [2,3,5,6,7]. The main focus of existing patterns frameworks is essentially retrospective in character, where the general aim has been to mine existing experiences in order to build a set of patterns that convey design problems and solutions to the wider community. Prescriptive solution-based patterns approaches have been complemented by descriptive patterns frameworks, which are concerned to illuminate, again retrospectively, work arrangements that commonly occur across a variety of settings, rather than design problems and solutions [10,12]. These patterns frameworks form part of a broader pattern

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based-approach to design where patterns are made available as a resource for design teams [9].

Our own work seeks to extend the concern with descriptive frameworks by shifting from a retrospective outlook to consider a prospective role for patterns in the design of interactive systems for the home. We are particularly interested in the use of pattern-based approaches as a means of structuring the *on-going analysis* of ethnographic material as part of an on-going process of design. Our aim, then, is not to re-examine previous ethnographic studies in the search for aggregated phenomena but to provide those undertaking ethnographic studies of the domestic environment with a *device for structuring and presenting* ethnographic findings in a way that supports the broader needs of design, particularly analysis of the design space [4]. The adapted patterns framework does not articulate problems and solutions, then, but is a vehicle for ‘capturing and conveying expertise’ [14], and more precisely, for reminding analysts of important social-and-technical-infrastructures that exist in the home when considering the question: what is to be built?

Although eschewing the conventional problem-solution focus, our turn to a patterns framework as a means of driving an on-going design process is informed by Alexander’s original work where the commonsense notion of *place* assumes a central role in the structuring and presentation of patterns [1]. Simply put, Alexander instructs us that patterns are tied to places (bathing to bathrooms, eating to kitchens, sleeping bedrooms, etc.) We take this observation to be foundational and to provide a distinct study policy: important social-and-technical-infrastructures that exist in the home might be explicated by attending to the patterns of action and mutually elaborative technology uses that occur in the particular places that make up the home.

Our use of such a framework in design is motivated by the appeal to and use of commonsense knowledge of patterns of action (or “typifications”) in everyday design practice [13]. Typification (shared knowledge of what persons usually do, what typically occurs in this place or that, how activities are normally conducted, etc.) is central to design and a descriptive patterns framework may provide a useful typification device, capturing and conveying knowledge of day-to-day activities, interactions, and technology uses in the home. Patterns support cooperative analysis of the design space by informing us as to what activities typically occur in particular places, how those activities are interactionally (socially) organized, and how technologies are implicated in the production and management of everyday activities constitutive of ‘life at home’.

Furthermore, the collection of patterns that occur in a place display a *bricolage of patterns* that coalesce around particular technologies. This coalescence draws attention to potential sites for design. The set of empirical patterns of use surrounding the kitchen table, for example, illustrate the way in which a pattern approach serves to support

analysis of the design space. Real world patterns of action and use inform us that the kitchen table assumes far more practical significance in domestic affairs than being an important place to eat meals and socialize [11]. In day-to-day praxis the kitchen table is an *activity center* around which a great many patterns of use revolve. These patterns inform us that the kitchen table has a number of important uses in the management of the everyday activities and interactions in the home.

- It is used as an *awareness center* where people place things they are required to take along with them when they leave the home. Thus, the table is used to coordinate domestic activities with the outside world.
- It is used as an internal *coordination center* where adults may monitor the doing of schoolwork by children and as a site where young children may be occupied (doing drawing, crayoning, painting, etc.) and monitored while adults get on with domestic chores.
- It is used as an *internal communication center* where mail is sorted and displayed to household members, where letters and cards are written, and where notes are jotted down and displayed.
- It is used as a *shared information production and management center* where shopping lists are constructed, bills are processed, account books and ledgers updated, etc.

Indeed, the kitchen table is used for a host of practical activities that are completely unsupported by current computer-based technologies in the home.

Other patterns in the kitchen inform us that the design space is larger than we might initially believe as the kitchen table, to continue with the example, is also *connected in action* to a range of other technologies: to noticeboards, calendars, diaries, etc., which raises the possibility of developing distributed systems, devices and displays in the kitchen and around the home. And if such systems and displays are developed, what of interacting with them via mobile devices from outside the home to further augment awareness, coordination, communication, and shared information production and management in the home?

Limitations of the Framework

Like any framework, ours has its limitations. These are essentially practical rather than ontological or epistemological in character. As noted above, the domestic is as complex and varied a domain as the workplace and so the framework is confronted by the problem of scale. Understanding the home, like work, will take time This does not negate the usefulness of the framework as a structuring and presentation device but draws our attention to the simple but brute fact that it will take many years of painstaking research to explicate a substantial corpus of knowledge of social-and-technical-infrastructures that exist across a wide variety of different kinds of domestic setting.

This, in turn, leads us to confront a second significant practical problem, namely, the constraints of design.

Research everywhere is conducted within designated time frames. This means that design is compelled to be selective, concentrating on particular aspects of domestic life rather than the needs of the home as a whole. The implication of this is that in its early stages the framework offers piecemeal views on the home according to the various research initiatives which drive investigation. Nonetheless, over time it might be expected that a considerable corpus of findings extending across the home and various settings might emerge.

The third significant problem we have encountered is in the use of video. We began our research with a large corpus of video data (some 6000 hours in total). Apart from the resources required to analyze this material (some 27 years, which puts such a task outside the constraints of design), the primary problem with such data is its partial character. The video was collected from cameras mounted in fixed locations, with the result that although a rich picture of life in the home is produced it is nonetheless incomplete as the fine, close-up details of peoples interactions are missed; as people move in and out of view; and as activities have a temporal order that extends beyond the recording cycle. In order to develop the kinds of in-depth understandings that design requires we have therefore been obliged to augment the findings produced through the application of the adapted patterns framework. This is not an inherent problem of the framework, however, but of the video data the framework is applied to.¹

AUGMENTING PATTERNS: ETHNOGRAPHY

Targeted ethnographic studies have been undertaken to augment the adapted patterns framework and explicate the specific organizational details of particular areas identified in analysis as relevant to design. This involves the close inspection and scrutiny of the social organization of specific activities in the home; activities such as sorting mail, annotating calendars and diaries, using photographs, etc. The aim here is not to collect a large number of studies of targeted activities but to examine one or two instances of their *situated occurrence* in *observable and reportable details* of their occurrence. The emphasis on detail prevents the provision of a practical example in such a short paper. The rationale underpinning the approach is well known in design however, and in CSCW in particular, where it has enjoyed considerable success under the auspices of 'ethnomethodological studies of work' [15].

Ethnomethodological Studies of Work

It may appear strange to talk of 'studies of work' given the questionable value of workplace approaches and methods to the study of the home. Ethnomethodology employs the notion of 'work' in a very specific sense however, in that it construes of the domestic environment as 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, ordinary, everyday and nonetheless crucially important practical activities and interactions* that go on in and make up life at home. We take it that it is the sense of ongoing practical activity and interaction, rather than of paid labor, that the home may be characterized as a site of 'work' that is amenable to study then. Furthermore, we take it that the work that takes place in the home elaborates existing social-and-technical-infrastructures in real world, real time organizational detail. Close inspection of the situated work implicated in the accomplishment of specific activities in the home thus provides concrete resources which may be used to elaborate patterns in fine detail and reason about the definite character of potential design solutions.

ACKNOWLEDGMENTS

This research was funded by the [Equator IRC](#) (EPSRC GR/N15986/01) and the EU Disappearing Computer Initiative [ACCORD](#) (IST-2000-26364). Follow the link for more information about [the adapted patterns framework](#).

REFERENCES

1. [Alexander, C.](#) (1979) *A Timeless Way of Building*, New York: Oxford University Press.
2. Bayle, E., *et al.* (1998) "[Putting it all together: towards a pattern language for interaction design](#)", *SIGCHI Bulletin*, vol. 30 (1), pp. 17-23.
3. Borchers, J. (2000) "[Interaction design patterns: twelve theses](#)", position paper presented at the Workshop on Pattern Languages for Interaction Design, *The CHI 2000 Conference on Human Factors in Computing Systems*, April 2-3rd, The Hague, Netherlands: ACM Press.
4. Crabtree, A., Hemmings, T. and Rodden, T. (to appear) "[Pattern-based support for interactive design in domestic settings](#)", *Proceedings of the 2002 Symposium on Designing Interactive Systems*, 25th-28th June, London: ACM Press.
5. Erickson, T. (2000) "[Lingua francas for design: sacred places and pattern languages](#)", *Proceedings of the 2000 Symposium on Designing Interactive Systems (DIS 2000)*, pp. 357-368, August 17th-19th, Brooklyn, New York: ACM Press.
6. Erickson, T. (2000) "[Supporting interdisciplinary design: towards pattern languages for workplaces](#)", *Workplace Studies: Recovering Work Practice and Informing System Design* (eds. Luff, P., Hindmarsh, J. and Heath, C.), pp. 252-261, Cambridge: Cambridge University Press.
7. Fincher, S. (2000) [The Pattern Gallery](#).
8. Gamma, E., Helm, R., Johnson, R. and Vlissides, J. (1995) [Design Patterns: Elements of Reusable Object-Oriented Software](#), New York: Addison-Wesley.
9. Granlund, Å. and Lafrenière, D. (1999) [A Pattern-Supported Approach to the User Interface Design Process](#).
10. Hughes, J.A., O'Brien, J., Rodden, T., Rouncefield, M. and Viller, S. (2000) "[Patterns of home life: informing](#)

¹ For more information about the adapted patterns framework see [4].

- [design for domestic environments](#)”, *Personal Technologies*, vol. 4, pp. 25-38.
11. Junestrand, S., Keijer, U. and Tollmar, K. (2000) “[Private and public digital domestic spaces](#)”, *International Journal of Human Computer Interaction*, vol. 54 (5), pp. 753-778.
 12. Martin, D., Rodden, T., Rouncefield, M., Sommerville, I. and Viller, S. (2001) “[Finding patterns in the fieldwork](#)”, *Proceedings of the Seventh European Conference on Computer Supported Cooperative Work*, pp. 39-58, Bonn, Germany: Kluwer Academic Publishers.
 13. [Sharrock, W.W.](#) and Anderson, R.J. (1994) “The user as a scenic feature of the design space”, *Design Studies*, vol. 15 (1), pp. 5-18.
 14. Vlissides, J. (1997) “[Patterns: the top ten misconceptions](#)”, *Object Magazine*, March 1997.
 15. [Suchman, L.](#) (1987) *Plans and Situated Actions: The Problem of Human-Machine Communication*, Cambridge: Cambridge University Press.