Technomethodology: Paradoxes and Possibilities

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ABSTRACT
The design of CSCW systems has often had its roots in ethnomethodological understandings of work and investigations of working settings. Increasingly, we are also seeing these ideas applied to critique and inform HCI design more generally. However, the attempt to design from the basis of ethnomethodology is fraught with methodological dangers. In particular, ethnomethodology's overriding concern with the detail of practice poses some serious problems when attempts are made to design around such understandings. In this paper, we discuss the range and application of ethnomethodological investigations of technology in working settings, describe how ethnomethodologically-affiliated work has approached system design and discuss ways that ethnomethodology can move from design critique to design practice: the advent of *technomethodology*.

Keywords
Ethnography, ethnomethodology, design practice, methodology, accounts, abstraction.

ETHNOMETHODOLOGY AND DESIGN

There has been much discussion within the HCI community about a "turn to the social" (e.g. [23], [38]). Particularly within CSCW, but also within HCI, many of those who are considering such a move have been attracted to ethnomethodology [18] as a favoured sociological position. Ethnomethodology turns away from the structures and theorising of traditional sociology, concentrating instead on the details of the practices through which action and interaction are accomplished. In this respect, designers have found ethnomethodology a richer resource for insights about the organisation of work than other, more theoretically oriented, sociological positions.

More or less ethnomethodologically-oriented investigations are now regularly presented at CSCW conferences (e.g. [1], [5], [7], [8], [30], [37], [39]) and increasingly at HCI conferences ([6], [13], [26]). Ethnomethodology is being used to inform design through:

1. fieldwork investigations that develop an understanding of work and organisations from the "inside", providing innovative insights into the organisational situatedness of work and the methods and practices through which work activities and interactions are assembled and which may be used in the design of technology to support work; and
2. developing an understanding of the temporal organisation of activities and interactions, revealing them to be a moment-by-moment organisation, and in so doing furnishing new concepts around which to generally consider the design of technology.

There are a number of inter-related reasons why some within the design community are taking up these two sets of issues.

First, Lucy Suchman's book "Plans and Situated Actions" [43], which articulated an argument that has significantly influenced many designers, was partly founded in the work of ethnomethodology. Her analysis emphasised a perspective on purposeful human action as situated in (and organised around) the context of particular circumstances, and, in doing so, provided a forceful critique of the user modelling and plan-based approaches common in both HCI and AI. Suchman's book has had considerable influence upon HCI research and design, becoming almost an icon of a concern in HCI with work settings and the detail of everyday working practices; and, as relevant parts of the design community have taken on board Suchman's arguments, they have also taken on, perhaps unwittingly, an ethnomethodological influence.

Second, there has been a strong and vocal group within HCI who have consistently argued that the requirements for technology should be developed around the work situations of users, most particularly in the Participatory Design movement (e.g. [22]). Ethnomethodology is generally concerned with the "detailed and observable practices which make up the incarnate production of ordinary social facts" [35] which means that its studies of work domains contain rich descriptions of work practices. This may suggest to those who are already concerned with the relationship between work and design that they have an analytic ally who may be

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readily turned to as a resource to draw upon either for methodological sustenance or even empirical descriptions.

Third, for a variety of reasons that we will not go into here, ethnography as a method of enquiry has been attracting a great deal of attention from some within CSCW and HCI (see e.g. [2], [31]). Like some other positions within sociology, ethnomethodology uses ethnographically generated material in its studies, though the analyses that it develops from these can vary significantly from those produced by other types of sociology. It is often difficult for those in the design community to apprehend the difference between competing sociological arguments, and the relevance for so doing might even be questionable. Ethnomethodology may, as a consequence, be basking in the sun of ethnography in general, some in design equating an interest in ethnography with an interest in ethnomethodology[1].

Fourth, Grudin [23] has argued that HCI has passed through a number of stages and is currently moving from the fourth stage which focused upon a dialogue with the user to a fifth stage of focusing the interface not around the individual but the work setting. Ethnomethodology may thus be, for some, a port in the storm of transition, for ethnomethodologists' emphasis upon not only work practice but also upon the organisational situatedness of work may offer candidate solutions to problems of incorporating the work settings, as well as work practice, into design.

However, the experience has been that the attempt to incorporate ethnomethodological understandings into design—either specific artifacts, or the design process in general—has been problematic. The models, assumptions, processes and sensitivities of the various groups involved have been sufficiently different as to present problems for their integration. This paper, indeed, follows in a tradition of introspection and analysis on the integration of our disciplines, and the respective roles played by each (e.g. [31], [41]), and this reflection mirrors similar issues in the integration of other theoretical approaches to the human sciences into HCI design (e.g. [3]). In this paper we want to unpack the issues surrounding the application of ethnomethodological accounts of working situations, and, critically, of ethnomethodology itself, not only to situations which involve technology, but to the design and introduction of advanced technologies. Our goal is primarily to understand and develop the relationship between ethnomethodology and technological design; secondarily, we hope that this might address some issues in the relationship of the human sciences to HCI practice more widely.

Having reviewed the basis for the current interest in ethnomethodology within HCI, we will next examine the contributions that have so far been made for technological support for socially-organised activity which have come from an ethnomethodological perspective—what we'll call "technomethodology".

1.Although we cannot develop the point, note that ethnography and ethnomethodology are not the same thing. Loosely, ethnography can be thought of as a collection of techniques for gathering and organising field materials, while ethnomethodology is an analytic study policy which may draw upon ethnographic materials.

ASPECTS OF TECHNOMETHODOLOGY

Ethnomethodologically affiliated studies have been conducted across a wide range of work situations that involve technology: the work of air traffic controllers [25], city stockbrokers [30], software engineers [12], designers [36], print shop workers [8], municipal transport controllers [27], as well as the users of menu-driven computer systems [29], multimedia technologies [28] and photocopiers [43].

These studies fall into two related areas of enquiry: investigations of the organisation of social action and interaction; and investigations of the organisation of work and work settings.

The Organisation of Social Action and Interaction

One direction of research has been into the ways in which people organise and manage everyday social activity. In particular, Conversation Analysis, a branch of ethnomethodology, has developed an extensive corpus of findings about the ways in which people generally build up their social actions and interactions with one another, and, more recently, a conversation analytic sensibility has been extensively used in studies of the ways in which people interact with one another through or around technology. An obvious contender for such scrutiny are technologies that provide for access between persons who are geographically distributed, and attention has been paid to video-mediated communication (e.g. [28]). The thrust of this work is to furnish descriptions of the ways in which persons normally organise their actions and interactions and then compare this to what is possible or not possible using the technology. However, it is not just video-mediated communication that has been the subject of such examinations, but also other work settings in which technology is used, such as control suites [27], the doctor's consulting room [21], and stock dealing rooms [30].

The Organisation of Work

A second major thrust in the work of ethnomethodology has been the examination of the practices and methods through which people accomplish their work. In particular, it has been concerned with how it is organised in such a way as to make it recognisable to others as uniquely the work it is. Ethnomethodologically affiliated studies of work have been made of technologically rich work settings. Suchman has, over a number of studies (e.g. [45]), developed descriptions of the practices through which particular types of work-settings are organised as centres of co-ordination. A team of researchers at Lancaster University in the UK have, again over the course of a number of studies (e.g. [25]), developed detailed descriptions of the work of air-traffic controllers. There has also been a series of studies of the work of engineers (e.g. [42]). In addition to these examples of sustained enquiries into domains of work there have been numerous one-off studies of work and the role of technology. These mainly involved studies of the organisation of the work prior to the introduction of technology and the subsequent effects that the technology had, e.g. Button and Harper's [11] examination of the introduction of an accountancy package into the furniture industry and Bowers, Button and

Sharrock's [8] description of the impact of a Management Information System on the work practices involved in the organisation of a flow of work on the shop-floor in the print industry.

Ethnomethodological Critiques of Technology

We have been describing two main themes in ethnomethodological work, the organisation of social action and interaction and the organisation of work, and how these have been applied by those who claim an ethnomethodological affiliation to the study of social action, interaction and work involving technology. Taken together, ethnomethodologically affiliated studies have produced a strong critique of the design of technology at work for they have displayed that technology, at best, often fails to support the work it is designed for, or at worst, does not allow people to actually engage in their work, because the technology is not aligned to the practices through which they organise their actions, interactions and work. Heath et al summarise this conclusion for CSCW in the following: "Despite impressive technological developments in CSCW, it is widely recognised that there are relatively few examples of successful applications in real world settings. [...] it is suggested that the lack of success of CSCW systems derives not so much from their technological limitations, but more from their insensitivity to the organisation of work and communication in real work environments" [30].

We will content ourselves with two examples to make this point. First, based in part upon Conversation Analysis and the work of its founder Harvey Sacks, Lucy Suchman [44] has challenged speech act theory upon which systems such as Winograd and Flores' "THE COORDINATOR" are based. The thrust of her criticism in this respect is that conversation analysis has demonstrated that meaning and intention are interactionally contingent, something that is not accounted for in speech act theory. Consequently, this is a feature of ordinary action and interaction which cannot be supported by THE COORDINATOR, indeed a feature of social action and interaction that is violated in the stipulative organisation imposed by the system.

Second, Bowers, Button and Sharrock [8] examined the work of printers on the shop-floor and described how, in being faced with the uncertainties of orders which could result in either periods of high demand which stretched operators and machinery or in periods of low demand when operators and machinery were idle, operators would use ad hoc practices not found in the formal representation of the work-flow of the print room, to "even out" the flow of work. However, when a technology designed to organise the flow of work on the shop-floor was introduced, it utilised a formal model of work flow which prevented the operators from utilising their ad hoc practices. The result was that the printing work was seriously disrupted with order deadlines being missed and significant over-time having to be done. Quite simply, the technology was not designed with knowledge of the methods and practices through which the work it was designed to organise was done, the methods and practices being revealed through ethnomethodological study.

Critique and Design—Two Paradoxes

As we have seen, then, ethnomethodological analyses have been used in a range of circumstances to critique technological design in particular working settings and situations. Ethnomethodology, in attending in particular to the details of everyday action and work practice, has been able to expose an unfortunate paradox in the design of technologies for collaborative activity (or socially-constructed action). This is the *paradox of system design*—that the introduction of technology designed to support "large-scale" activities while fundamentally transforming the "small-scale" detail of action can systematically undermine exactly the detailed features of working practice *through which* the "large-scale" activity is, in fact, accomplished. It points, fundamentally, to the interdependence of minute practice and grand accomplishment.

However, in so doing, ethnomethodology finds itself caught in a second paradox—the *paradox of technomethodology*[2]. Given the concern with the particular, with detail, and with the moment-by-moment organisation of action, how can ethnomethodology be applied to the design of new technologies? Certainly, ethnomethodologists have urged that designers take into account the methods and practices through which social action, interaction and categories of work are organised; but in the face of the unavoidably transformational nature of technology and system design in working settings, it would seem that ethnomethodology becomes relatively powerless. Its tradition is in analysing practice, rather than "inventing the future". Even Heath and Luff's observations of the relative impotence of gaze and gesture in video-mediated communication are, to an extent, undermined by accounts of the active transformation of visual conduct in video-mediated interaction by which the same communicative *accomplishments* are reconstructed; reconstructed, ironically enough, out of the *lived detail* of video interaction [17].

Ethnomethodologists interested in technology and design have thus so far, and after much effort, managed to make the first step from the study of the use of technology to the critique of technology. The next step, however, is yet to be taken and will be more problematic, which is to move from critique to design. How can design now productively learn from ethnomethodology?

LEARNING FROM ETHNOMETHODOLOGY

We have outlined two related forms of "technomethodological" enquiry. Operating across these, however, are fundamental issues about how to incorporate findings and insights from ethnomethodology into the process of design. This integration is at the heart of technomethodology, and raises some of the most important questions for both ethnomethodologists and designers. To explore the issues, we set out three ways in which this relationship can operate. Two caveats should be noted. First, actual practice will tend to draw, to some extent, on elements of each; but a pedagogical separation helps frame the discussion. Second, for the

2. Taken together, these paradoxes produce what Grudin and Grinter [24] have called the "ethnographers' dilemma".

CHI audience, we present these largely in terms of design *learning from* the ethnomethodological perspective; in practice, of course, the relationship is bidirectional.

Learning from the Ethnomethodologist

Arguably, to date, the most widespread and successful approach to incorporating ethnomethodological input into the design process is for the design process and designers to *learn from the ethnomethodologist.* In this model, the ethnomethodologist goes into the field to study a work setting. While the results may be written up as an ethnomethodological account of the work, it is not this account, but rather the ethnomethodologist, who will be the primary resource for the design process. Fresh from the field, brimming with detailed observations and an analytical framework within which to organise them, the ethnomethodologist works closely with the designers from the earliest points in the process. From the designers' perspective, the ethnomethodologist serves as a proxy for the users in the field—or, perhaps more accurately, a proxy for the *field setting* itself. Design ideas can be "bounced off" the ethnomethodologist, who draws on field observations both to evaluate and to contribute to aspects of the design.

Where is the locus of the ethnomethodology, in this model? Primarily, it is in the ethnomethodologist's head. From the perspective of the designers, the ethnomethodologist is almost indistinguishable from any other fieldworker, and ethnomethodology, itself, is not crucial as input. Ethnomethodologists will presumably use their analytical perspective in shaping a story about the field setting, and in evaluating and contributing to the design. However, it is primarily the ethnomethodologist—as a trained field worker—who acts as a channel between the designers and the users.

Learning from Ethnomethodological Accounts

A second approach is to organise the design around *specifically* ethnomethodological analysis. In particular, the second approach involves *learning from ethnomethodological accounts of work settings.* Like the first approach, this will probably involve the close collaboration of ethnomethodologist and designer; however, the primary difference is that the designer is working with a specifically ethnomethodological analysis of the work situation, rather than with an ethnomethodologist who might use their training and judgement to respond to design specifics.

The locus of ethnomethodology is in the account—and that's a key distinction, because now it is an explicit part of the communication between field and design. In many ways, this is a much more satisfactory way to proceed; one which proceeds from an understanding that ethnomethodology is an analytical perspective, a form of "writing up" rather than a form of data collection [2]. However, it's harder to do, and it's certainly less common. The first approach, after all, does not require the designers to be sufficiently well-versed in ethnomethodology to be able to read an ethnomethodologist's account of a working situation. What's more, the first approach more directly reflects the feeling that design must "engage the user"; the feeling which has lead to the emergence of User-Centred Design as a movement, and to the increasing use of ethnographic field techniques in design in the first place! Connection between designers and users is valued and sought out, so the "disconnection" implied by mediation through an ethnomethodological analysis rather than through a person is, consequently, to be avoided. However, the second approach more adequately builds on ethnomethodological understanding (rather than simply any field observation); and so, if we are to take seriously a turn towards ethnomethodology *in particular*, then we must similarly understand how this second approach proceeds.

Learning from Ethnomethodology

In the first approach, design was organised directly around the contribution or involvement of an ethnomethodologist. In the second approach, it was organised around an ethnomethodological analysis of a working situation; a more explicit basis in ethnomethodological investigation, rather than simply on field observation and commentary. The third approach is to make the connection at a deeper level yet. Here, the design process *learns from ethnomethodology.* That is, we consider the implications which foundational ethnomethodological principles—those insights and perspectives which characterise the discipline—hold for both the artifacts and processes of design. In this approach, design does not take on board ethnomethodological analysis and insights, but takes on board the very study policy of ethnomethodology.

This approach differs significantly from the first two, in that it regards the relationship between ethnomethodology and system design as a theoretical matter. Again, this theoretical orientation is why we have been concentrating on ethnomethodology, rather than qualitative methods in general. So, rather than have systems design and ethnomethodology "reach" towards each other and "meet" at a design, we instead look to forge more foundational relationships, and then approach design from this new position. This foundational relationship is one in which design adopts the analytic mentality of ethnomethodology, and ethnomethodology dons the practical mantle of design. We look forward, through this approach, to what Garfinkel has often referred to as the emergence of a "hybrid" discipline out of ethnomethodological studies of other disciplines.

This approach is as radical for ethnomethodology as it is for system design. On the one hand, it deals directly with the generally operative social processes which are the currency of ethnomethodology; elements such as situatedness, practical action and representation, achievement and mechanism, phenomena of order, and accountability. On the other hand, it deals with the fundamental, almost implicit, aspects of system design—generalisation and abstraction, configuration, data and process, fixedness and mutability. So rather than ask, "what are the implications of this ethnomethodological account of the work of hotel receptionists for the design of a booking system?", we might ask, "what are the implications of the operation and use of member categorisations for questions of individuality and grouping in software systems?". This is a quite different order of question.

To make this more concrete, let's consider a specific example. In recent work, we have been concerned with issues of abstraction and representation in system design. In particular, we have looked at the contrast between, on one hand, the traditional role of abstraction in systems design and, on the other, the practical aspects of representations of activity from an ethnomethodological perspective. From this we have developed a notion of "accounts" [16]; computational representations which systems continuously offer of their own behaviour and activity, as a resource for improvised and contextualised action[3]. Accounts draw on recent research on software architectures and "open implementations" [33], which introduce the idea of a "causal connection" which maintains the correspondence between representations and the systems they represent. In the accounts model, this causal connection provides for the continual *accountability* of the account; the backing in its relationship to the action of the system which lends it legitimacy. Just as ethnomethodology has shown how social activity is accountable, i.e. performed in such a way as to reveal its organisation, so our notion of computational accountability relates interface activity to the structure of what lies below. Interface activity is organised within an account of the system's action, so that it can become a resource for the ongoing management of user activity and interaction.

The notion of accounts and accountability as a basis for system-building constitutes a significant reorientation of abstraction in system design. Computational abstractions provide modularity and separation. The abstraction "stands for" the behaviour of the code which implements it. Abstraction barriers are opaque; on the one hand, they hide the complexity of what lies behind, and on the other, they present it for use in some rationalised way. So system design traffics in abstractions, rather than in meanings, interpretations or behaviours.

Accounts begin to capture some of the flavour of the social. This alternative view is less concerned with what the abstraction (or representation) *is*, in itself, focusing instead on what it can do and how it can be made to work. They place the emphasis on where the abstraction came from, how and why it was produced, by whom and for whom. The representation exists only by dint of its being maintained and supported, being made acceptable to the parties on either side for some set of purposes and actions. So when we begin to design systems with a model of "abstractions as accounts", the action isn't in the abstraction, but in how the abstraction can be *worked*—in the notions of accountability which make it useful.

Accounts illustrate the investigation of an aspect of system design with respect to an aspect of ethnomethodology as a body of knowledge. As such, they exemplify our third approach to system learning—from ethnomethodology itself, rather than from particular ethnomethodological investigations, or from the ethnomethodologist as a proxy of the working situation. The success of the first two approaches in the development of CSCW systems and technologies is testament to their value; however, the deeper connection between ethnomethodology and system design, as disciplines, seems crucial to the progression from study and critique to design.

3. We present this work only as an example of the relationship between fundamental concepts from the disciplines; a fuller description—an "account of accounts"—is outwith the scope of this paper.

HUMAN SCIENCES AND DESIGN PRACTICE

The general problem which we have addressed here—the relationship between a body of disciplinary knowledge and the practice of HCI or CSCW design—is hardly a new one to the HCI community. Over the past ten years or so, many analyses have focused on the relationship between a range of scientific understandings and HCI design (see, for example, [3], [34]); a range of design approaches drawing on different levels of theoretical input have been developed and explored (e.g. [14], [15], [32]); and attempts have been made to integrate multiple theoretical and practical approaches to HCI design (e.g. [4], [9]).

In many ways, some of the distinctions which we have presented in this paper—especially our separation between the three modes of incorporation of ethnomethodological understandings into design efforts—mirror these analyses of (primarily) cognitive science and human factors knowledge into the HCI design process. In much the same way as we describe designers learning from ethnomethodologists as work-setting proxies, so human factors specialists have been introduced into design teams. Similarly, by analogy with our second form of collaboration, attempts have been made to inform system design on the basis of cognitive models of human activity. And finally, our third approach can be thought as being related to more radical attempts to restructure the design process around a cognitive "science base". Even in particular, restricted areas of research investigation, we can see these various approaches operating at once—consider, for example, the range of ways in which research on mental models has been incorporated, more or less directly, into the design of interactive systems.

In this way, then, our concerns here relate to a larger set of concerns within the HCI community. As such, we hope that our perspective can also shed light on those general issues. However, there are a number of aspects of our position which differ from these approaches in significant ways, some of them based on the nature of the particular theoretical perspective, ethnomethodology, which concerns us. We will address three here.

The first reason to explore these issues was discussed in the first section of this paper—the prevalence of ethnomethodological perspectives in the design of collaborative systems. Collaborative systems open up new sets of issues for theoretical exploration, and we have increasingly found those issues work their way back to more traditional areas of HCI. So, just as the various approaches to the incorporation of cognitive and psychological approaches to HCI design reflect the particular details of the various approaches—indeed, different approaches appear to be most fruitfully applied in different ways and at different points in the process—so a focus on ethnomethodology, simply as a new discipline, opens up these issues to further scrutiny.

The second important point to be made is that the third level of connection between ethnomethodology and system design which we have advocated, and described with the example of the "accounts" work, is *not* a link between theory and practice; it's a link between theory and theory. An important understanding which underpins our attempt to identify fruitful relationships of this sort is that it is not simply enough to consider the implications which a theoretical orientation has for the way in which we design systems; rather, it is critical that we consider the implications for the *nature of the systems we design*. A respectfulness for the notion of improvised action, or for the social production and use of representations, forces a reorientation of perspective which reaches deeper than the design process itself.

The third issue has to do with the very nature of ethnomethodological understandings; and, in particular, with ethnomethodology's overriding attentiveness to the detail of practice. Ethnomethodology itself set out to respecify issues arising from the application of models, theories and structures in traditional sociology, and hence ethnomethodology's position on the relationship between practice and generalisation is itself a slippery one, forcing us to look in new ways at how to incorporate ethnomethodological understandings in system design. So this relationship between the abstract and the particular is the crux of any relationship we might try to derive between ethnomethodology and design.

ABSTRACTION AND PARTICULARITY

> *"... the reported phenomena are only inspectably the case. They are unavailable to the arts of designing and interpreting definitions, metaphors, models, constructions, types or ideals. They cannot be recovered by attempts, no matter how thoughtful, to specify an examinable practice by detailing a generality."*
> *—Harold Garfinkel [19]*

The roots of ethnomethodology—and, in particular, its radical respecification of the issues of sociological analysis—are firmly grounded in a primary concern with the particulars of everyday, practical action. System design, on the other hand, is fundamentally about the creation, manipulation and use of abstractions. So, as ethnomethodology has encountered systems design, it has sometimes, perhaps unfairly, been seen as exclusively concerned with detail and specifics—the "excruciatingly particular"—and unwilling, or unable, to trade in generalisations.

However, this is a short-sighted criticism. It is important to note that many of the social "mechanisms" that ethnomethodology has described are found across many different social circumstances. For example, Garfinkel and Sacks [20] describe "cohort independence" phenomena, by which they mean social phenomena that are not tied to the scenic features of their production. Thus, for example, the model for turn-taking in conversation [40] is, in some crucial respects, cohort independent in that it operates across local circumstances such as gender, ethnicity, race, occupational identity, etc. It is these sorts of generally operative social processes, explicated by ethnomethodology, which we turn to in our third approach to technomethodology. These processes are, in Sacks et al's terms, "context free, yet context sensitive".

Since we are advocating the use in design of general processes arising from a discipline concerned with the particular, there are some issues to be clarified. We will make two points here.

The first is to emphasise that the generally operative social processes to which we make appeal are incontrovertibly grounded in practice. They arise from, and are employed in, the specifics of everyday action. Their generality does not lie in any "abstracting away" of detail; it lies, instead, in their general *operativeness,* the wide range of actions and interactions which they underpin.

The second observation is that ethnomethodologists and system designers will typically put the generalisations of their disciplines to work in very different ways. On one hand, the ethnomethodologist's generalisations tend to be *analytic* characterisations—categories and descriptions of action employed to delineate, describe and explicate action. On the other hand, the abstractions of software engineering are *generative*; they not only characterise system action but, themselves, give rise to it. Abstractions in computer programs produce behaviour; indeed, all behaviour is generated through some set of abstractions (embodied in software systems, programming languages and instruction sets). As a result, ethnomethodologists and system designers have, traditionally, had very different ideas of the scope, form, nature and use of generalisations.

Understanding the place of abstraction and generalisation in ethnomethodological accounts of work is critical to making the move between the three forms of learning, because it represents a move towards the abstract. In particular, the move represents an attempt to work with a set of *sensibilities* rather than with the details of specific activity, even though, of course, those sensibilities arise out of the discipline's very concern with the grounded and specific experience of everyday activity. In other words, the third approach to technomethodology attempts to align system design not so much with the details of *specific working practices*, as with the details of the *means by which such working practices arise and are constituted.*

This distinction is critical to the successful interworking of systems design and ethnomethodology, as is the recognition—and, subsequently, the *working*—of the difference in models of abstraction.

Consider an example to illustrate this distinction. In recent years, there has been an interest in utilising the insights of ethnomethodology for the development of dialogical interfaces. Attempts have been made to build in the *specifics* of Sacks et al's turn-taking model, such as the rules associated with speaker transfer, into computer interfaces. However, our argument is that the value of the turn-taking model described by Sacks et al is in the way in which it shows how the abstractions of conversational flow are *sustained*, rather than rote procedures by which they might be *enacted* [10]. It is this notion of the ongoing management of conversation, rather than the specifics of any human dialogue, which provides an abstraction for design. When we fail to make the distinction, we fall foul of the paradox of technomethodology.

So, the two paradoxes which we described—the paradox of system design, and, particularly, the paradox of technomethodology—are based in large part in the differing forms and uses of generalisation in the two disciplines. The third approach of technomethodology—one which attempts to work with generally operative processes from ethnomethodology as resources for design—is a starting-point in attempting to resolve some of these difficulties.

SUMMARY

The design of both single-user and multi-user interactive systems on the basis of ethnomethodological studies of working settings and work practice has been relatively successful, but nonetheless problematic. The force and tellingness of these accounts of work is testament to their utility, but aspects of ethnomethodology's project pose problems for design practice. The paradox of technomethodology lies in the attempt to design novel technological solutions based on an analytical perspective with a specific orientation towards the existing detail of practical action. We have discussed three approaches to working with ethnomethodology in system design; and in particular, we have proposed a model which applies not simply to the process of design but, crucially, to the nature of computational artifacts in working settings. Our intention is to identify ways in which ethnomethodology and system design can be combined in ways which are respectful of both as bodies of knowledge and practice; and, in so doing, we have pointed in particular to fundamental differences in the nature and use of generalisations and abstractions in the two disciplines. Our ongoing project is the investigation and exploitation of precisely these relationships in the pursuit of technological support for everyday activity and working practice.

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