Ethnography in Participatory Design

Andy Crabtree
Centre for CSCW Research
Department of Sociology
Lancaster University
United Kingdom
Telephone: +44 1524 94683
E-mail: crabtree@unix.lancs.ac.uk

ABSTRACT
Even the most cursory glance through recent proceedings of the biannual participatory design conference shows that ethnography is becoming an increasingly widespread technique in work-oriented design. This paper (1) explicates the rationale behind participatory design's 'turn to ethnography'; (2) identifies central problems with the technique's employment from participatory design's point of view; (3) presents methodological solutions developed in the course of designing a prototype supporting the work activities of some 2500 potential end-users distributed in over 250 offices around the world. Emphasis is placed on attention to working language as a reproducible means of getting hands-on work and organisation, particularly in large-scale settings.

Keywords
Work-oriented design, participatory design, ethnography, methodological problems, methodological solutions.

INTRODUCTION
Over the last decade a common core of techniques supporting user-involvement in systems design have emerged from within participatory design. Future workshops, mock-ups, and scenario construction are frequently employed in concert with prototyping as techniques of requirements specification. While effective in enabling user participation in design, these particular prototyping techniques are subject to an endemic problem of systems design. Specifically, in emphasising future possibilities, the danger of 'tunnel vision' and thus, of coming up with perfect technological solutions to the wrong set of work problems [63]. Although techniques of participatory design, particular experimental techniques, have gone a long way in reducing the significance of this problem in practical circumstances of design, the problem nevertheless remains as an ever present danger. One course of action seen to be contributing to a potential solution has been to turn to ethnography, an approach which insists that rigorous attention be paid to the social organisation of current practice [36].

THE EMERGENCE OF COMMON PRACTICES IN WORK-ORIENTED PARTICIPATORY DESIGN
Since its inception in Scandinavia nearly thirty years ago, the concept of active user-involvement in work-oriented design has undergone some radical transformations. In its origins, the concept of user-involvement emphasised unmediated, trade union-oriented and (thus) institutionalised notions of participation in workplace design. [51, 56, 57]. Today, more inclusive stakeholder notions emphasising interdisciplinarity and the development of practical techniques supporting user-involvement predominate [7, 30, 46]. Although a heterogeneous enterprise, and despite internal equivocation regarding this shift in focus [2, 3, 8], participatory design has enjoyed modest success in developing commonly applicable techniques that (potentially) support original ambitions of workplace democracy [44]. As awareness of the benefits of user-involvement in design has grown over recent years, these practical achievements (outlined below) have seen techniques of participatory design be taken up, further developed and complemented with new techniques in Western Europe, North America, Austrilasia and beyond.

In shifting focus from the politics of design to the

practicalities of design, participatory design has placed an emphasis on developing computer-based artefacts that resonate with or 'fit', and at the same time transform, the activities cum organisation of work in which they are to be embedded [66]. Following the Utopia project and the emergence of the 'tool perspective', end-users have been elevated from central focus in design to indispensable resource in so much as they are seen, and treated as a matter of policy, as the proper experts in details of work's achievement.

Subsequent emphasis in design has been placed on eliciting the tacit local knowledge and skills which characterise work and on supporting local knowledge and skills in a mutual, collective process of learning and design of potential technological solutions [23]. In the effort to understand work and its organisation, participatory design practices have been further elaborated through the inclusion of workplace analysts [14] and the development of cooperative user-designer techniques [11, 13, 26, 38]

Today, PD is a heterogeneous enterprise employing a wide range of practical techniques for enabling active user participation in design. Despite a vast array of evolving approaches, participatory design might nevertheless be said to consist in a common core of techniques supporting user-involvement in work-oriented design:

Future workshops: user-designer sessions intended to identifying substantive 'problems' of work and alternatives from a user perspective [39].

Studies of work: typically (but not exclusively) preliminary studies of the workplace intended shed light upon important aspects of practice requiring support [15].

Mock-ups: cardboard designs that serve in the game of envisioning future work, enabling users to experience and modify potential design-solutions [25].

Prototyping: the construction of the future through the preliminary and iterative design of potential systems enabling concrete experience and modification by prospective users.[12].

Scenario construction: employed in developing, potential applications, scenarios are open-ended hypothetical alternatives to current practice constructed and enacted by users and designers on the basis of representative instances of work activities [16].

These common techniques may be employed individually at various, selective stages in development, or in concert throughout development.

MAKING COMMON PRACTICES WORK
In treating users as the ultimate experts on what constitutes

appropriate computer support within their own context of work, participatory design is characteristically concerned with creating worklike contexts in which users and designers can formulate appropriate designs. Following future workshops and initial workplace studies, scenarios may be constructed. Scenarios are concerned with and informed by observations of specific work situations and are enacted and explored by users and designers alike through the use of mock-ups and / or prototypes in order:

• to explicate or make visible users taken-for-granted knowledge and skills.

• in simulating work through alternative technological means, to identify what is necessary to practice and what is contingently dependent on the current organisation of work.

• thereby, to enable users and designers to get hands-on future technical possibilities in concrete detail [49].

Scenarios are open-ended and continuously elaborated, developed and refined by users and designers hand-in-hand with mock-ups and prototypes throughout development until a concrete product – a fully functional prototype – emerges [45].

Prototyping's strength lies in its orientation to future practice and the construction and iterative development of potential applications in (varying degrees of) cooperation with end-users [1, 17, 27]. Prototyping's strength however, is also its weakness: in the iterative construction of potential applications lies the endemic problem of 'tunnel vision' – i.e. the danger of designing perfect technological solutions to wrong problems of work [1, 43, 63]. As Mogensen describes the situation:

'First of all, prototyping is directed towards the future (potential computer applications) … Once the process of development of successive prototypes has started, the danger arises that one is led to elaborate the details of the current prototype instead of questioning its underlying premises.' [49: 98]

The methodological problem alluded to here is not so much one of designing a potential application in successive iteration through the use of said techniques but rather, the methodological orientation taken in employing those techniques; namely the inherent *orientation to the future*.

Recognising that effective prototyping depends on an adequate understanding of - and thus an orientation to - current practice [31, 49], cooperative approaches to experimental prototyping have emerged in response to the problem of getting hands-on the current organisation of work [32]. The purpose of understanding current practice is two-fold. On the one hand current practice is oriented to in order to identify practical problems of work and thus, to

formulate initial 'guesses' as to what might constitute realistic possibilities for design. On the other hand, to elaborate those guesses through an experimental process in which prototypes are developed through confronting the practical problems embodied in current practice. In elaborating practical problems of work through a continuous process of analysis and design, participants 'work up' alternate futures through the cooperative formulation of concrete design-solutions to those problems. Thus, in experimentation both the current *and* the future are mutually and reciprocally elaborated through iteration and cooperation in analysis and design.

Cooperative techniques of experimentation are predicated upon existing common practices of participatory design. Of particular but often downplayed importance are initial descriptions or studies of work. Initial descriptions of work facilitate the formulation of initial guesses as to what might constitute realistic possibilities for design. These guesses may then be explored in cooperation with end-users through the construction of scenarios and use of mock-ups and / or prototypes. As Morten Kyng points out, work descriptions

'are descriptions of relevant, existing situations within the users' workplace. Here the word relevant indicates that users find that these situations are important parts of their work and that currently they constitute a bottleneck, are error prone, or for other reasons need to be changed.' [45: 94]

In the enactment of scenarios predicated on these descriptions, the prototype assumes the character of a 'triggering artefact', mediating analysis and allowing users and designers alike to investigate current practice, its problems, dynamics and constraints, in exposing current practice to alternate future possibilities [48, 50]. In exploring and experimenting with practice through designing-prototypes-with-users the future is 'worked up' in the present by elaborating current practice, and the problem of designing perfect solutions for wrong problems of work is, in principle at least, adequately resolved.

PROBLEM
Experimental techniques, like all techniques of participatory design, are predicated in their employment on what users' consider relevant. Emerging from, working within and attempting to 'handle' the dialectics between tradition and transcendence[1], Simonsen and Kensing suggest that while there can be no doubt that users should 'be taken seriously', failure to 'take a closer look' at enacted practice may result in inappropriate design.

---

[1] The gap between current practice and future practice which further characterises participatory design [24].

Without observing practice *in situ*, as it is performed in the workplace, one may well come up with the perfect solution to the wrong problem:

'The immediate learning experience from [our] research project was that "taking a closer look" did result in specific changes to our first design proposal. This was, to some extent, even a surprising result, as both we and the users found the first design proposal very appropriate.' [62: 56]

The methodological problem alluded to here does not abnegate the notion that design should be predicated on what users find relevant. Rather, it is to point out that what users find relevant in the course of accomplishing participatory design activities, experimental or not, is not necessarily what they find relevant in the course of work's accomplishment. Of course there is, quite frequently, a strong relationship between activities of work and participatory design – but a relationship is all that exists: *the two are not the same.*

The problem here is well known and consists in the difficulty of articulating or otherwise making visible enacted practice in actual details of its enactment [45]. Although participatory design has devised a number of sophisticated techniques to deal with the problem, it is not fully resolvable through the sole application of such techniques. The reason: enacted practice is highly localised, contingent, and (above all) subject to continuous enquiry and discovery for practitioners themselves *in the course of work's accomplishment* [59]. Thus, enacted practice is, to some significant extent, intransigent to explication in alternate contexts [35]; hence the need to 'take a closer look'.

Despite significant methodological developments in experimentation, the endemic problem emerging from the simulation of context and the intractable dialectics of tradition and transcendence maintains to some, not insignificant, extent [62]. It will continue to do so in so much as enacted practice is intransigent to adequate abstraction to – and thus visibility in - alternate contexts however artfully provided for. One problem that participatory design has faced for some time then, is that of developing complementary means of 'taking a closer look'.

ETHNOGRAPHY - A CANDIDATE SOLUTION
Granting the need for a technique of getting hands-on current practice in actual details of its enactment does not answer the question as to which technique may be best suited to meet this need. In Scandinavia (at the very least) common agreement existed in the early 90's however, as to the desirability of incorporating a sociological approach to work in systems design [42]. From several competing sociological schools of candidate solution, ethnography

emerged in applying an approach that facilitates the design of systems that resonate with or 'fit' work in context.

The term 'ethnography' delineates little more than a distinction between quantitative and qualitative methods of social research. As Shapiro, commenting on the limits of ethnography in CSCW, remarks:

'Ethnography can be put to the service of virtually any theoretical school: there are, for example, functionalist, structuralist, interactionist, Weberian and Marxist ethnographies.' [61: 418]

This is not the place to explore the differences between such schools of thought. It is, however, to note that ethnography is anything but a unified method, indeed it is not really a method at all but, as Shapiro makes clear, is rather a gloss on various and different analytic frameworks[2]. Despite the disunity of ethnography it might nevertheless be said to entail a minimum orientation which has something to do with seeing social activities from the point of view of participants. As Randall *et al*. point out:

'One "take" on this [orientation] … is the ethnomethodological one, in which members methods for accomplishing situations in and through the use of local rationalities becomes the topic of inquiry.' [53: 330]

Ethnomethodologically informed ethnography's primary topic of inquiry has been the world of work and organisation. Seen from ethnomethodology's point of view, ethnography's task is to identify the everyday methods and practical reasoning in and through the application of which activities of work are practically accomplished as routine, taken-for-granted activities within a working division of labour. Ethnomethodology focuses on the working division of labour as individuals are necessarily individuals-as-part-of-a-collectivity and much of their work therefore consists of the intersubjective coordination of tasks into an ongoing assemblage which just is the 'organisation' of work: the factory, the office, the air traffic control suite etc. In coming to understand the *situated* methods through the application of which workers *accomplish* and *coordinate* their activities as activities 'within' some unique or distinct assemblage [29, 64], ethnomethodologically informed ethnography displays the performance of work and production of organisation in skilful, intersubjective (i.e. social) details of its real-time achievement in contrast to idealised form [54]

Through its orientation to the social organisation of current

practice, ethnomethodology has achieved some prominence in system design [64, 34, 35, 36]. In respect of these achievements, participatory design turned to this particular brand of ethnography as a (potentially) complementary means of getting hands-on current practice [65, 9, 10, 62, 40, 41].

SOME PROBLEMS WITH ETHNOGRAPHY'S CANDICACY

Despite achieving considerable prominence within CSCW, ethnomethodologically informed ethnography's candidacy in participatory design has not been and is not now without its problems; some real, others putative[3].

Interpretation

On a general level, participatory designers have suggested that to construe ethnography as a methodology supporting requirements gathering is to profoundly misrepresent and obscure its true nature as a vehicle of 'cultural translation and representation' [4]. Seen as a translation exercise, ethnography is construed as an interpretative activity which limits its (potential) input into design. As Harold Garfinkel, ethnomethodology's founder, points out:

'[Ethnomethodology] is not an interpretative enterprise. Enacted local practices are not texts which symbolise "meanings" or events. They are in detail identical with themselves, and not representative of something else. The witnessably recurrent details of ordinary everyday practices constitute their own reality. They are studied in their unmediated details and not as signed enterprises.' [28: 8]

The concept of 'interpretation' is akin to that of 'forming a hypothesis' or 'making an informed guess' [68]. Ethnomethodology is not in the business of making informed guesses about enacted local practices but seeks to describe them in practitioners terms and actual details of their witnessable (re)occurrence which is the orderliness and thus (social) organisation of work: ethnomethodology describes what people do in observed and observable details of the doing. There is no hypothesising here then – this or that activity happened: the question is, in *visible* details of some particular activity's, or family of activities (re)occurrence, how? Thus, despite occasional labelling to the contrary by its own practitioners, ethnography interprets nothing but seeks to rigorously describe and explicate the

---

[2] This point draws attention to the distinction between gathering data and producing findings through analysis of the data gathered: data may be analysed in multiplicity of ways for a multiplicity of purposes.

[3] Ethnomethodologically informed ethnography is simply referred to as ethnography from here on in as I am only concerned with ethnomethodologically informed ethno-graphy from this point forward. It is worth bearing this point in mind to avoid confusion when considering claims about ethnography - any claims made about ethnography forthwith are claims about ethnomethodologically informed ethnography only.

socially organised features of some family of activities (re)occurrence thereby making visible the practices that systems will be embedded in and change[4].

Having said that, ethnography is unquestionably a means of cultural representation[5] in so much as the approach, properly conducted, makes visible enacted local practices: the intersubjective *workings* of a culture, such as the workplace. It is the very ability to represent a culture's workings – the shared, social 'methods' or practices of work's situated accomplishment and coordination - that has enabled ethnography as a methodology supporting requirements specification in the design of CSCW systems.

Proxy User
One of the central problems with ethnography in participatory design has to do with the notion of the ethnographer as a proxy user. In one respect this is a nonsense as the ethnographer does not (or at least should not) seek to be a proxy user but rather, seek to predicate design on enacted local practice. Of course the ethnographer can never know the work domain as users know it [35]. However, it is not the ethnographer's task to speak on behalf of or represent users but the *practices* users enact through attention to the recurrent details of their enactment. That is to say that the ethnographer seeks to represent the 'job', and more specifically, the intersubjective methods or social practices in and through which the 'job' gets done time and time again. Thus, the ethnographer is concerned with portraying those features of work that maintain regardless of individual.

Nevertheless, criticism has been made [45] in light of remarks suggesting that ethnographers can act as 'users champions' in the early stages of design [6]. Ethnography has (and can have) no objection to direct user-involvement from the outset of design, although the economic realities of industrial design may well dictate otherwise – as advocates of participatory design are well aware [32]. However, as Bardram (1996) points out, to exclude users even from the initial stages of design and elect ethnographers as proxy creates a potential problem of

'one-way communication between users and designers, meaning that information is floating from the work practices to the designer, but no information about the future technology, the use of computers etc., is floating back to the future users in the

---

[4] The methodological issue of interpretation is both a complex and subtle one which is addressed at greater length in the forthcoming paper *Ethnomethodologically Informed Ethnography and Information Systems Design* [22].

[5] Where representation is understood in the sense of *to stand or act in the place of, as a proxy* (Webster's: 1994).

workplace.' [4: 616]

In short, exclusion of users from initial design limits requirements formulation, thus affecting the efficacy of the design process as a whole. While it needs to be recognised that ethnographers frequently act as a communicative agents between users and designers, the potential problem of one-way communication, and thus the isolation of users and designers, is a significant problem to be reckoned with. However, the endemic problem of tunnel vision in design suggests that not only should users and designers be in direct contact from the outset of design, whenever possible, but also, that ethnographers should be an integral link in that chain if design is not to go astray in this way.

Intervention
System design is characterised as a process of change: design is an intervening activity. In the course of its participation in design, ethnography has characterised itself as 'non-intervening':

'Ethnography insists that its inquiries be conducted in a non-disruptive and non-interventionist manner, principles that cannot be compromised given that much of the motivation for IT is to reorganise work.' [36: 431]

Comments such as this have led many participatory designers to criticise ethnography as failing to recognise the dynamics of design [4, 32, 45, 49]. That ethnography in a sociological mode should advocate a non-interventionist attitude I find curious. From its origins, sociology has been explicitly concerned with the issue of social change. Not simply as a topic of sociological inquiry but more importantly, as the point and purpose of sociological inquiry. Sociological findings were, from their very conception let alone production, to be put to use in changing society and ethnographers are very much involved in bringing about social change, particularly in working order through technological design. To take a non-interventionist attitude is not only wholly incompatible with the ethos of sociology but also incongruent with design activities within in which ethnography is embedded and performed.

Having said that, as Hughes *et al.* [36] point out, there are some principles at work here 'that cannot be compromised'. The most important principle is the notion of maintaining faithfulness to the phenomenon. If system design depends on an adequate understanding of enacted practice, then it needs to achieve a congruent understanding of practice's workings on any occasion of design. Ethnography's success here (to date) depends on it observing work *in situ* in a non-disruptive manner. This is not a negotiable matter, but a condition of effective organisational change through design as anybody can change practice. If one is not aware of the

social characteristics of the job which are work's guarantee however, design may well fail or worse, impinge upon working life in ways that are detrimental to workers *and* business alike [34, 36, 53].

Motivated by change, participatory designers frequently emphasise the need to take action and intervene. Intervening in the absence of sufficient knowledge of enacted practice can hardly be construed as best practice in any respect [62]. To require that an approach to understanding and getting hands-on enacted practice be non-disruptive, is not to advocate that the understandings produced by that approach be non-interventionist: what one *uses* the understanding for, and how, is an entirely *different* matter[6] [40].

Current Practice

Ethnography's orientation to enacted local practice has given rise to criticism to the effect that it 'fetishes' current practice at the (potential) expense of future conceptions of work [50]. Criticisms such as this are not intended to abnegate an attention to current practice but draw attention to the proper place of such an attention in design. As Mogensen describes it:

'Current practice imposes a number of constraints on potential applications' and as such 'current practice often contains the keys to what "guesses" could be appropriate.' [49: 98]

The point and purpose in attending to current practice is to discover realistic possibilities for design where the notion of 'realistic' is understood in the context of 'constraints' or features of practice which are integral to the continued performance of work. Ethnography could not agree more:

'Ethnography .. brings a particular focus to the analysis of systems in use and thereby outlines the "play of possibilities" for system design …[Thus] we are not making .. a defence of current practice [but explicating] .. possibilities that good design should not ignore'. [53: 337]

Ethnography does not 'look' at current practice for its own sake then, but in order to identify 'essential' characteristics of practice on any occasion of design. Specifically, the shared methods in and through which activities are accomplished and coordinated - the *what* and *how* of practice so to speak - and the practical reasoning

---

[6] It might also be said that to recognise design's interventionist character is not to buy into any preconceived notions as to what intervention 'is all about': appropriate intervention depends on the situated character of the phenomenon in question not on prior formulations of what the phenomenon might be.

underpinning activities - the *why* of practice. Knowing the 'what', the 'how' and the 'why' of practice *as of* enacted detail is to understand the realistic 'play of possibilities'.

If design is to be effective, it must be able to get hands-on the realistic play of possibilities on any occasion of design, hence ethnography's attention to current practice. It should also be said, that identifying these features of practice is not only an initial concern in design but a concern that runs throughout development [19]. Ethnography ought to influence and run in parallel to exploratory and experimental activities of user participation, thus enabling design to *maintain* an adequate grasp on current practice in 'working up' the future through cooperation in design [21].

Implications for design

The greatest problem ethnography faces, is that of 'linking' its findings to system specifications [4, 36, 52, 61]. The issue has been treated in two ways by ethnographers to date. One, through the development of structured means such as DNP (COMIC Del. 2.2[*]) which consists in developing computer support for organising ethnographic findings and formulating abstractions; and two, by reformulating the problem. In the case of the latter and for example: in considering the working practices of ethnographers and designers, Plowman *et al.* [19] note that specifications for design are routinely generated through internal reports and discussions with designers. Reflecting on the character of internal reports and discussions, Plowman *et al.* suggest that ethnographic studies 'impart knowledge to design' rather than 'give form to design'. Ethnographic studies are 'informative', and that is all they are supposed to be.

Such a reformulation of the problem is untenable. It does, however, encapsulate a common attitude and one which is detrimental to ethnographic study in design (in the longer term at least). As Shapiro makes forcefully clear:

'Any role at all for sociologists in this field rests on their claim to being in a better position to identify particular aspects of "what is really going on" in a given field of work and "what is really the problem" that people encounter in doing it. If this claim is not sustainable then sociologists have no contribution to make to systems design.' [60: 21]

If ethnography cannot support system developers in the redesign of work rather than 'run for cover' [61], then it has no business in design. Having said that, findings in hand, it is no part of ethnography's remit to come up with actual design-solutions [54]. Design-solutions are the indisputable task of the participatory designer cum software engineer, and users. Ethnography's task is to develop commonly applicable means of discovering and linking 'what is really

---

[*]www.comp.lancs.ac.uk/computing/research/cseg/comic/

going on', why and how in ways that support the formulation of potential design-solutions. Of course, the problem is how ethnography might achieve this in ways that are readily assimilable by software engineers and users?

'LINKING' ETHNOGRAPHY TO DESIGN

The central problem of linking ethnography to design is a problem of method. As Kensing and Simonsen describe the situation:

'though we have learned that applying ethnography contributed to [our] result, it is impossible to specify .. precisely which techniques gave which kind of insight.' [62: 56]

Although firm advocates and developers of ethnography as a means of getting hands on enacted practice in the attempt to solve the endemic problem of designing perfect solutions to wrong problems of work, Kensing *et al*. point out that issues of technique are still problematic [40]. In attempting to support the continued assimilation of ethnography in work-oriented practices of participatory design, below I outline the ethnographic method developed in the course of the designing a prototype for a global customer service system. Immersion in the setting [36], standard use of audio or videotape[7] [65] and description of work in its own term's [9] are taken-for-granted here. The concern here is with language, its relationship to the routine performance of work, and with the production of concrete resources supporting the formulation of concrete design-solutions. Properly speaking, what is outlined below is not simply a method but a methodology: way of working and rationale of work are two sides of the same coin.

Language: a candidate methodological solution

The notion of language as methodological solution to the problem of securing empirical reference (getting hands-on current practice) has some pedigree within the social sciences [37]. One 'take' on this point of view emerged in the course of interdisciplinary work in developing a global customer service system supporting the commercial activities of a large geographically distributed container shipping company. The organisation's staff, some 2500 members, work out of two hundred and fifty offices in over seventy countries providing world-wide coverage. The first and biggest problem the project presented was its sheer scale: a globally distributed company with over two hundred and fifty offices in seventy countries world-wide. How is one supposed to get hands-on that?

Language-games and organisations

A fundamental feature of all human practice is language. Different practices have different 'grammars' - i.e. they all use natural language but do so in distinct ways constitutive of distinct practices. Thus, the language of container shipping is different to the language of rail transport, rail transport different to sociology, sociology different to computer science and so on. In its use language is constitutive of distinct practices, and the language of any practice is distinct in and as itself: as the practice of container shipping, rail transport, sociology or computer science etc. Borrowing a metaphor from Wittgenstein, I characterise a distinct practice as a 'language-game'. From my own point of view, to understand a language-game is to understand a distinct *organisation* of work: a practice, or more precisely, a family of practices. It should be said that the methodological reason for invoking the notion of a language-game is not simply to draw attention to the relationship between language and organisation. Rather, in so much as language *is* practice [67], then it is to point out that attention to a working language is a primary *means of discovering* organisation in and as the normal, natural course of work's accomplishment[8].

What one sees in getting hands on the language-game is practice and thus organisation in its own terms, in real world detail providing for the possibility of effective technological support. Thus, to understand the language-game of customer service in the container shipping business for example, is to understand, in actual details of accomplishment, that complex of categorised activities in and through which customer service work (for example) is achieved and some element of a unique organisation produced.

Organisations and language-game concepts

The strength of this orientation to practice lies in an all too frequently glossed feature of work in large organisations. No matter what size, work is achieved locally, in small settings: in offices, workshops, and on factory floors etc., consisting in sections, sub-sections, work groups and so on, all of which consist in a relatively small number of members. Widespread, even global practice emerges from the implementation and routine accomplishment of pre-defined procedures *in small settings and assembly's of work*. Thus, to get hands-on practice in one location is to get hands-on it in another in so much as (and only in so much as) the same pre-defined procedures of work apply, which they frequently do hence there being such a thing as 'common' practice whether at local, regional or global levels; different procedures, then different organisations of work (as one frequently finds at regional levels in a global

---

[7] See [65] to see what the 'standard' is.

[8] As Pelle Ehn reminds us: 'To design new artefacts that are useful for people, designers have to understand the language-games of the use activity.' [24: 108]

scheme[9]). In their application, common procedures of work are rendered intelligible (and thus discoverable) through unique concepts: this set of procedures is called X, that set of procedures called Y. Furthermore, this or that set of procedures are applied (and work thus performed) by persons occupying discrete positions within the working division of labour. Likewise, these positions are rendered intelligible through concepts found in each and every local setting of work: in container shipping for example, whether in Europe, Asia or America, one finds persons occupying positions dealing with 'pricing', 'export handling', 'documentation' etc. in customer service.

In other words the working division of labour is a categorised framework enabling the *identification* of common practices of work. These practices consist of the achievement of pre-defined procedures, which are themselves categorised *and* related. One may get hands-on work then by 'mapping the grammar' of the language-game[10] [68].

In order to map a language-game's grammar it is necessary to adopt the ethnographic stance – to observe practice itself. The purpose here is to document language-game categories or concepts as *enacted* concepts. The first step here is to get hands-on the working division of labour. This is achieved by mapping the *primary* concepts constitutive of practice or the area of practice in which design is interested, and their interrelations:

Example 1.0: In developing GCSS we were concerned with developing technological support for a distinct area of organisational practice known as 'customer service'. The primary concepts at work here are 'quoting', 'pricing', 'export booking', 'allocation', 'documentation', 'inbound handling'. Interrelations are respective – quoting (standard rates) and pricing (non-standard rates) relate to booking and allocation (one formulates and issues a financial rate and if accepted does a booking and assigns cargo to specific vessels); booking to documentation (having booked cargo and loaded the container on a specific vessel, legal documentation must be made to cover its shipment);

documentation to inbound handling (having shipped cargo to some point, arrangements for its release and delivery must be made). These concepts were discovered through attention to the *membership* categories employed by persons embedded or occupying discrete positions within the working division of labour: people who, as a matter of daily routine, do 'quotes', 'pricing' 'export handling' etc.

Having identified the primary concepts and the sense in which they relate to one another, the next step is to map the grammar of each primary concept. Each primary concept consists in a family of activity specific or *relational* concepts [55, 5]. Mapping the grammar of each primary concept thus consists in identifying relational concepts and mapping their individual grammatical features:

Example 1.1**:** The primary concept of 'export handling' consists in the relational concepts of 'preliminary booking', 'freight type' (+ the categories 'full load', 'partial load', 'over size', 'dangerous': all of which are associated to other activity specific concepts: 'over size' to 'dimensions' for example) 'routing', 'space allocation', 'pricing', 'planning', 'inland haulage', 'confirmation', 'notification'[11].

By mapping individual grammatical features I mean this: insofar as language-game concepts are enacted, then mapping a relational concept's grammatical features consists of describing the actions in and through which the activity being mapped is recurrently accomplished:

Example 1.2: In mapping the primary concept 'booking' and relational concept 'over size' we must, in addition to regular booking concepts, map the concepts of 'dimension' - which consists in obtaining and inserting details of 'length', 'width', 'height' and 'weight' into the system - and 'acceptance'; the shipment of 'over size' freight must be 'accepted' by the vessel 'coordinator'. The work of acceptance consists in sending a telex marked 'OOG' to the coordinator who, having assessed the feasibility of carrying the freight and availability of space on the vessel, approves shipment by inserting 'A' for accept and returns the telex; over size bookings *cannot* be confirmed without being accepted by the coordinator.

Despite its simplicity the above example, which is greatly abstracted as space limits what can be shown here, serves to demonstrate that mapping a relational concept's grammatical features not only makes the constitutive details of a particular activities accomplishment visible but also,

---

[9] In the context of container shipping, Europe works in one way, Asia another for example, although work within these regions is much the same as the same procedures of work apply. In so much as local variations do occasionally occur, then they are conceptually distinct and thus mappable. See [20] for further detail.

[10] That is to say, by describing the practised ways in which categorised positions and procedures of work are recurrently achieved and related to other categorised positions and procedures.

[11] In practice, each concept would be described in the details of its constitution: the actions, collaborations, temporal character of the work, tools (no matter how mundane) and information produced and used etc.

and at the same time, renders apparent the embodied ways in which that accomplishment relates to or is coordinated with other activities within the working division of labour.

Mapping a language-game's grammar not only makes visible the ways in which work is intersubjectively orchestrated and achieved as a matter of everyday routine then, but in so doing secures a particular relevance for design in making visible what the 'game' is and how it is played. This issue goes to the heart of systems design, for in achieving an understanding of the 'game' (the family of practices an organisation consists of as a phenomenon in action) and how it is played, how its constituent activities 'hang together' as activities in playing the game, we come to understand what playing the game *depends on* and thus, of what is necessary or essential to practice and what is contingent on the current organisation of the game. In other words, in mapping grammar and thereby achieving an understanding of the situated ways in which the 'game' is played, we come to understand what is and what is not amenable to change. Thus, we come to see what practices playing the 'game' relies upon. *A fortiori*, mapping grammar contributes to the resolution of the classical problem of tradition and transcendence on any occasion of design (Ehn, 1988). In doing so it contributes to the solution of the endemic problem of tunnel vision. Furthermore, in mapping the grammar of language-game concepts, we furnish concrete resources for design.

Instances of language-game concepts

Primary and relational language-game concepts are mapped through the provision of 'instances'. Instances are concrete cases of concepts-in-use, of activities-being-done, of work-in-progress [10]. They describe, in real world detail, the social organisation of this or that concept, describe the practices in and through which this element of the game is played. Specifically, instances display: shared, inter-subjective techniques or ways of working, artefacts used including information worked on and transformed in the working and, of the utmost importance, the practical reasoning or point and purpose for which information is being worked on. Language-game concepts are mapped through real world instances of concepts-in-use and as such, delineate a fluid movement of action and interaction in real time. Instances may be provided in the form of video or audio recordings of work-in-progress and by transcripts of informal interviews with staff in their actual settings of work which incorporate copies of artefacts-in-use (screen dumps, documents, hard copy files etc). In so much as instances display practice then they provide methodical detail of work's real time accomplishment in that these methods, like the practices constitutive of chess, are the practices whereby the 'game' is played by any competent member. Thus, instances furnish concrete topics and resources for design.

An instance of a language-game concept

In the normal, natural course of customer service work in container shipping, 'allocation' is an activity concerned with assigning cargo to a particular vessel. In discussion with the project's participatory designer and the organisation's project management, allocation was 'scoped' as a matter of specifying rules regarding weight, financial margins, type of containers etc., and displaying allocation figures per vessel and office.

Through experimentation with allocation functions in workshops, it became apparent to the developers that the 'scope' needed to be extended. Specifically, to enable 'taking action when space pressed'. Ethnographic studies of the work were undertaken and although a contingent activity, 'taking action when space pressed' transpired to be an everyday activity accomplished in routine (or recurrent) ways. The routine character of work here consisted in export handlers informing the 'capacity manager' of the current state of affairs and of prospective business by telex, and asking for an according increase in allocation for the space pressed vessel. The capacity manager coordinates all requests from export handlers through the use of hard-copy vessel specific allocation sheets, informs 'line management' of the actual and prospective state of affairs by using a computer based artefact akin to an edit sheet, and requests an according increase in allocation. Line management checks the actual state of affairs for the vessel in all regional offices through an on-line vessel specific allocation overview, and if any regional office is under-booked and, as the prospects indicate, does not look likely to achieve its allocation, grants the request.

Vessels becomes increasingly space pressed the closer it gets to arrival / departure date. Thus, taking action is typically a 'last minute' activity which is vital to the well being of the business as the company wishes to maximise its operational capacities and get each vessel as full as possible, and full with cargo generating the most income. Given the 'last minute' character of allocation, it is not uncommon for several, if not all, offices to be competing for space. Thus, when calculating 'prospects' capacity managers often 'add' an excess to the total figure, knowing that line management will probably not be able to give it to them but in responding to over-estimated prospects, will probably give them something close to what they really need. This 'negotiation' is on-going and becomes increasingly frenetic the closer the arrival / departure date comes. Compromise is the norm here and capacity managers routinely have to 'roll' some cargo to the next available vessel which may well be a week away, and which consists in using an on-line export overview

displaying customer, commodity, number of containers and other details of relevance to making a decision as to who and what can be rolled in maximising operational capacities and cost-benefit. So the next vessel …

Analysing instances

In mapping the grammar of 'allocation' in details of that concepts enactment, it became apparent that in addition to scoped requirements, the 'problem' of work we had to support *if* the system was to adequately support the daily accomplishment of work, consisted in providing for the accomplishment and coordination of activities between export handling and capacity management on the one hand, and capacity management and line management on the other. In coming to understand the rationale of the work by mapping the situated ways in which taking action when space pressed was routinely accomplished, and discussing the details of that accomplishment with the participatory designer and users, it became apparent how we might go about *solving* that problem.

This is not to say that we sought to reproduce existing mechanisms of coordination but rather, that in coming to understand the social organisation of the work through observing such mechanisms in use, we came to understand just what kind of design-solutions were realistically possible. Specifically, design-solutions would have to enable communication between export handlers and capacity management on a case by case basis; enable the capacity manager to coordinate cases; get an overview of the actual and prospective state of affairs throughout local export handling per vessel; get an overview of roll criteria; enable line management to get an overview of the actual and prospective state of affairs throughout regional export handling per vessel; enable capacity management and line management to 'negotiate' allocation on a contingent, moment-by-moment basis.

Achieving an understanding of real world working practice through mapping grammar and thereby documenting the actual details of work's accomplishment, allows us to identify practical problems of work and situated, inter-subjective methods of solution which taken together provide for the development of systems that support, and at the same time transform, the activities in which they are to be embedded. Instances of language-game concepts-in-use faciltate the specification of requirements in that they delineate a *problem-space* emergent from practice itself. Furthermore: in illuminating the ways in which staff routinely go about solving the problem, instances of concepts-in-use delineate a *solution-space* rich in productional detail providing for the initial formulation of concrete design-solutions. One product emerging from the orientation to the socially organised features of the

allocation instance for example, was the development of a flexible overview enabling coordination and negotiation.

Having said that, design-solutions such as the overview are not the product of ethnography alone but of ethnography, object-orientation and participatory design working in concert with end-users in a process of evolutionary prototyping[12]. The instance is, one might say, a concrete starting point for design; which is not to say that one must have a collection of instances prior to design but rather, that they should be generated throughout the course of design in concert with exploratory and experimental activities. Instances are concrete starting points in that they *display* the social organisation of activities of work in real time and as such they *circumscribe a problem-solution space* for design. In this respect instances of concepts-in-use not only enable design to get hands-on practice in details of its enactment but also, and at the same time, 'link' ethnography to design in a readily assimilable way. As such, instances furnish concrete topics for design and serve as resources, sensitising designers to the subtleties of work's real time accomplishment in a manner that provides for the formulation of concrete design-solutions. Instances are invaluable resources in grounding design in practice and its constituent details then. They enable system design to get hands-on the language-games of use activities - thus contributing to the resolution of the problems of tradition and transcendence, and tunnel vision - and do so in a rigorous, reproducible fashion, furnishing transformable resources in the process.

ETHNOGRAPHY IN PARTICIPATORY DESIGN

User-involvement has undergone some radical transformations since its inception. In shifting emphasis from institutional notions of user participation in design to more technologically oriented means, prototyping has emerged as a common (potential) solution to the problem of accomplishing (more) democratic organisational change. Prototyping's strength lies in its orientation to the future and, in participatory design's case at least, the formulation of potential futures in active cooperation with users. The strengths of prototyping are also its weakness however. On the one hand, in orienting to the future lies the endemic danger of tunnel vision: designing the perfect solution to the wrong problem(s) of work. On the other hand, what users find relevant in the course of participatory design activities is not necessarily what they find relevant in the course of accomplishing work. No matter how artfully provided for, the problem of explicating enacted practice in

---

[12] The confines of this paper exclude elaboration of that, somewhat complex, process. For an explication of the process and its formal characteristics see [18, 21].

alternate contexts cannot be fully resolved.

In attempting to solve the problem of designing perfect solutions to wrong problems of work by getting hands-on enacted practice in details of its enactment, participatory design has turned to ethnography as one complementary, candidate solution. Incorporating ethnography into participatory design in readily assimilable and reproducible ways has proved to be problematic however. In explicating the ethnographic techniques employed in the design of a global customer service system, it has here been suggested that attention to working language provides a rigorous, reproducible and complementary means of getting hands-on work and organisation, and of linking ethnography to design. In treating practice as a language-game and mapping the grammar of its concepts-in-use, instances of the intersubjective ways in which work is routinely accomplished and coordinated in real time are provided as resources for design.

In the analysis of instances, practical problems of work are displayed. More: the everyday ways in which practitioners routinely solve those problems are displayed. Still further: instances display the rationale of work and thus make visible, 'what the work is really all about' in actual details of its achievement. In the technological transformation of these findings – i.e. in prototyping - current and future working practice may be further elaborated through experimentation and continued ethnographic inquiry until a concrete application thoroughly grounded in, and at the same time transforming, everyday organisational practice emerges.

In conclusion, it might be said that participatory design relies on obtaining an adequate understanding of the language-game of the use activity. Working in parallel with experimental techniques, that goal may in significant part be achieved on any occasion of design by attending 1) to the working division of labour and the membership categories employed by persons embedded there-in; and 2) to the categories members' use to make their activities intelligible both to each other and the inquirer alike. Concrete resources – instances – supporting the formulation of design-solutions may be furnished by describing the recurrent activities of language-game categories or concepts employed:

> *'a language-game is something that consists in the recurrent procedures of the game in time.'*

> (Wittgenstein, On Certainty: 519)

REFERENCES

1. Bally, L., Brittan, J., Wagner, K.H. (1977) A Prototype Approach to Information System Design and Development, *Information & Management*, vol 1.

2. Bansler, J.P. & Kraft, P. (1994a) The Collective Resource Approach: The Scandinavian Experience, *Scandinavian Journal of Information Systems*, 6 (1).

3. Bansler, J.P. & Kraft, P. (1994b) Privilege and Invisibility in the New Work Order: A Reply to Kyng, *Scandinavian Journal of Information Systems*, 6 (1).

4. Bardram, J.E. (1996) The Role of Workplace Studies in Design of CSCW Systems, *Proceedings of IRIS 19,* 613-629, Gothenburg Studies in Informatics, Sweden.

5. Benson, D. & Hughes, J.A. (1983) The Use of Categories and the Display of Culture, *The Perspective of Ethnomethodology*, Longman: London.

6. Bentley, R., *et al.* (1992) Ethnographically Informed Systems Design for Air Traffic Control, *Proceedings of CSCW '92*, Toronto, Canada: ACM Press.

7. Bjerknes, G. *et al.* (1987) *Computers and Democracy: A Scandinavian Challenge*, Aldershot: Avebury.

8. Bjerknes, G. & Bratteteig, T (1994) User Participation, *Proceedings of PDC '94*, Chapel Hill, NC: CPSR.

9. Blomberg, J., *et al.* (1993) Ethnographic Field Methods and Their Relation to Design, *Participatory Design* (eds. Schuler, D. *et al.*), Hillsdale, NJ: Lawrence Erlbaum Associates.

10. Blomberg, J., Suchman, L., Trigg, R. (1994) Reflections on a Work-Oriented Design Project, *Proceedings of PDC '94*, Chapel Hill, NC: CPSR.

11. Bødker, S., *et al.* (1987) A UTOPIAN Experience, *Computers and Democracy* (eds. Bjerknes, G. *et al.*), Avebury: Aldershot.

12. Bødker, S. & Grønbæk, K. (1991) Cooperative Prototyping, *International Journal of Man-Machine Studies*, 34 (3).

13. Bødker, S. & Grønbæk, K. (1991) From Prototyping by Demonstration to Cooperative Prototyping, *Design at Work* (eds. Greenbaum, J. *et al.*), Hillsdale, NJ: Lawrence Erlbaum Associates.

14. Bødker, S., *et al.* (1993) *The AT-Project*, Computer Science Dept., Århus University: Daimi PB-454.

15. Bødker, S., *et al.* (1993) Cooperative Design, *Participatory Design* (eds. Schuler, D. *et al.*), Hillsdale, NJ: Lawrence Erlbaum.

16. Bødker, S. *et al.* (1995) A Conceptual Toolbox for Designing CSCW Applications, *Proceedings of COOP '95*, France: ACM Press.

17. Boehm, B.W. (1988) A Spiral Model of Software Development and Enhancement, *Computer*, vol 21.

18. Christensen, M., *et al.* (1988) Multiperspective Application Development in evolutionary prototyping, *Proceedings of ECOOP '98*, Belgium: Springer.

19. COMIC Deliverable 2.2 (1994) *Field Studies and CSCW*, (eds.) Lancaster & Manchester University.

20. Crabtree, A. (1998) Talking Work: language-games, organisations and CSCW, *Computer Supported Cooperative Work: The Journal of Collaborative Computing*, to appear, the Netherlands: Kluwer.

21. Crabtree, A. & Mogensen, P. (1998) *The Relevance of Specifics and the Specifics of Relevance*, Computer Science Dept., Århus University.

22. Crabtree, A., Nichols, D.M., O'Brien, J., Rouncefield, M., Twidale, M. (1998) *Ethnomethodologically Informed Ethnography and Information Systems Design*, Computing Dept., Lancaster University.

23. Ehn, P. & Kyng, M. (1987) The Collective Resource Approach ..., *Computers and Democracy* (eds. Bjerknes, G. *et al.*), Aldershot: Avebury.

24. Ehn, P. (1988) *Work-Oriented Design of Computer Artefacts*, Stockholm, Sweden: Arbetslivscentrum.

25. Ehn, P. & Kyng, M. (1991) Cardboard Computers, *Design at Work* (eds. Greenbaum, J. *et al.*), Hillsdale, NJ: Lawrence Erlbaum Associates.

26. Ehn, P. & Sjögren, D. (1991) From System Descriptions to Scripts for Action, Design at Work (eds. Greenbaum, J. & Kyng, M.), Hillsdale, NJ: Lawrence Erlbaum Associates.

27. Floyd, C. (1984) A Systematic Look at Prototyping, *Approaches to Prototyping*, Berlin: Springer-Verlag.

28. Garfinkel, H. (1996) Ethnomethodology's Programme, *Social Psychology Quarterly*, 59 (1).

29. Garfinkel, H. (1967) *Studies in Ethnomethodology*, Englewood-Cliffs, NJ: Prentice-Hall.

30. Greenbaum, J. & Kyng, M. (1991) *Design at Work: Cooperative Design of Computer Systems*, Hillsdale, NJ: Lawrence Erlbaum Associates.

31. Grønbæk, K. (1991) *Prototyping and Active User Involvement in System Development*, Ph.D. thesis, Computer Science Dept., Århus University.

32. Grønbæk, K. *et al.* (1995) Cooperative Experimental System Development, *Proceedings of Computers in Context*, Computer Science Dept., Århus University.

33. Grudin, J. (1989) Why Groupware Applications Fail, *Office: Technology and People*, 4 (3).

34. Hughes, J.A., Randall, D., Shapiro, D. (1992) Faltering from Ethnography to Design, *Proceedings of CSCW '92*, Toronto, Canada: ACM Press.

35. Hughes, J.A., Randall, D., Shapiro, D. (1993) From Ethnographic Record to System Design, *CSCW: The Journal of Collaborative Computing*, 1 (3).

36. Hughes, J.A. *et al.* (1994) Moving Out of the Control Room: Ethnography in System Design, *Proceedings of CSCW '94*, Chapel Hill, NC: ACM Press.

37. Hughes, J.A. & Sharrock, W.W. (1997) *The Philosophy of Social Research*, Longman: London.

38. Kensing, F. (1987) Generating Visions in System Development, *System Design for Human Develo-pment and Productivity*, Amsterdam: North-Holland.

39. Kensing, F. & Madsen, K.H. (1991) Generating Visions, *Design at Work* (eds. Greenbaum, J. & Kyng, M.), Hillsdale, NJ: Lawrence Erlbaum Associates.

40. Kensing, F., Simonsen, J., Bødker, K. (1996) MUST - A Method for Participatory Design, *Proceedings of PDC '96*, Cambridge, MA: CPSR.

41. Kensing, F. & Simonsen, J. (1997*)* Using Ethnography in Contextual Design, *Communications of ACM*, 40 (7).

42. Knudsen, T. *et al.* (1993) The Scandinavian Approaches, *Proceedings of IRIS 16*, Computer Science Dept: University of Copenhagen.

43. Kyng, M. (1988) Designing for a Dollar a Day, *Office: Technology and People*, vol 4.

44. Kyng, M. (1994) Collective Resources Meets Puritanism, *Scandinavian Journal of Information Systems*, 6 (1).

45. Kyng, M. (1995) Creating Contexts for Design, *Scenario-based Design* (ed. Carroll, J.), NY: John Wiley.

46. Kyng, M. & Mathiassen, L. (eds.) (1997) *Computers and Design in Context*, Cambridge, MA: MIT Press.

47. Malcolm, N. (1995) Wittgenstein on Language and Rules, *Wittgensteinian Themes* (ed. von Wright, G.H.), Ithaca, NY: Cornell University Press.

48. Mogensen, P. & Trigg, R. (1992) Artefacts as Triggers for Participatory Analysis, *Proceedings of PDC '92*, Boston, MA: CPSR.

49. Mogensen, P. (1994) *Challenging Practice: An Approach to Cooperative Analysis*, Ph.D. thesis, Computer Science Dept., Århus University.

50. Mogensen, P. & Robinson, M. (1995) Triggering Artefacts, *AI & Society*, vol 9.

51. Nygaard, K. (1979) *The "Iron and Metal Project"*, Swedish Centre for Working Life: Malmö.

52. Plowman, L., Rogers, Y., Ramage, M. (1995) What Are Workplace Studies For? *Proceedings of ECSCW '95*, Sweden: Kluwer.

53. Randall, D., Rouncefield, M., Hughes, J.A. (1995) BPR and Ethnomethodologically Informed Ethnography in CSCW, *Proceedings of ECSCW '95*, Sweden: Kluwer

54. Rouncefield, M., Hughes, J.A., Rodden, T, Viller, S. (1994) CSCW and the Small Office, *Proceedings of CSCW '94*, Chapel Hill, NC: ACM Press.

55. Sacks, H. (1979) Hot-Rodder: A Revolutionary Category, *Everyday Language* (ed. Psathas, G.), NY: Irvington Press.

56. Sandberg, A. (1979) *The DEMOS Project*, Swedish Centre for Working Life: Malmö.

57. Sandberg, A. (1979) *Project DUE*, Swedish Centre for Working Life: Malmö.

58. Schmidt, K. & Carstensen, P. (1983) *Bridging the Gap: Requirements Analysis for System Design,* COMIC-RISØ Deliverable 2.2.

59. Schutz, A. (1967) *The Phenomenology of the Social World*, Evanston: North Western University Press.

60. Shapiro, D. (1993) Interdisciplinary Design, *Proceedings of IRIS 16*, Computer Science Dept: University of Copenhagen.

61. Shapiro, D. (1994) The Limits of Ethnography, *Proceedings of CSCW '94*, Chapel Hill, NC: ACM Press.

62. Simonsen, J. & Kensing, F. (1994) Take Users Seriously, But Take a Deeper Look, *Proceedings PDC '96*, Chapel Hill, NC: CPSR.

63. Sol, H.G. (1984) Prototyping: A Methodological Assessment, *Approaches to Prototyping*, Berlin: Springer-Verlag.

64. Suchman, L. (1987) *Plans and Situated Actions: The Problem of Human-Machine Communication*, Cambridge: Cambridge University Press.

65. Suchman, L. & Trigg, R. (1991) Understanding Practice, *Design at Work* (eds. Greenbaum, J. & Kyng, M.), Hillsdale, NJ: Lawrence Erlbaum Associates.

66. Utopia Project Group (1981) *Training, Technology and Product from the Quality of Work Perspective*, Swedish Centre for Working Life: Malmö.

67. Wittgenstein, L. (1967) *Zettel*, Oxford: Basil Blackwell.

68. Wittgenstein, L. (1968) *Philosophical Investigations*, Oxford: Basil Blackwell

69. Wittgenstein, L. (1968) *On* Certainty, Oxford: Basil Blackwell.