Patterns of Cooperative Interaction: Linking Ethnomethodology and Design

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Patterns of Cooperative Interaction are regularities in the organisation of work, activity, and interaction amongst participants, and with, through and around artefacts. These patterns are organised around a framework and are inspired by how such regularities are highlighted in ethnomethodologically-informed ethnographic studies of work and technology. They comprise a high level description and two or more comparable examples drawn from specific studies. Our contention is that these patterns form a useful resource for re-using findings from previous field studies, for enabling analysis and considering design in new settings. Previous work on the relationship between ethnomethodology and design has been concerned primarily in providing presentation frameworks and mechanisms, practical advice, schematisations of the ethnomethodologist's role, different possibilities of input at different stages in development, and various conceptualisations of the relationship between study and design. In contrast, this paper seeks to firstly discuss the position of patterns relative to emergent major topics of interest of these studies. Subsequently it seeks to describe the case for the collection of patterns based on *findings*, their comparison across studies and their general implications for design problems, rather than the concerns of *practical and methodological* interest outlined in the other work. Special attention is paid to our evaluations and to how they inform how the patterns collection may be read, used and contributed to, as well as to reflections on the composition of the collection as it has emerged. The paper finishes, firstly, with a discussion of how our work relates to other work on patterns, before some closing comments are made on the role of our patterns and ethnomethodology in systems design.

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1. INTRODUCTION: THE TURN TO THE SOCIAL

At CHI '90 Jonathon Grudin presented an analysis of the development of the 'interface' in his paper *"The Computer Reaches Out: The Historical Continuity of Interface"*. This heralded the ensuing 'turn to the social' in computer science research, particularly in the fields of HCI (Human-Computer Interaction) and CSCW (Computer Supported Cooperative Work). Grudin considers that HCI has passed through a number of stages in its history, suggesting that the focus of HCI has progressed from the fourth stage – dialogue with a user – to the fifth – dialogue in a social/organisational setting:

> "…with the advent of "groupware" and systems to support organizations, we are beginning to see the focus of user interface design extend out into the social and work environment, reaching even further from its origin at the heart of the computer."

In the following years, studies of various orientations which place an emphasis on understanding the detail of social settings as a means of informing design have been reported in the literature. This is particularly true of CSCW, where investigating and supporting the social is to a certain extent an intrinsic pre-requisite of design. The social, however, has also been of increasing importance for HCI, which traditionally followed the single-user-to-single-computer paradigm. Echoing Grudin, and as researchers have pointed out [e.g. Martin et al., 1997] even much of what has been characterised as single-user-to-single-computer interaction is bound up in a social situation. For example, it may well take place as part of organisational practices, within a working division of labour, and often is a *public phenomenon*, i.e. the usage is observable and understandable to onlookers.

The turn to the social has encouraged the use and incorporation of techniques, methods and theories from, for example, anthropology, sociology and social psychology. An important strand of this research has utilised participant-observational field studies (ethnographies). Ethnographic studies focus on building up an understanding of work or activity as it occurs, *in situ*. An important strand of these studies have an ethnomethodological[1] orientation [see Luff et al., 2000 for a review]. This orientation eschews employing a prior theoretical stance to the subject of study instead focusing on the details of the situation-specific practices through which work (or activity) is achieved by participants as a recognisable social accomplishment. When considering such an approach in relation to specific design projects, we have seen that the situation-specific approach is well-suited to illuminating on some issues for design in these specific settings [e.g. Hughes et al., 1992; Martin et al., 1998]. However, such an a-theoretical stance poses tricky questions when attempting to build up a repository of design knowledge based on extraction and comparison of findings across studies. It is this question to which we turned in our project on Patterns of Cooperative Interaction.

Our patterns of cooperative interaction highlight similar findings across studies related to particular socio-technical configurations, and the accompanying activities given those configurations. They start to address the question of how we generalise from ethnographic studies to provide guidance for system designers and other users. This paper provides some background and detailed reflections on our patterns collection, considering ethnomethodology, the patterns themselves, some experiences of use and how this all informs our ideas of how they may be used by researchers and professionals in relation to systems design. Indeed, one of our core purposes in this paper is to reach out to a wide range of professionals in the community of readership for ToCHI. We believe that patterns can be of relevance and practical use to researchers and practitioners from technical or social scientific backgrounds who have an interest in social aspects of systems design, as well as patterns having a more obvious relevance for ethnographers. They are specifically created as intermediary tools for design purposes.

[1] Originating in the work of Harold Garfinkel (1967)

They present findings in a uniform framework, which facilitates initial access to, and allows comparisons of studies, while maintaining deeper access to more complex details and the studies themselves. In this way, although the patterns themselves simplify and abstract findings, they are never divorced from the 'rich descriptions' from which they are derived.

Keeping this previous introduction in mind we have organised the rest of the paper into seven main sections. The first section (section 2) continues an introduction to the background research on which we based our work. It discusses research of an ethnomethodologically-informed nature that has relevance for systems design and focuses on both this relationship between study and design, and generalisation, as continuing pertinent topics – ones we seek to address with patterns. Also in this section we introduce a series of topics that have emerged from ethnomethodological studies, which are pertinent across settings and are incorporated in our patterns. In the following two sections (3 and 4), we introduce our patterns, providing a basic description of what they are, then describe how they are constructed and related to the topics introduced. In section 5, we discuss the patterns collection itself, describing some of the features of individual patterns. Then we focus on two (out of our current collection of 10) of the patterns and demonstrate how they may be used for purposes of analysis directed towards design questions. In the next section (6), we discuss our evaluations of the collection and present a scenario and suggestions for use that flow from these experiences. In section 7, we relate our work to the work that served as our inspiration for considering patterns as a bridge between ethnomethodologically-informed ethnographies and design – Christopher Alexander's work on patterns in architecture and urban planning. In this section, we reflect on where his work (and other patterns work in computing) inspired us and meshes with our project while acknowledging the ways in which it is distinct. In the final section, we reflect on the collection itself, it composition and make some concluding remarks on the relationship between ethnomethodology, patterns and systems design.

2. FROM ETHNOMETHODOLOGICALLY-INFORMED RESEARCH TO DESIGN AND GENERALISATION

Over the last ten years or so, we have developed a tradition of using ethnomethodologically informed research as a resource for systems design. This began with the well-known studies of aircraft control [ATC: e.g. Hughes et al., 1992; Bentley et al., 1992] and has developed over the years with studies in such diverse settings as ambulance control, banking and the small office [Martin et al., 1997; Martin and Rouncefield, 2003; Rouncefield et al., 1994] During this time, complementary work concerned with the relationship of these studies to systems design, and the development life-cycle, has been detailed [e.g. Hughes et al., 1994]. Furthermore, research has focused on the ways in which such studies may be organised and presented as part of the requirements process or within design or project meetings [e.g. Sommerville et al., 1993, Viller and Sommerville, 1999, Hughes et al., 1997a,b]. Other researchers in the tradition have also looked at the relationship between ethnomethodology and systems design [e.g. Button and Dourish, 1996].

2.1 The Problem of Generalising Findings

However, we have now reached a stage in this research program where we feel it is important to reflect on what the collection of studies tells us as a body of knowledge, going beyond topics that serve as orienting and organising devices (which are described below), to discuss how the actual details of work in particular settings relate to one another. For instance, are certain work configurations similar, and do they lead to similar activities? Furthermore, we need to present this knowledge in a manner that is useful and usable for a variety of professionals working in the field and with an interest in the findings of such studies. As researchers that are familiar with many studies and have long-running experience in

the field, we are aware that our widespread knowledge and experience benefits us when describing and analysing work in new settings. Furthermore, it aids in making what we find and document useful for software engineers or systems designers. We are also aware that to others, as a corpus, these studies can appear like a disparate collection, united by method and orientation but with findings peculiar to each particular setting. Informally, within the individual studies, findings are related to other work but often the relevance of studies to a new setting (or across settings) is not apparent to those less familiar with the work. The designer's or software engineer's problem, here, has therefore been one of seeing how particular findings in diverse settings may provide useful background for understanding or characterising work in different settings. There are elements of work arrangement and practice in call centres that may form a useful resource for thinking about work (and later design) in a control centre, or a council planning department. In setting up this project we were looking to set up a resource that would provide access to some of the connections across studies, and would illustrate the manner in which we make these connections[2].

From our studies, and other related research, a number of recurrent topics, that are of repeated concern to researchers across studies, have arisen. These provide a critical background to our patterns work but before delineating them we provide a basic description of the orientation to study.

The broadly ethnomethodological, ethnographic, conversational analytic (CA) and interaction analytic (IA) studies of work and technology which have been presented in the CSCW and HCI communities have, as their initial concern, a desire to document, describe and analyse work and activity as it actually occurs and unfolds. The general conception is, therefore, a focus on the everyday accomplishment of work or activity involving technology (broadly), computer systems, artefacts, objects, instruments, pens, paper etc. Such studies are concerned with how the order of work is socially produced – i.e. how this order is achieved, maintained and repaired. They are concerned with the role that action and interaction, between personnel, and with technology, have in the production of order. They are also interested in how the ecology of settings and the design of artefacts relates to the way work is carried out.

The preceding description succinctly captures the research orientation of ethnomethodology and some of its analytic concerns. This should be readily apparent to those well versed in ethnography and ethnomethodology. However, sometimes the mechanics of employing this approach can appear somewhat elusive to the wider HCI/CSCW community. Those less familiar with this approach to study may wonder how they should begin, what aspects of work they should focus on and how they should organise and present descriptions and analysis of work. To aid in this process, researchers have proposed various topics which can serve as both orienting and organising devices [see, for example, Anderson et al 1989; Hughes et al 1997a,b]. They provide both possible topics to focus study, and topical headings with which to organise the resulting analytic descriptions. For example, researchers may note the importance of the relationship between the ecology of the workplace and the activity undertaken, or direct readers to the activities by which coordination is achieved amongst a number of people. In a basic sense, such topics will be seen to be relevant irrespective of setting, i.e. how a setting is arranged will influence how work is achieved, and workers within a division of labour will have ways of coordinating their work. However, in any given setting *just how* coordination is achieved in relation to *what*, and in *what ways* layout affects, facilitates or constrains activities remains still to be discovered.

[2] The reader may notice that a deliberately *pragmatic* description is employed. This is because we are not theory building as this would go beyond the scope and philosophy of ethnomethodology. However, since design involves selection, formalism and a movement away from 'rich description' and patterns are meant to serve as *general* resource and an *intermediary* tool for design purposes, we suggest that it is perfectly reasonable to abstract and formalise sensitively for these *practical* purposes. Indeed the tension between abstraction and detail is precisely the challenge of patterns.

These topics or concerns can serve as a useful introduction to the perspective of ethnomethodological studies of work and technology as well as being a resource for orienting and organising such studies. We therefore present them together here, in a manner not done previously.

2.2 Sequentiality and temporality

Here the focus is on the actual, embodied achievement of sequencing, whether sequences are linear, parallel, recursive or whatever. That activities are part of a sequence, that things get done one after the other, that activities happen closely in sequence, further apart or have a precise placing is important to the meanings they have and the sense they make to those involved. Clearly linked to this is the importance of the temporal dimension to how action and interaction unfolds. Garfinkel argues that conventional theoretic accounts of action treat time as a 'fat moment' [1967], i.e. action and interaction is analysed without reference to any on-going temporal dimension. However, the fact that this happens now, as opposed to then (whenever that may be) is crucial for providing some of the sense (in terms of context) for the event. Within the flow of action or interaction the notion of how actions relate to previous actions and preface future ones is essential to understanding.

2.3 Working division of labour (egological-alteriological principles)

Many workplaces are characterised by an organisationally explicit, formal division of labour. The ethnomethodological 'take' on formal descriptions of divisions of labour is to offer a re-specification by including 'working' to focus on the fact that a division of labour must be achieved in practice, *in situ*. Where formal descriptions or representations of the division of labour and its operation exist there is often an interest in the relationship between these and the manner in which the division of labour works in practice. The 'egological' and 'alteriological' principles refer respectively to how individuals within a working division of labour, in an on-going fashion, firstly, delineate their work from the work of others. Secondly, they also orient their activities such that they fit with the work of others (or make other's work easier). Activities in, for example, the home may have a character that involves a division of labour but often this is more implicit and less formally planned or explicitly recognised.

2.4 Plans and procedures (representations)

We may usefully think of plans and procedures as being generally more formal and more explicit in the workplace, whether existing in documents, process maps or being embedded in artefacts (computer systems, checklists etc.) and so forth. Of course, this does not mean such things are not characteristic of other activities. However, often there is not the same orientation to these artefacts as a whole. On the one hand it is easy to state that plans and procedures do not capture the full details of work or activity as it is played out but the more crucial point is to examine the relationship between these and the actual 'work' undertaken. Where do they (and in what way), guide, constrain, drive action and interaction? How is action and interaction conducted as to orient to plans and procedures and so forth? Clearly, the relationship is variable - sometimes actors are strongly constrained by process and action has a more 'set' quality. Other times the relationship between the two is far looser.

2.5 Routines, rhythms, patterns (orderliness of activity in self-organising systems**)**

In many respects these features of activity should be seen in contrast to plans and procedures. Human activities have an order and an orderliness that follows routines, rhythms and patterns. Importantly, one should realise that this orderliness is something that is achieved in the doing rather than something that pre-exists situations. Often, such mundane (everyday) routines are not marked out (i.e. remarked upon), they are just carried out as such, with no explicit or formal representation. Indeed, their routine (and

ordered) nature can be revealed by the fact that noticeable deviations are marked out, commented on, shown to be non-routine, clearly repaired and so forth. Researchers (e.g. Tolmie et al., 2002; Crabtree et al., 2002) have been keen to discuss non-work related activity in the home in such terms. Patterns and rhythms capture similar aspects of activity, however here we are dealing with 'patterns' as they are used in everyday language as opposed to the specific 'Patterns of Cooperative Interaction'. 'Rhythms' (e.g. see Reddy and Dourish, 2002) too is similar, but nicely brings to mind the importance of the temporal dimension to activity.

2.6 (Distributed) coordination

The ethnomethodological studies of work and technology have commonly described the means by which people coordinate their activity, whether this is people working in a division of labour or collaborating in some activity. Studies may focus on coordination in fine grain detail or on a more general level. Coordination may be achieved face-to-face as in the workings of a team in a control room, or may be remote and distributed and achieved through technology, e.g. CSCW or CMC (computer mediated communication). Coordination may be a routine or regular feature of work or may be more ad hoc, happening occasionally. However, from an ethnomethodological perspective, coordination is seen as something that is *always occasioned*, that is motivated by something and is directed for achieving something whether the something happens often, or regularly or only now and then. It is not just the activities or means of cooperation that are of interest but what gives rise to it and what it is directed at achieving.

2.7 Awareness of work

This topic concerns the means by which co-participants in a working division of labour or in a concerted activity become aware and make others aware of important aspects of that activity for getting that activity done. For instance, looking at the methods by which participants make their activity available for others to pick up on, or looking at the ways in which participants seek out information on the activity of others. In face-to-face situations, being there, in a shared situation may provide a ready context within which awareness 'needs' may be worked out. In distributed situations such 'awareness work' may be computer supported or more explicitly achieved. Understanding how and why this works (or fails), has been an important topic in ethnomethodological studies of work and technology.

2.8 Ecology and Affordances

The arrangement of settings and the configuration of artefacts (pre-designed and designed through use) are related to the ways in which activity gets done, what participants can see, do, how they may interact with others and through which means. For example, co-location in part of an office may allow participants to oversee and overhear one another, providing on-going supervision of work, ready assistance and the ability to tightly coordinate activities. Distributed settings may create greater separation of activity or may require more work to coordinate activities or may require different types of support. A related notion is that of affordances, originally derived from the ecological theory of visual perception [Gibson, 1979]. Slightly different conceptions of affordances exist, but all are related to the way in which aspects of the environment and objects in it provide resources for the purposes of action and interaction. For example, a cup might be said to afford *picking up* and *drinking from*. Affordances can be thought of as residing in a relationship between person and the environment, i.e. it is through interacting in the environment that affordances in that environment (of objects etc.) become realised by people. This notion of affordances can be contrasted with versions (that we oppose) where the environmental aspect of affordances is considered to be necessarily visible rather than learned. The

ethnomethdological perspective on affordances stresses their inherently social, as well as learned, nature [Sharrock and Anderson, 1992]. It is through being regular participants in a setting that people can readily infer details on the status of work and what other people are doing through looking and listening. The competent member can look at another worker looking at a screen and know that they are working on the dispatch of an ambulance or can tell that a pile of paper in that person's in-tray means that there is a backlog of invoices to be signed off.

3. PATTERNS OF COOPERATIVE INTERACTION

Patterns of Cooperative Interaction are importantly related to the topics outlined above. They are our attempt to deal with the problem of abstraction and generalisation of findings from ethnomethodologically-informed studies, for the purposes of comparison and re-use in new design situations. They are descriptive in nature but can be put to generative use. By thinking about how the patterns relate to a current design situation the researcher can gain analytic leverage on socially-oriented design problems. These features are illustrated later, but firstly we need introduce them and outline the basic structure of the patterns and our collection of them.

Patterns of Cooperative Interaction can be basically thought of as ways of highlighting regularities in the organisation of work, activity and interaction amongst personnel taking part and with, through and around artefacts. They were discovered through studying the fieldwork corpus, and looking for examples of phenomena that were similar across at least two different studies. We now have a collection of ten patterns each presented with a front page summary description, with access to further pages in which specific instantiations of the pattern are documented (we term these 'vignettes' and they show details of the pattern from specific studies)[3]. Thus, the pattern as a whole is composed of specific vignettes as well as an abstracted 'front page' description that unites the vignettes. At the 'deeper' level of vignette they can be thought of as having two major components. The first component is a textual description (and sometimes a pictorial representation) of a socio-technical configuration of people and artefacts in a particular setting. The second component is a description of the social practices by which work is achieved given that configuration. At the 'higher' level of the front page, we provide a more abstracted description that pulls together the vignette examples, discussing what makes them similar and what differentiates them. Also available from the front pages are hyperlinks to access the specific vignettes, a short paragraph on why we drew attention to the pattern ('Why useful') and some design considerations that arise from the pattern (in a section termed 'Design for dependability').

Patterns are inspired by the findings of workplace studies. Studies highlight aspects of practice given certain socio-technical configurations. In creating our patterns we extract a finding from an initial study to create a vignette and see whether comparable configurations and practices have been noted elsewhere. If so, we can produce a second vignette, and from that derive a front page and a completed pattern that may be refined, and expanded by adding further vignettes. Patterns are an explicit device for comparing and contrasting findings from different settings as a means of demonstrating the analytic orientation of our work and the relevance that findings can have across settings. In producing our collection we have previously detailed how we went about finding and presenting patterns [Martin et al., 2001] and one way in which they might serve as a resource for design [Martin et al., 2002]. We also have a related site that details a series of patterns from a study of software development using eXtreme Programming (XP) which are in turn related to patterns on the main web site. The XP site serves to demonstrate how a series of potential patterns might be derived from a single study[4].

[3] http://www.comp.lancs.ac.uk/computing/research/cseg/projects/pointer/pointer.html
[4] http://polo.lancs.ac.uk/pointer/

Now that our collection is of a reasonable size - a size where it forms a useful resource and a size at which we would like to open it up for public contribution - we feel it is important to provide a paper that addresses the important issues this raises. As part of opening up this collection we have recently cloned the main website onto wiki web pages[5]. Wiki web pages (also used on the XP site) are editable by any viewer/user on-line. Templates for adding to the collection are accessible from the home page and we are expanding our departmental use of them and would like others across the computing community to contribute in the future. To aid in the opening up, dissemination and use of our collection we have written the rest of this paper as follows. Firstly, we explicitly elaborate how our patterns are related to the previous studies and specifically the major topics identified earlier. We then describe how the collection is organised, present some actual examples of patterns, detail the different ways in which it has been, is being and may be used, reflect on its emergent structure and properties and discuss how other researchers may like to and be able to contribute to the expansion of the collection. We then describe where, and where not, our work is related to the work of Christopher Alexander and other work on patterns, before finishing with some reflections on how all of this work may serve for design.

4. FROM RECURRENT TOPICS TO PATTERNS OF COOPERATIVE INTERACTION

The work of ethnomethodological studies in systems design is all about furnishing *concerns, interesting and illuminating examples, cautionary tales* and about providing *suggestions* about what aspects of work might be looked at, and from which orientation. As described earlier (section 2), the topics identified can serve as both orienting and organising devices for such studies which may also help in the communication of findings by ethnographers to technically minded researchers and designers. Previous studies utilising subsets of these topics for these purposes have reported comparative success (e.g. Hughes et al. 1997a,b). Hopefully (and already so to a certain extent) they provide a *lingua franca* for communication between systems design practitioners from various backgrounds. Therefore, listing them and re-iterating their details should hopefully be useful for the range of ToCHI readership who have an interest in social aspects of design.

In that they help orient the focus of a study and provide a basis for organising the analysis they provide a short cut into ethnographic (and ethnomethodological) work for those of different backgrounds. For example, the comparatively 'novice' ethnographer can use the topics to orient initial study. They can begin by collecting materials (detailed notes, audio/video recordings, photographs, screenshots, manuals etc.) on 'real-time real-world work'. They can focus on collecting materials that capture how collaboration unfolds over time, how work relates to the ecology of the setting, the meaning actions and artefacts have in the workplace, and so forth. In turn, the topics can then serve as an aid (either used explicitly or implicitly) for organising and analysing these materials. The analysis, as derived from the materials, may then be directed at explicating, for example, just how the working division of labour is played out, how participants coordinate their work, and how the layout facilitates certain practices and constrains others and so forth? From there, basically, design implications are usually produced by considering which aspects work well against situations where problems occur, highlighting important aspects of how the work gets done to support, and thinking about how they might be supported.

Given this background, it is clear that the recurrent topics introduced in section 2 are quite strongly related to the Patterns of Cooperative Interaction. They are incorporated into the descriptive framework for the vignettes that are integral to the patterns. The topics have a 'context-free and context-sensitive' nature. In that they are context-free they have been incorporated into the framework which is used to

[5] http://polo.lancs.ac.uk/patterns/

describe all of the vignettes. In that they are context-sensitive their specific realisation in any given vignette is peculiar to that setting. In providing a front page 'abstraction' for each pattern we both bring together and slightly differentiate the separate vignettes. The descriptive framework for each of the vignettes consists of five dimensions; 'cooperative arrangement', 'representation of activity', 'ecological arrangement', 'coordination techniques' and 'community of use'. To understand how the framework is composed, we have basically described the patterns at the level of vignette as being composed of the following two components:

1. A textual description (and sometimes a pictorial representation) of a socio-technical configuration of people and artefacts in a particular setting.
2. A description of the social practices by which work is achieved given that configuration.

From this we can show just how the components are catered for in the framework. The socio-technical configuration is described textually, in a basic sense, under the first heading, 'cooperative arrangement' and may be also drawn pictorially under the heading of 'ecological arrangement'. At the moment this second pictorial representation of socio-technical configuration is not considered to be essential however we may re-consider this in the light of on-going research that we will discuss later. The second component – that of the social practices through which work is achieved – is catered for under the headings 'representation of activity' and 'coordination techniques'. Representation of activity' not only deals with how the activity is represented but how this relates to how the work is carried out. 'Coordination techniques' details the practices through which group work is achieved.

The framework allows the recurrent topics, discussed in section 2, to be represented. Recall that these topics are:

1. Sequentiality and temporality
2. Working division of labour (egological-alteriological principles)
3. Plans and procedures (representations)
4. Routines, rhythms, patterns (orderliness in self-organising systems)
5. (Distributed) coordination
6. Awareness of work
7. Ecology and affordances

Dealing with the first two topics, although 'sequentiality and temporality' and 'working division of labour' are not specifically instantiated in the framework they form the backdrop of how such studies focus on the 'real-time' nature of work and how such work is an on-going achievement of coordination and differentiation between co-workers. 'Plans and procedures' and their relationship to actual practice, routines etc. are explicitly dealt with in 'representation of activity'. We have not dealt with 'routines, rhythms and patterns' separately as patterns of cooperative interaction were originally conceived of as relating to studies of work only. Of course, routines, rhythms and so forth punctuate work, however, in work there is a relationship between informal practice and formal procedure that is dealt with in 'representation of activity'[6]. '(Distributed) coordination' and 'awareness of work' are explicitly covered in 'coordination techniques', i.e. how is work coordinated and how do workers become aware

[6] Following on from this, we suggest that for patterns of cooperative interaction relating to non-work activities, 'routines, rhythms and patterns' could be substituted for 'representation of activity' since this topic deals with activities in which plans and procedures are not formally specified.

of one another's activities? 'Ecology and affordances' is explicitly dealt with in 'ecological arrangement'. At the moment 'ecological arrangement' may detail a pictorial representation of the socio-technical configuration as well as details of office arrangement, artefacts their affordances. The final dimension of our framework – 'community of use' - does not specifically relate to the topics or particularly to the components, apart from that it is a basic description of the characteristics of the 'user group' involved. However, it was considered important to have basic details of this.

The framework was produced through group discussion of studies, topics, patterns and so forth here at Lancaster. Group members were asked to produce their idea of a framework based on these discussions and then through a further iteration we reconciled individual contributions into the framework set out above. A framework such as this is always a 'forcing device' to some extent and as may be clear from above (e.g. with ecological arrangement) we are still considering further refinement. However, we have found it to be practically usable and useful for our project thus far.

Considering again the relationship between the topics and patterns, we can see them as complementary resources. The topics may be used as orienting and organising devices for study. If explicitly used as such, the final product is conceived of as a 'rich description' and analysis of work in a setting that is organised around discursive topics such as how work sequentially and temporally unfolds, how the working division of labour is made manifest and so on. In a workplace, different findings from different areas, or different local configurations of workers might well be subsumed under a single topic. And, of course, different aspects of the operation of a local configuration might be covered under different topics. In basic, or rough terms, patterns would cross-cut a descriptive structure based on the topics. When we find something both interesting and illuminating about the way a socio-technical configuration operates, we extract it and describe it according to elements of the topics as described. One, of course, could organise an ethnography according to the topics and then extract a pattern (or patterns) by piecing together an example of socio-technical configuration operation by selecting the pieces that relate to it from under the topical headings. Indeed, this would be one way to slightly 'formalise' and structure an analysis without making it mechanical.

We clearly had the topics in mind when searching for patterns, although in picking them out, we, more instinctively than programmatically, sought to present some interesting and useful findings across a series of studies together, in a uniform format, with comparisons and some design considerations. Patterns, therefore, serve a crucially different purpose than the topics. They are a resource that places the findings of studies together rather than serving to aid in the organisation of a particular study. We do believe and have shown (as will be discussed later) that they can be usefully employed on a single study or in a specific design project as well as being this more general resource where findings from different studies are presented together. Several vignette components of patterns may be derived from a single study as shown in the examples themselves and in, for instance, the XP website discussed earlier. However, these lists of vignettes from studies are not comprehensive ethnographies, rather, they are certain selected 'highlights' of the studies. The greater analytic thrust of patterns comes in noting the similarities and differences across the vignette examples of the 'same' pattern. This focuses the mind on the situation-specific nature of work while at the same time provides possibilities for considering how work and technology might be re-designed, particularly where one vignette describes a configuration that works well and another where problems occur. Even when such a comparison is not possible, considering the other vignettes may produce some design inspiration or ideas for tweaking the 'system'[7]. We shall return questions of use (and to evaluation) in more detail in the following sections but firstly we will introduce the collection itself.

[7] In that they are 'highlighted' and that they contain comparisons which are meant to aid thinking about design, patterns are the intermediary design devices discussed earlier.

5. THE PATTERNS COLLECTION

In a general sense, the Patterns of Cooperative Interaction collection provides a different point of access to the corpus of studies. This access arrangement places findings as the entry point into the material rather than access through the studies themselves, or through conference proceedings, or searches of abstracts. The patterns are presented in a structure which seems to make pragmatic sense. They are presented in a series of web pages with the full list of patterns on a front page. The full list is currently as follows:

1. Artefact as an audit trail
2. Multiple representations of information
3. Public artefact
4. Accounting for an unseen artefact
5. Working with Interruptions
6. Collaboration in Small Groups
7. Receptionist as a hub
8. Doing a walkabout
9. Overlapping Responsibilities
10. Assistance Through Experience

Each pattern name is a hypertext link which takes the user to a front page for the pattern in question. This front page contains various information, as introduced previously. Firstly a high level description of the phenomena is provided under the heading *"the essence of the pattern"* subsequently below this are three more sections entitled *"why useful?" "where used?"* and *"dependability implications?"*. *Where useful* details (in basic terms) why we have chosen to draw attention to the pattern (the particular phenomena). *Where used* details the two or more specific fieldwork settings we have found examples of the pattern in, and also some brief remarks on similarities and differences between the settings. Finally, as discussed, *Dependability implications* is used to make some comments about what the identification of the pattern may mean for certain questions concerning 'good', usable, dependable design. Again, as they are noted in the 'where used' section, the named specific examples on this screen serve as hypertext links to the individual study examples of the patterns, the *vignettes*. Navigating to this level, the reader accesses a greater level of specificity/particularity. Each instantiation (vignette) is described according to the five topical headings as described in the previous sections. As we develop our collection we are making each reference available from the pages containing the actual examples and intend on making the actual studies (where possible) available as downloadable files.

Our patterns are best viewed on-line as we specifically designed them as a hyperlinked, readily browseable, web-based resource. However, to provide the reader with a more concrete idea of what our patterns are, in this section we provide more detail and some actual example web pages. All of our patterns focus on work practices and interactions and how various work and technology configurations give rise to these, facilitate or constrain them. Broadly speaking there are patterns where we focus most particularly on different artefact designs and placements and their relationship to work practices and interactions (*Public Artefact, Multiple Representations of Information, Artefact as an Audit Trail, Accounting for an Unseen Artefact*). The rest of the patterns may be thought of as slightly less focused on specific artefacts but rather on how ‘work’ and ‘job’ design are related to actual practices and interactions given certain configurations (*Working with Interruptions, Collaboration in Small Groups,*

Receptionist as a Hub, Doing a walkabout, Overlapping Responsibilities, Assistance Through Experience).

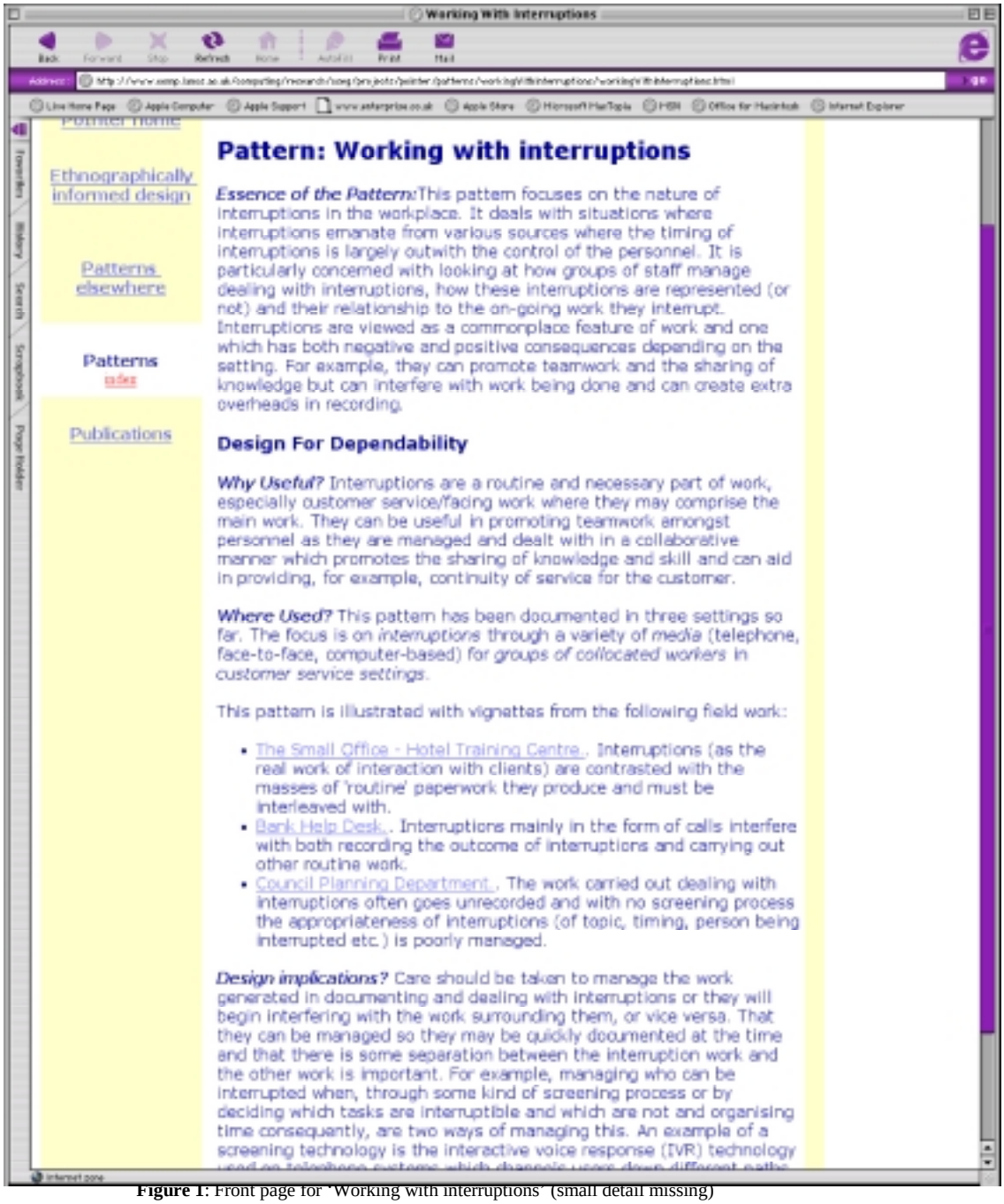

Figure 1: Front page for 'Working with Interruptions' (small detail missing)

Our two examples are derived with one from each 'sub-group'. The first (presented fully) is 'Working with Interruptions' (figures 1-4, see previous, this and following pages). This pattern is concerned with situations (so far in service industries) where personnel have to manage to interleave

computer and paper based work in the face of multiple, various source, media (e.g. face-to-face and telephone) and topic interruptions. How the staff deal with interruptions in a practical sense, what the problems are and what works well is detailed. Such workplace arrangements are fairly familiar and the pattern and vignettes provide a resource for thinking about design in situations where similar issues are pertinent.

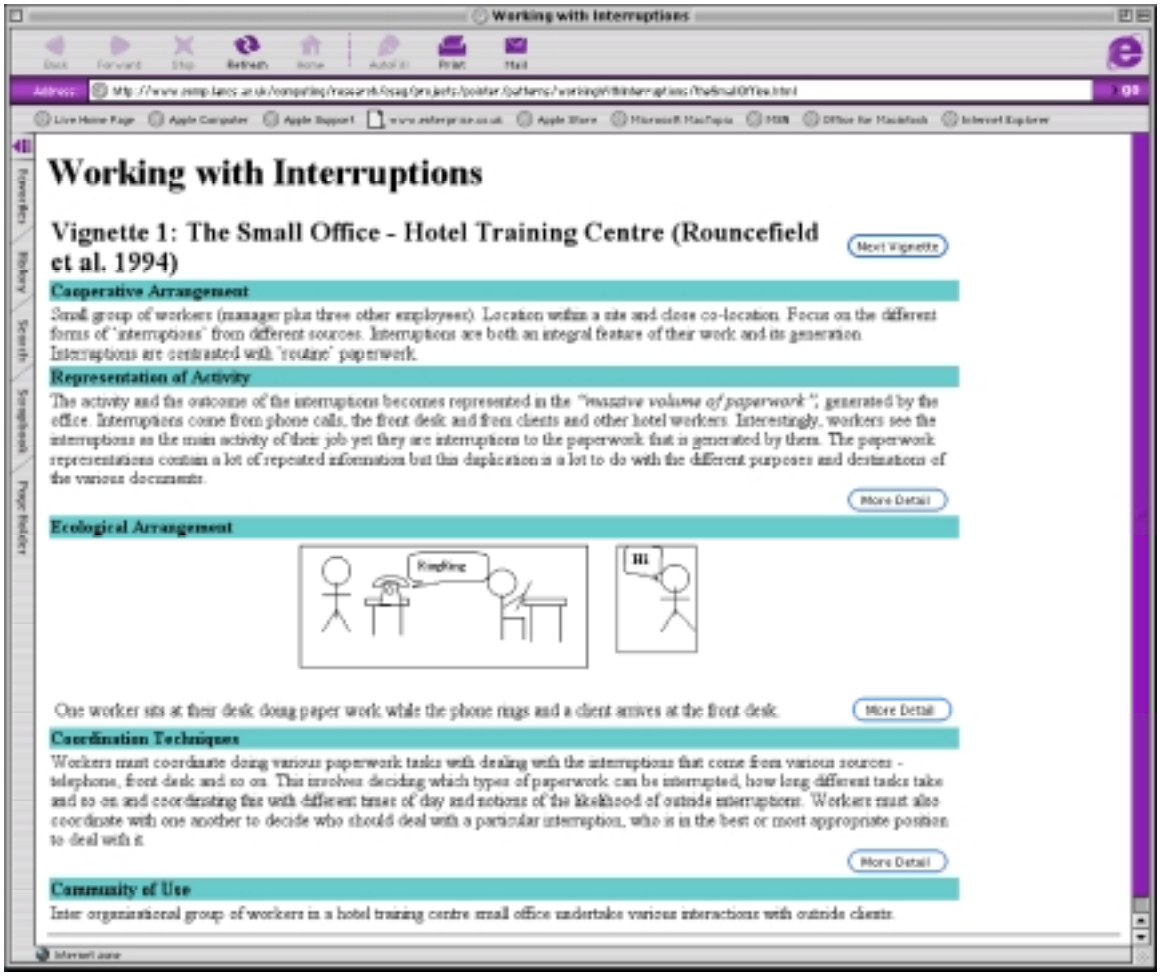

Figure 2: First vignette for 'Working with interruptions

The first specific vignette (above) was provided by Rouncefield and colleagues [1994] in a paper actually called "Working With Constant Interruption". The study was of a hotel training centre reception desk and focused on how the frontline reception work (face-to-face and over the phone) produced 'massive volumes of paperwork'. Slightly ironically the 'frontline' work became a set of 'interruptions' which had to be managed skilfully in order that the paper work could be successfully completed and forwarded.

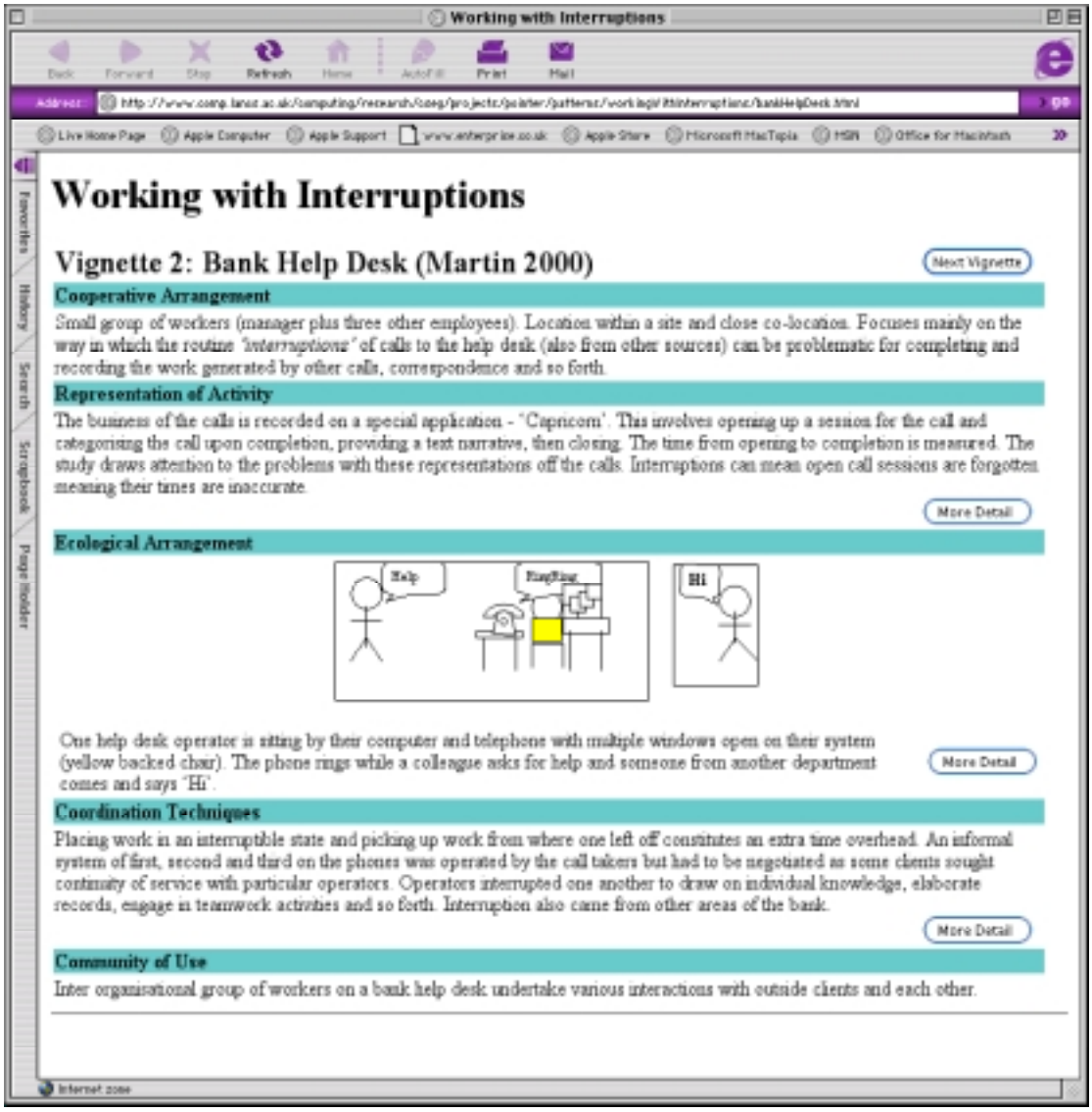

Figure 3: Second vignette for 'Working with interruptions'

The second study focuses on the work of a software help desk in the bank. This time the concern was once again with the management between the work required to deal with the interruption and the work it produced. Here, however there was quite a strong focus on the call recording system and the requirement to record calls in various ways.

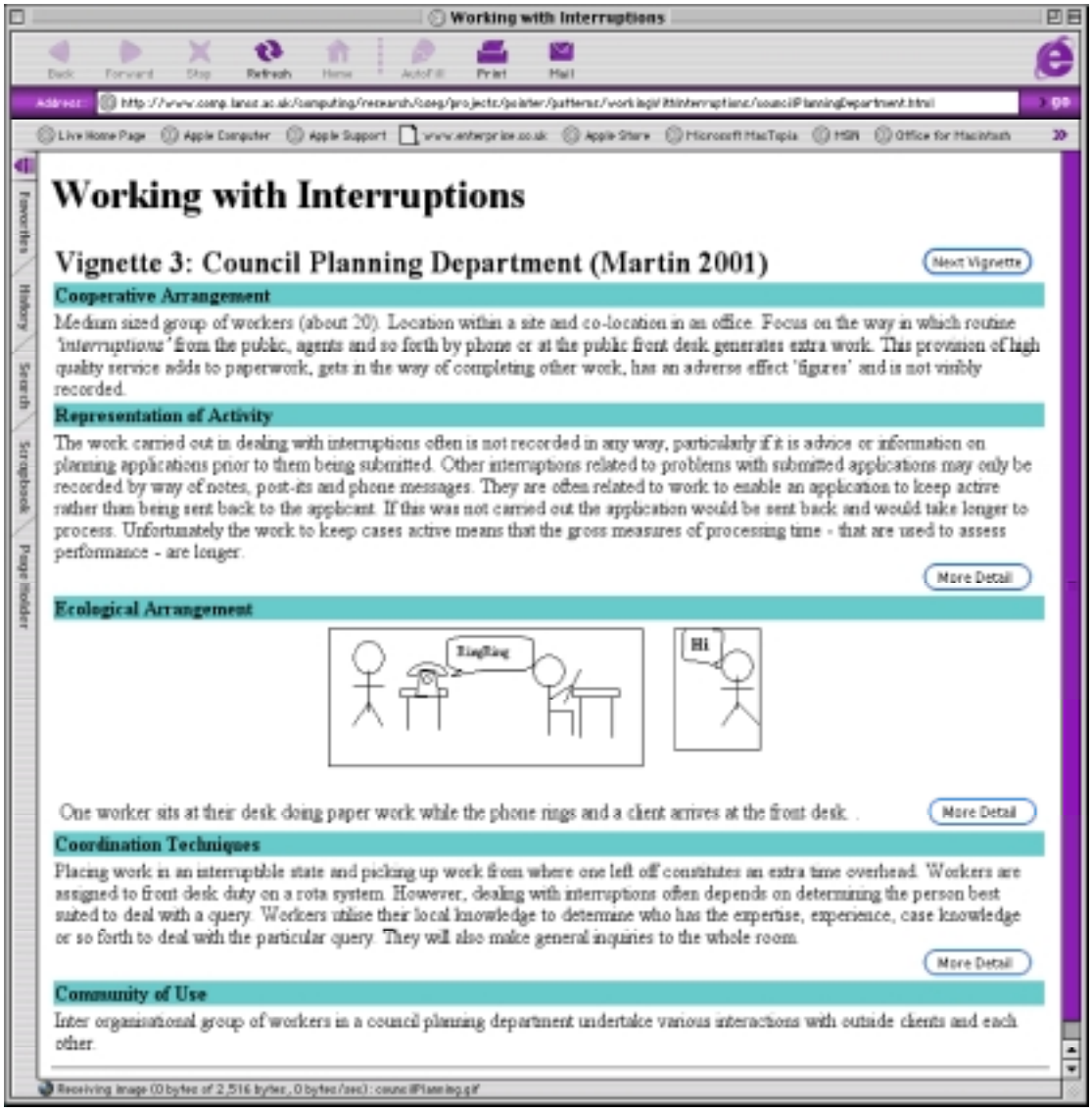

Figure 4: Third vignette for 'Working with interruptions'

The third vignette is derived from a local government council planning department where the focus was particularly on a contrast between interruptions from an inside source and those which were external. Inside source interruptions were often positive in that they could be negotiated and often were about sharing knowledge and expertise. External interruptions were unpredictable, often either inappropriate or directed to wrong staff member but still had to be dealt with. Taken as a whole the pattern provides considerations for such service work settings. For example, designers should concern themselves with the separation or interleaving of other work (e.g. paperwork) with the work of dealing with interruptions - what is interruptible, what needs to be separated, should there be a separation of jobs, or by shift or whatever? Furthermore, it raises questions on the utility of rigorous interruption (call) recording procedures and suggests organisations may gain from screening and filtering interruptions.

With the full Working With Interruptions example we have tried to provide a flavour of what we are trying to achieve with the patterns - building up a collection of findings where similar phenomena are grouped together. In the vignette summaries we can see that certain issues and problems are highlighted - which can provide a useful design resource when encountering a novel situation with similar features.

Our second example is "Accounting for an Unseen Artefact" (figure 5). Here we only provide the front page for reasons of space. This pattern deals with the now fairly familiar set up where an operator interacts with a system while dealing with a customer or client over the phone. Such a set up is routine in call centre work across various service industries as well as control centre work.

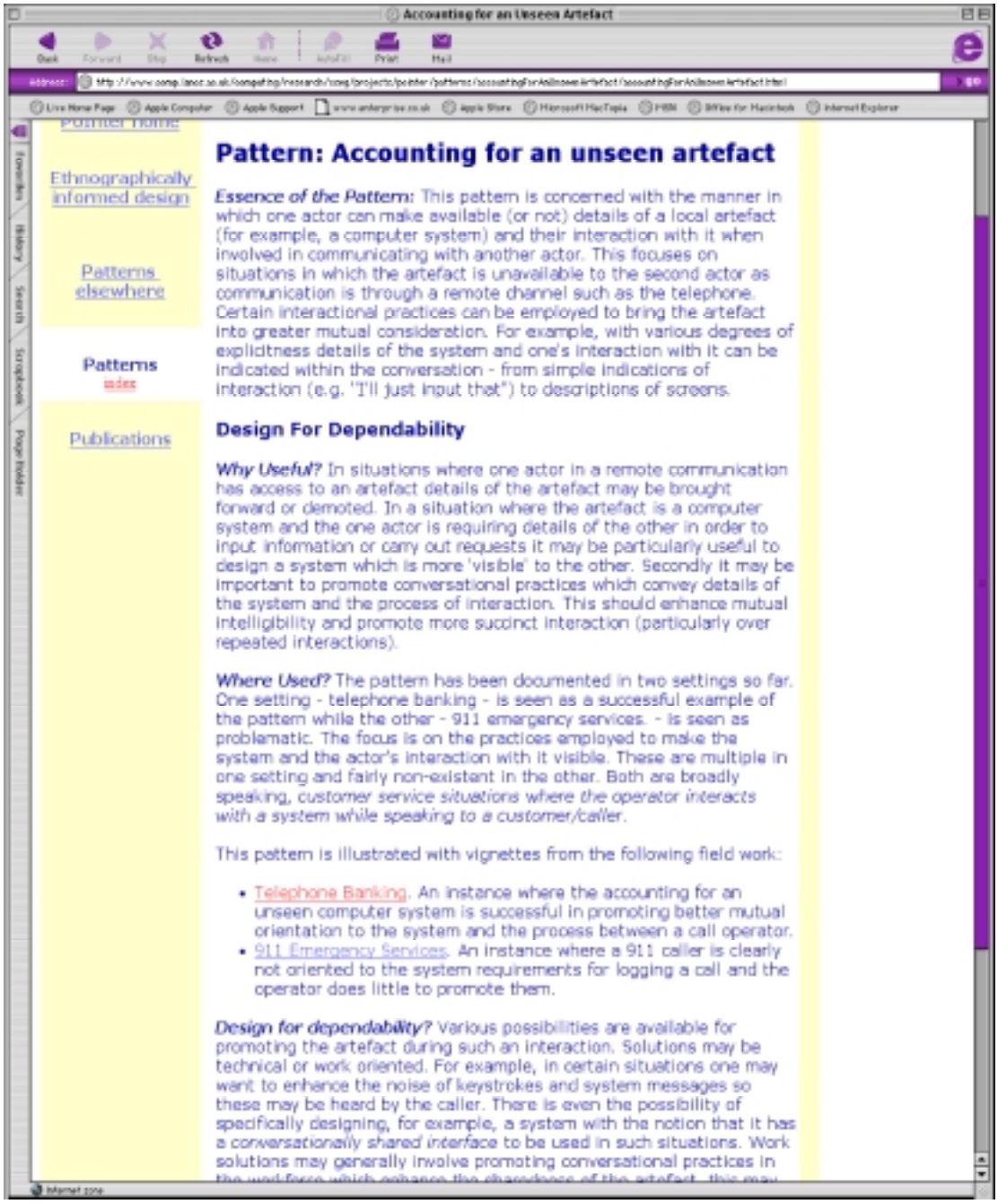

Figure 5: Front page for "Accounting for an unseen artefact"

The pattern focuses on the 'role' of the system in the interactions between operator and client, considering the ways in which it guides the interaction, how operators communicate aspects of the system, its informational requirements and so forth. And furthermore, how the caller orients to the system and system use (or not as may be the case). The two vignette examples actually present

contrasting cases. The first provides examples where system use is skilfully embedded within interaction between operator and caller in telephone banking. It is not that difficulties never occur, but rather that operators employ techniques to orient callers to aspects of the system and its required interactional sequencing such that over repeated contacts callers are seen to configure their talk to achieve business smoothly. Also of interest is the translation work done by operators in reconciling diverse customer perspectives with required organisational process. This situation is contrasted with Whalen and colleagues [1998] analysis of a call to a 911 emergency line where the operator is seen to orient more to the requirements of the system to the detriment of managing the business of the call - providing a swift response to a medical emergency. This leads to a tragic outcome as the call is prolonged. Taken as a whole the pattern raises issues concerning support system design, operator skills and training (e.g. concerning how the system is made accountable (visible and reportable) within interaction) and the need to understand caller characteristics. The pattern aids in an exploration of pertinent issues for work and technology design in call centre work.

6. USERS, USES AND EVALUATION OF THE PATTERNS COLLECTION

It is our aim that our collection of patterns may be used by a variety of researchers and practitioners as an aid to understanding socio-technical considerations for design. Thus far we have detailed the intellectual tradition within which our work on patterns is situated. We have shown how our patterns are directly related to several major topics that have emerged in ethnomethodologically-informed studies. In the previous section we introduced our collection and made some initial remarks on how specific patterns can enable analysis and provoke considerations for design in novel settings. In this section, we expand on this by providing a more detailed scenario to show how patterns might be used in a specific situation of design, and we want to reflect on several uses of patterns within Lancaster and on projects we are engaged in. This will hopefully serve to demonstrate an evaluation of the collection which will inform use by the ToCHI audience. Our experiences at Lancaster appear positive, but part of the longer term evaluation should, we feel, involve use by researchers and practitioners from other institutions. This paper is intended to reach out to those researchers.

6.1 Patterns as a General Resource

Patterns are intended to be a resource that is a structured collection of findings from field studies of work and technology. As such, reading through them should provide a good background understanding of some of the social design issues which arise out of these ethnomethodologically-informed studies. Within our department, which is inter-disciplinary in nature, they have served to communicate the flavour of such work and its pertinence to design particularly to the more technically oriented researchers on particular projects. We may think of this as therefore both communicating social aspects of design, and as a consequence, providing the beginnings of a *lingua franca* for discussing design in the multi-disciplinary teams we are a part of. Indeed, we are also involved in a large scale multi-disciplinary, multi-site project to research dependability in design and have found that patterns have been an effective vehicle to present and discuss social issues in design arising from our and other researchers studies.

Furthermore, partially inspired by our patterns work, one of our technically oriented colleagues has been developing an interactive, computer-based tool for viewing socio-technical configurations derived from ethnographic studies. The tool supports the viewing and combination of structural and process oriented visualisations of configurations, and it is hoped it will aid in the analysis and re-design of these. It seems apt that such a tool could express patterns or at least be used in conjunction with them

for the purposes of analysis and design and we look forward to reporting on this in more detail when we have explored its applications.

Through these experiences, described above, we believe the patterns will serve other researchers and professionals wishing to access a corpus of studies and findings that are pertinent to social issues for design and may help enable cross-disciplinary work.

6.2 Adding To The Collection

A second related issue is that of using patterns as a device for describing findings (and thus hopefully contributing to the collection). Many of the initially derived patterns were the work of the first author and indeed many of the patterns and vignettes derive from his work. We realise that this raises the question as to whether other researchers can easily add to and aid in refining the patterns collection. Our experiences would suggest that other researchers can fairly straightforwardly derive new vignettes, although adding new patterns may be a little more complicated. Two experiences are outlined below:

- As part of a project we introduced our collection to a programmer with working knowledge of eXtreme Programming (XP). He had been recently working with other colleagues on an ethnographic study of XP in action, in a software development company. We wished to evaluate whether someone of a technical background could understand our patterns, find them useful and derive examples of their own. We were also interested in whether a series of vignettes could be derived through examining a single study. On both counts we were successful; the programmer managed to produce 5 new examples of vignettes and proposed 3 candidate patterns. We developed a wiki site linked to our original site to illustrate the results (as described in section 3) and this in turn inspired the migration of our main site onto wiki pages, to open up our collection.
- As a second evaluation, a colleague ethnographer has recently been adding to the collection drawing on a series of ethnographic studies she has carried out in healthcare settings. This came about because co-workers on a project have expressed a desire to see some of her findings expressed as patterns. So far she has produced 4 new examples of vignettes for, for example, ‘artefact as an audit trail’ and ‘working with interruptions’. At the moment she is in the process of adding these vignettes to the wiki website and we are working on producing a new pattern from her work based on some examples of work in distributed (not collocated) configurations.

Both of these experiences suggest that patterns are accessible to other professionals and can be relatively easily extracted and presented by them. They also raise two interesting issues. The first is that it appears to be relatively easy to add vignettes to patterns already defined, but adding patterns is more difficult. Out of the ‘candidate’ patterns that were produced in the XP example, one was subsumed by our pattern ‘collaboration in small groups’ and the other two were interesting but were again felt to focus too particularly on small aspects of interaction. We would suggest that adding patterns is difficult, but the place to start is by extracting interesting findings from studies then trying to form these into vignettes. If they work as vignettes one can look for another similar example in another setting, and if found, it should be possible to produce a pattern.

Secondly, the two examples nicely illustrate the tension between detail and abstraction that is inherent to patterns (see section 2.1). The vignettes produced by the programmer were more succinct and more abstract than the present collection, while those produced by the ethnographer were more detailed. As far as we are concerned, there is no ‘correct’ level of abstraction and we welcome a degree of variety. When writing patterns this is something that the author needs to contend with, hopefully gaining a balance that feels right. It should always be remembered that readers can (and are encouraged

to) read the original studies behind the vignettes they are interested in to gain proper access to their details. So some degree of abstraction is required.

6.3 Specific Use: scenarios and reflections

In terms of putting the patterns collection to specific use on projects, we have had a variety of experiences in house that lead us to believe the patterns collection may be a valuable resource. In line with our comments about our patterns being a relevant resource for an audience range of TOCHI we will discuss the use of patterns for a range of practitioners. We envisage three possible scenarios of use of the patterns collection for specific design projects by requirements engineers, systems designers and those from a more technical (or less familiar with ethnographies and social aspects of design).

- At the very beginning of a project where social interaction is involved, the requirements engineer or systems designer may scan the patterns collection to get an overall impression of what has been important in previous projects and hence what he or she might look out for during the requirements engineering or design process.
- During a project after some observations of work have been made, the requirements engineer or systems designer may attempt to classify and organise these observations by 'fitting' them to the patterns in the collection. He or she is then prompted by the pattern language for the other relevant information about the situation (the representation of the activity, ecological arrangement, etc) that may be relevant to that situation.
- After a pattern has been discovered and located within the patterns collection, the general pattern information and the vignettes associated with the pattern tell the engineer or designer how the pattern is manifested in other settings and hence provide some clues as to the requirements that might be generated in this case

In describing these potential scenarios of use we have envisaged situations where an ethnographer, or socially oriented researcher may not be present. Here, we are thinking more about use by systems designers or requirements engineers. In these cases the patterns, to some extent, serve as a surrogate for not having an ethnographer involved. However, as we have descried above, we also envisage use in multi-disciplinary teams.

We will now illustrate the potential for use by engineers and designers with a small scenario that makes use of the 'working with interruptions' pattern that we have described in this paper. Consider a situation where we are developing the requirements for a student information system that is to be used in a university setting. This system will manage confidential student information, collects information from a range of sources and is used by different users who cooperate synchronously and asynchronously. Many of these users work in public offices and have regular contact with faculty staff and students.

A short period of observation has shown that interruptions are common so the 'working with interruptions' pattern is consulted to discover the commonalities with other comparable situations and the questions that should be answered for that specific setting.

From the vignettes associated with the pattern, the following questions emerge:

- What is the cooperative arrangement in the setting where the system is used?
- How is the activity represented so that users can 'start where they left off' when an interruption occurs?
- What is the physical arrangement of the office and how does it contribute to supporting the working practice?
- How do different users coordinate their work?

- Who are the users?

The answers to these questions do not generate requirements in themselves but they provide an effective starting point for discussions with users and other stakeholders about the system. For example, in our own setting, the physical layout is designed so that desks face the door of the room so that those entering see the backs of screens. Discussion with staff reveals that this arrangement means that, when they are interrupted while dealing with confidential records then these records are not visible to the person who has just entered the room.

Further examination of the patterns reveals that an important issue when dealing with interruptions is often finding the best person to deal with that interruption. Where workers share a room this is not a problem but is more difficult when people work in physically separate areas. As this is the case in this particular situation, we may generate a system requirement as follows:

- The system shall include a facility that allows users to discover other users who are making use of the system.
- The system shall support a 'query broadcast' facility that allows a user to broadcast a query to all other connected users and to receive responses from them.

While, of course, these requirements could be derived by a sensitive analyst, we would argue that an approach that is simply based on the work tasks carried out (that is, the use cases of the system) is likely to miss this type of social requirement that can be identified through the use of patterns. We hopefully have provided an illustration of how a pattern might be used to generate requirements for engineers and designers with less experience of social research, through the above scenario.

Our strongest evaluation of the use of patterns for design was carried out as part of a project looking into e-government. For this we successfully employed patterns in a multi-disciplinary project, in an industrial setting. In a previous paper [Martin et al., 2002] we discussed this project and demonstrated how patterns already in our collection were used as an *analytic* device for considering aspects of work within a local council planning department. Patterns were used in conjunction with ethnographic materials to consider design in the light of the constraints of several technology related projects. The most salient project was one to move services to electronic channels of delivery. In this work specific patterns (e.g. "working with interruptions", "receptionist as a hub"), were employed post study (a five day ethnography), as a means of characterising certain aspects of the work. Through comparing and contrasting the work in the council to other examples of the patterns and in conjunction with project staff and within various project related constraints we were able to analyse several aspects of the work and produce issues and recommendations for possible work and technology redesign. Through informal assessment of their use in discussion with various stakeholders we believe that the patterns aided our analysis and could be used as 'design concepts' (useful shorthand terms to stimulate discussion and design work) in the setting.

It should be clear that it is through this work and the other evaluations carried out with various researchers in our department that we have derived our scenarios of use, and feel justified in claiming that the patterns can be useful for a variety of researchers and professionals in a variety of situations.

7. DISCUSSION 1: PATTERNS - AND OUR 'TAKE' ON ALEXANDER

As stated earlier in the paper, our work on Patterns of Cooperative Interaction is related to other work on patterns in computing and to the work of the originator of patterns, Christopher Alexander. 'Patterns' have recently become something of a 'hot topic' in computing, but have their origin in the work on architecture and urban planning explicated by Alexander [Alexander et al., 1977; Alexander, 1979].

We have taken aspects of Alexander's work as an *inspiration* for ours but we have not systematically attempted to translate his work. Although parts of Alexander's work (and other patterns work) marry well with our work, because there is no systematic relationship we have held back this discussion till here, instead focusing on the more influential background of ethnomethodologically-informed studies. Here we explain the connections and differences.

For Alexander, patterns are attempts to marry the relevant aspects of the *physical* and *social* characteristics of a setting into an architectural or urban design; they provide a facility to share knowledge about design solutions and the setting in which such a solution is applied:

> "..every pattern we define must be formulated in the form of a rule which establishes a relationship between a context, a system of forces which arises in that context, and a configuration which allows these forces to resolve themselves in that context" [Alexander, 1977]

All versions of patterns in the computer science literature involve seizing on aspects of Alexander's work and transforming them for the purposes of conveying, for example, design knowledge and good practice [Gamma et al., 1995], 'solutions' to common programming problems [Cooper, 2000], or interface design 'heuristics' [see the Brighton Usability Pattern Collection]. These various conceptions of patterns are united in a basic sense by a concern for archiving design knowledge whether concerning the interface or at deeper levels. This is then made available for re-use whether in a more prescriptive template fashion or in a looser sense, as a resource to be reconfigured according to situational specifics.

In the following sections we draw attention to our translation of Alexander's work which is commensurate with our exploration of the 'social interface'. Firstly, we pick up on his focus on the interplay between the *physical* and *social* aspects of a setting as these marry well with concerns of ethnography and ethnomethodology. As described earlier, these approaches focus on work as social action and interaction, which takes place in and is facilitated by, workplace and artefact layout, placement and design. Secondly, although the predominant use of patterns suggested by those in the systems design community is of patterns which tend to be prescriptive in nature, these "reuse templates" tend to be less flexible than those originally suggested by Alexander. He states:

> "each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice". [Alexander, 1977]

As with Alexander we intend our patterns to be used as a resource to be drawn upon, as resources which need to be selected and used sensitively and creatively as background to or within the process of design. A primary motivation for the use of patterns in systems design has been the acknowledgement that designers often encounter similar situations. Therefore a key justification for this focus on patterns is the prospect of re-use. Our conception of re-use is closely tied to Alexander's as presented above. We aim to re-use *knowledge* gained through the corpus of ethnographic studies of work and technology rather than provide specific solutions. Our patterns involve *description* and *comparison* of similar work arrangements and their attendant practices of accomplishment. We believe our resource will allow others to draw from previous research and consider how previously reported, particular work and technology designs, may become relevant to new settings and problems. Thirdly, and building on the last two points, our patterns are intended to serve as a resource for the multiple stakeholders involved in actual projects to communicate some sense of the application domain as a tool for thinking about how this impinges on design considerations. Indeed, this notion of patterns as a *lingua franca* for

design has been proposed by Tom Erickson [e.g. 2000a,b], whose ideas about, and work on patterns in HCI/CSCW hold the most in common with ours:

> "(Patterns provide)..ways of allowing the results of workplace studies to be reused in new and different situations. .. ways of representing knowledge about the workplace so that it is accessible to the increasingly diverse set of people involved in design.." [Erickson, 2000]

A fourth rationale behind our patterns is taken from Alexander's notion of 'quality' ('The Quality Without A Name') and how this fits with the 'solution' use of patterns. Here 'quality' refers not to some mystical characteristic but to features of systems that ensure that they 'really work', that they fit with the social circumstances of use. Interestingly, this is also part of the rationale for the turn to ethnography in systems design, [Crabtree et al., 2000]. In focusing on this we want to emphasise that if our patterns are to be usefully employed at least some effort needs to be made in understanding the novel social context. Indeed, as we have described in section 6, we believe that some researchers may gain some leverage by deliberately employing them as a means to understanding a novel social context.

We must note that if a ready comparison between our patterns of cooperative interaction, and either the original Alexandrian work, or the other work presented in the computer science literature is sought, our patterns can be seen as rather distinct. We feel it is correct to discuss the other patterns work in relation to ours as it served, particularly Alexander, as an *inspiration* for our work. Taking an approach, a method, a theory from another domain of academic work and applying it to computing or systems design always involves translation, selection, rejection and transformation. Neither sociology, nor urban planning in theory or practice builds computer systems. They can form a useful resource, can be the inspiration behind good or even great designs but they do not lead to good designs in a systematic manner. Making sociology most useful for design may mean altering the sociology during design in ways that distance it from its original roots. Marrying inspiration from urban planning theory with ethnomethodology for the purposes of design involves modifying both. We have highlighted the aspects of Alexander's patterns that fit well with our ethnomethodological approach but some of the more positivist, theoretical, solution-oriented aspects of his research[8] we had to reject, as the collection of studies from which we were drawing our patterns stands in opposition philosophically to this.

In picking out the parts of Alexander's work in urban planning, through selecting illustrative quotes that make it fit with ours in using ethnomethodology for design, we have not *detailed* all points where the two mesh and diverge. Returning to the initial quote we will hopefully illustrate just why he can be both inspiration and partly at odds with our purposes:

> "..every pattern we define must be formulated in the form of a rule which establishes a relationship between a context, a system of forces which arises in that context, and a configuration which allows these forces to resolve themselves in that context" (Alexander, 1977)

Ethnomethodologically-informed ethnographies deal in the business of describing how people, acting and interacting in *configurations* with computers and other artefacts in particular settings 'achieve' their work. Achieve captures a sense of ambivalence – this might be despite the technology, or even through inefficient means. The role of these studies is to describe, the movement to design is to sort the good aspects from the bad, decide which to maintain and support, which to transform. Our patterns are somewhere between study and design, they contain examples that seem to 'work' and

[8] As well as some of the more 'cosmological'!

examples that are cautionary tales.[9] Alexander's are too, but are more design and 'solution' oriented. Our patterns do not have the form of a "rule", we do not have a solution, for example, for the 'right' configuration and practices to do computer supported telephony the way it is meant to be done. However, we do have a body of studies with findings that may be put together that help designers to think about issues and learn from existing practice.

Alexander talks of 'forces' that arise in particular 'contexts' and of how a pattern (a design that works) provides their resolution. From our perspective, we focus on context and its mutually elaborative relationship with action and interaction. Context, in terms of setting, people, configuration, layout, plans, procedures, history etc. provides for certain forms of action and interaction and the meanings that are attached to them. In turn, action and interaction become part of the context for future action and interaction. Are aspects of context Alexandrian forces? He certainly talks about them being social and physical but it is difficult to be sure and since they can be resolved do they have the same dynamic properties that we crucially take them to have? And anyway, does trying to resolve this really move us on as he is talking about planning and architecture that works – we are describing the achievement of work? Hopefully, the reader can begin to appreciate that sometimes it is better to acknowledge the inspiration and select the pieces that work for you rather than to try to reconcile approaches in different domains that cannot be made truly commensurate.

8. DISCUSSION 2: REFLECTIONS ON THE COLLECTION AND ITS COMPOSITION

In the paper, we have provided the background which allows the reader to place our patterns against a set of recurring topics in ethnomethodological studies of work and technology. We have also described the organisation of our collection, some specific examples of our patterns and described some ways in which we have evaluated the collection. Based on these evaluations we have outlined how we believe they may be of use for the purposes of design, both generally and more specifically. In a previous paper [Martin et al., 2001], and re-iterated here in more detail and more precisely we have described the process through which we aimed to discover patterns and why we were presenting them as we did. We have expanded the background in this paper to more specifically position patterns beside the recurrent topics, however now we have a reasonable collection it is worth reflecting on the emergent processes through which patterns were found and also the structure of our collection. These reflections have implications for how we wish to develop our collection in the future, particularly as we would like to grow our collection as a public enterprise (through the wiki pages), allowing other researchers to become involved in adding new patterns and new examples of vignettes for pre-existing patterns.

To find a potential example of a pattern the first activity undertaken was to re-examine previous studies [as suggested by Hughes et al. 1994]. Therefore our primary inspiration was the very things highlighted by previous studies. The second stage by our criteria (of requiring at least two examples of similar phenomena from different studies) was to see whether we could find a second study where similar phenomena had been reported. Or crucially, as we reflect on our collection, in order to find second examples of our patterns we often needed access to a wider range of material from the original studies such that we could re-analyse this for these purposes. In terms of our collection, we performed a basic analysis of our collection which revealed we had produced 22 vignettes (study specific pattern examples). Of these 22, 10 vignettes come from the primary author's own work, while 6 come from the work of the secondary authors or close colleagues. Clearly, when producing pattern examples it is useful (if not crucial) to have good access to a range of materials from the study, or at least to have access to the persons who conducted the study. This allows re-analysis, discussion and checking. This,

[9] Of course such a conception resonates with the notion of anti-patterns – what not to do's

of course suggests that the best manner to grow the collection is through researchers considering how new fieldwork material relates to the collection, whether this produces new vignettes of existing patterns or new patterns altogether[10].

We hope that this paper so far serves as sufficient background for other researchers to understand our position and the potential utility of the collection (particularly as it grows). Furthermore, if readers wish to read the collection and feel they may have *comments, vignettes or patterns* that they could add (or stories of attempted use) we hope that we have provided sufficient background and instructions for this. We would strongly encourage them to contact us with details of their research (and add to our wiki pages if they would like) and look forward to adding to our collection with more diverse research. We do not dictate that studies should be ethnomethodological as a pre-requisite for inclusion but rather that studies should be ethnographic with detailed descriptions of work as a situated activity. Therefore (and intentionally) our collection should be open to a wider audience and wider range of contributors.

As ethnomethodologists (and ethnographers) working in computing science we do not believe that design is a 'problem' to be 'solved', but rather that good real-world design revolves around pragmatism. Rarely, if ever, is it possible to draw on dependable shortcuts leading to guaranteed outcomes. Instead, good design often involves exploring the situation (or 'problem space') to the best of our ability, highlighting features and considerations from all angles (e.g. technical, organisational, budgetary, *and* social) balancing these and working out which aspects, issues, problems and solutions deserve specific attention and what this should be. Our place in this is to contribute to deeper knowledge of the sociality of work and make the work of understanding the wider social contexts for design easier. In attempting to do this we try to make general *sensitivities, topics* and *concerns* apparent, highlight *interesting and informative findings*, invent *techniques* to make our work more accessible, and provide *checklists, archives* of findings, and outline *relevances* and so forth.

The topics outlined earlier do not represent an exhaustive list of topics and the patterns do not serve as an exhaustive checklist of phenomena (findings). They are not the *only* way to go about looking for phenomena or the *only* way to organise findings - many ethnomethodologists would not seek to be restricted in this manner. BUT, this does not mean they cannot (or should not) be used as such. Indeed, a main reason for presenting the work as such is precisely to open up an understanding for a range of professionals and to offer an orientation and ways of characterising and comparing situations. These, it is hoped, will sensitise designers to the kinds of things we feel it is important to recognise and describe about work and activity.

To re-iterate and conclude, we would strongly argue that when we consider information systems, systems design and so forth we should see the field as mainly a practical craft or production enterprise not as a science, particularly when we focus in systems in an industrial, commercial or institutional setting. Individual project success may be measured according to many criteria both organisationally and informally dictated. There is not a *single way*, a *scientifically* superior method to go about things. Things may work better, produce 'better' systems in a particular setting, but successful transfer to another project is down to many things including setting, personnel, financial constraints and so on and so forth. Claims of scientific, or even social scientific superiority of method do not always add up in the real world, arguments about what worked and why (in practical terms) are simply more convincing in this field.

[10] A useful way to understand how the collection developed is to think about the patterns collection as having essay like qualities. Basically, when a study is conducted it is common to discuss findings in the light of previous studies and to even employ other findings as an analytic device. This is explicit in the work of patterns.

When you look again at the claims of ethnomethodology, simply put - to focus on the provision of accurate descriptions of work analysed to bring out the manner in which it is achieved as a situated social activity - we can see although modest it should have a utility. No claims are made about 'solving the design problem' (of course) but we would argue that projects rarely have *a problem* to be solved rather there are many contingencies, problems, constraints, issues, foci etc. that exist in any project. However, why not seek, as part of the process, to understand the pertinent activity as it actually happens. Patterns are meant to be another help in getting ideas from ethnomethodological studies across to a wider audience, revealing of findings, demonstrating analytic orientation through comparing and contrasting findings in different settings, providing design pointers and allowing different access to a range of studies. We do not think that patterns in themselves produce better systems but we believe that the collection may be a practically useful resource for enabling a range of practitioners to make aspects of the social pertinent for good design.

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