

# Being There and Doing IT in the Workplace: A Case Study of a Co-Development Approach in Healthcare

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## ABSTRACT

While user involvement initiatives such as participatory design are welcome, in as much as they focus on design, they are only capable of advancing user control so far. We argue that more attention should be paid to building a partnership between IT specialists and users that extends over the whole system lifecycle, and is grounded upon what happens as users grapple with the problems of applying IT, i.e., appropriating its functionalities and affordances into their work practices and relations. In this paper, we outline how we have been attempting to achieve a user-led development approach in the context of an IT project within a healthcare setting.

## Keywords

Participatory design, co-development, social learning

## INTRODUCTION

Increased levels of user involvement in processes of IT systems development is universally recognised as the key factor in guaranteeing more usable and effective IT-based systems and artefacts. Numerous prescriptions for achieving this through participatory design (PD) have been put forward in recent years [3,4,11,22,28]. Previous work leads us to suggest, however, that while such initiatives are welcome, and can justifiably point to important breakthroughs in improving understanding between users and IT specialists, they are only capable of advancing user control so far [24].

We observe that, in as much as user involvement initiatives tend to focus their efforts within the early phases of the system or artefact lifecycle, they leave important issues unaddressed. Moreover, in providing only time-limited, intermittent and sometimes rather formalised opportunities for user involvement [8], PD approaches *as practiced* today typically retain significant elements of the 'top-down' character of more traditional

IT system development methodologies. We conclude that though PD approaches may be 'user-centred', they are not necessarily 'user-led'. In this paper, we describe an ongoing project whose aim is achieve a more user-led process by extending participation throughout the lifecycle. Central to our approach is exploring ways of 'being there and doing IT', i.e., taking the technical work of IT design and development into the users' workplace.

## BEYOND PARTICIPATORY DESIGN

As the application of IT becomes more entwined with the complexities of organisational working, so the challenges facing IT systems designers increase. In his influential paper 'The Computer Reaches Out', Grudin [12] argues for the need for IT designers to move beyond a narrowly conceived engineering mentality to attend to the lived realities of 'being a user in an organisational setting'. In a similar vein, a number of studies from a variety of disciplinary perspectives have suggested that IT systems failure is associated with inadequate attention to the social context of work [16]; acknowledging that sociotechnical systems are mutually constituting and adaptive as organisations and activities constantly evolve [2]. These issues of design and use have promoted a number of methodological developments. The turn to ethnography [18] has provided one attempt to capture the social context of use, however, though the ethnographer may claim to act as 'proxy' for users the approach increasingly faces problems with 'communicating' its findings to designers.

Another response has been the various forms of PD, a partnership between designers and users for rapid prototyping. With their emphasis on the importance of studying and interacting with users in their working environment, PD approaches generally try to address the problems posed by the asymmetry that is characteristic of IT specialist-user relations. However, in practice, the focus within PD seldom moves beyond the design phase onto development and implementation, where users must try to apply the new system or artefact within their work settings. It is at this very point where user expertise becomes most valuable, and users have the opportunity to be in control of the process, that practitioners of PD generally break off their engagement with them. We

In *PDC 2000 Proceedings of the Participatory Design Conference*. T. Cherkasky, J. Greenbaum, P. Mambrey, J. K. Pors (Eds.) New York, NY, USA, 28 November - 1 December 2000. CPSR, P.O. Box 717, Palo Alto, CA 94302 cpsr@cpsr.org ISBN 0-9667818-1-3

conclude that, despite declared intentions, PD approaches continue to privilege the role and expertise of IT specialists over that of users. This is not to imply that PD researchers and practitioners are invariably only interested in the design phase, but simply to recognize some of the difficulties of maintaining interactions over any extended period.

One result of this is that user requirements that can only be identified in the context of, and through, use, will be missed. This is a major deficiency, but this premature disengagement gives rise to a more critical failing which is the inability of PD approaches to integrate effectively with the 'bottom up', user-led innovation processes of social learning [25,31]. These processes of 'learning by doing' and 'learning by interacting' reflect users' capacity for evolving IT systems in use through experimentation and appropriating the innovations of others.

These observations suggest the need to reassess critically the emphasis that has hitherto been given to the design phase of the system/artefact life cycle. In particular, they are evidence for the proposition that it is time for the PD community to look 'beyond design' in order to further its goals of increasing user involvement. In our view, more attention should be paid to building a new understanding between IT specialists and users which is grounded upon what happens as the latter grapple with the problems of applying IT, appropriating its functionalities and affordances into their work practices and relations. The paper therefore reflects on what might be regarded as extending traditional PD through a practical implementation of some of Blomberg and Kensing's [4] suggestions for continued interaction between PD and CSCW. In particular it involves; attending to the evaluation of technologies; appreciating the benefit of active worker participation in design; adapting to a particular organizational setting and the explicit connection of studies of work and system design. It also accords with Trigg et al's [30] vision of the project of cooperative design; "... an approach to the creation of more useful and useable computer artifacts ... the combination of envisioning, building and use ... as we work our way through successive rounds of trial and discovery regarding all of the ways in which the world is different than we had imagined it to be."

#### **USERS AS CO-DEVELOPERS OF IT SYSTEMS**

A growing expectation is emerging that design should be informed by an analysis of the 'real world' circumstances of work and its organisation [18]. We are interested in the means by which design emerges and develops throughout a system's lifecycle, since use itself provides a significant source for design [2]. Limited consideration has been given in existing models of the system lifecycle to the issue of how systems are placed in actual work settings and how feedback from these setting might influence design. Systems design, viewed as a 'process' taking place over time and in different contexts of use, organisational

response and priority, gives a very different view of the design issues involved as well as a rather different picture of 'users' and design activity than that suggested in traditional approaches. As part of the 'turn to the social' it is acknowledged that design itself is prone to influence by 'social factors' [18] such that systems design is a 'negotiated product' rather than a set of demands simply waiting to be collected [5].

Recent studies point to the fact that, in the right circumstances, users can become involved in more sustained ways in systems design and development processes [21,25,30]. They reveal users acting, in effect, as (co-)developers, in processes that are user-led, rather than just user-centred. In part, the emergence of this new role can be attributed to the changing technical landscape of IT systems and artefacts. Many 'user-level' technologies are now available in the form of generic components, opening up the possibilities for solutions that can be customised, configured and evolved on a 'pick and mix' basis without the need for 'deep' technical expertise. In such circumstances, much of what has hitherto been highly technical work, the preserve of IT specialists, may be taken on by users themselves.

The other major factor is that as IT systems and artefacts penetrate more and more into the workplace, the real problem becomes not so much the creation of new technical systems and artefacts as their effective integration with work practices. Users need the opportunity that only their work can offer to explore fully the possibilities for adopting, and adapting to, new systems and artefacts. When this is allowed to happen, and given the right choice of technologies, development work can assume the characteristics of 'bricolage' -- i.e., the rapid assembly and configuration of 'bits and pieces' of software and hardware [6] -- led by users acting within their own work settings, with IT specialists taking on a support role as facilitator.

In contrast to the user-centred nature of PD approaches, co-development, or participatory evolutionary development [29] calls for the adoption of processes that are user-led, incremental, and can be applied not just during design, but throughout the lifecycle. Co-development provides the mechanism to integrate bottom-up and top-down processes and to capitalise on social learning. In this way, it can help to ensure that users' requirements continue to be met, even as the interplay between new technology and work practices leads to reformulation and innovation: what Henderson and Kyng [15] refer to as "design in use" becomes achievable.

The adoption of co-development approaches is not without its problems, however. Within many organisational settings its risks may be perceived by IT management to outweigh the potential benefits [17]. For example, without appropriate coordination and control mechanisms, interoperability problems can subsequently emerge. For

these, and other reasons, it is likely to be important that user-led processes be maintained in alignment with the broader, strategic concerns of IT management. Failure to reassure IT management that this could be done partly explains the hostile reception afforded so-called end-user computing in the 1980s [10]. Our earlier studies of the Financial Services Sector revealed the emergence of new, specialist groups within IT departments working closely with users and acting both as facilitators and gatekeepers of technical innovation [25]. One of the key techniques we observed being employed in support of this dual role was that of small-scale, pilot projects. These provided opportunities for experimentation and learning without high risk to either the organisation or the players involved.

Our present work sets out to explore the problems and prospects for co-development in the context of a large organisation. To achieve this we are undertaking a pilot IT project within a large hospital, focusing on the development of computer-based tools for clinical work. The goal is to explore how useful and usable innovations can emerge through encouraging user-led processes, while maintaining compliance with the wider requirements of hospital IT services. With respect to the latter, it is an open question whether the models for the management of co-development noted above are transferable to different organisational contexts. Our methodology is based upon creating the conditions for a lifecycle long partnership between users and IT specialists. To achieve this, we are attempting an immersive, situated approach to systems development, taking IT specialists and their work into the users' workplace.

#### **THE PROJECT SETTING**

Though IT promises many benefits for healthcare, these have often proven elusive in practice [20]. Failure has been attributed to a lack of appropriate user involvement in development [14], leaving IT specialists without an adequate understanding of user requirements, or of important usability issues. The healthcare sector, then, has much to gain from greater user involvement in IT projects. We also note the growing range of freeware and shareware medical applications for PDAs etc. that are now beginning to emerge from within the healthcare community (see, e.g., [www.handheldmed.com](http://www.handheldmed.com)). This, we argue, is strong evidence that conditions now exist for user-led processes of innovation to make a significant contribution to the development of healthcare IT. The key issue is how to nurture and harness them effectively. The healthcare sector is a very challenging setting in which to try to engage users in a real and sustained way. Healthcare work is very demanding and typically leaves little time for staff to participate in other activities.

We are working with staff members of a Deliberate Self-Harm (DSH) ward of an Edinburgh hospital to develop improved tools for the management of patient and procedural information [13]. Initial discussions with staff revealed a keen awareness of the deficiencies of current

procedures and tools, and suggested that a project to address these would enjoy a high level of staff interest and commitment. Further, there was already evidence that the ward was a site of significant user-led innovations that the project could build upon. For example, using off-the-shelf packages, one staff member was developing a patient database tailored to the needs of DSH admissions.

#### **METHODOLOGY**

Ethnographic enquiry is finding an increasing role in understanding the relationships between work and its social setting. However, its value for informing system design has been a matter of some controversy [16,23]. At its simplest, ethnography provides an informational input to the design process, making visible the 'real world' aspects of a work setting; focusing upon the specific and detailed organisation of activities which designers are concerned to understand, analyse and reconstruct. Ethnography, then, is generally perceived as valuable in identifying the exceptions, contradictions and contingencies of work activities that do not necessarily figure in formal representations of work. The kinds of changes to design that result from ethnographic studies are generally intended to have an incremental rather than a comprehensively transformative effect. There remain, however, numerous problems in enabling designers to utilise ethnographic studies involving, for example, the scope of the design, the size of the design team, the stage of the design, and so on [16]; frequently glossed in terms of 'communication' between fieldworkers and designers. The need to increase the utility of ethnography and to foster communication has directly motivated a number of developments for collecting, organising and presenting ethnographic material [23,27].

Our goal in this project is not just to understand DSH ward work, but to create the circumstances in which its staff can take control of the project. What we are seeking to do is to turn the concept of user involvement on its head: our aim is not greater user involvement in IT design, but greater IT specialist involvement in user-led processes of innovation and social learning. Our approach is based upon 'being there, and doing IT' -- taking the technical work of development into the users' workplace. The emphasis throughout is on tightly coupled, 'lightweight' design, construction and evaluation techniques. Methodologically, our aim is to achieve a situation where users and IT specialists can spontaneously shift the focus of their attention between the different phases of the system/artefact lifecycle, even to the extent that these cease to exist as distinct and separable activities. We are seeking to bring about a context for IT development work where, as Buscher et al. [6] have put it, "... effort shifts fairly smoothly between implementing or adjusting previously decided possibilities, picking up on the host of small problems that arise during work, coping with the unanticipated consequences of previous actions, talking to individuals ..." Among other issues, this

highlights the implications of our approach for the range of skills that the IT specialist may be required to display in order to cope successfully with these different circumstances. In effect, the IT specialist is called upon to play the role of facilitator in the broadest sense of the term: helping users to realise their needs. Among other roles, this involves acting as design consultant, developer, technician, trouble-shooter and handyman.

Our choice of methodology also has important ramifications for the selection of technologies. In particular, extensive use is being made within the project of various off-the-shelf, configurable components. These 'information appliances' can be easily and rapidly customised to create prototypes for evaluation, experimentation and use.

#### **FIRST PHASE: BUILDING COMMON GROUND**

The project began with a six-month period of familiarisation with DSH ward work practices through ethnographic fieldwork: observation, interviews and discussions with ward members, and examination of artefacts employed. Interleaved with this were frequent discussions with ward staff, both individually, and in groups, about how IT could support their work. The overall aim was to build relationships and common ground [1], essential preparation for the next stage, where one of the project team would become a participant in the work setting as the 'IT facilitator'.

The initial interest of members had been to investigate the possibilities of using 'off the shelf' speech recognition for overcoming bottlenecks associated with limited secretarial resources for transcribing dictated discharge letters. These letters serve a dual purpose -- to inform primary care providers of the admission and outcomes and as a record of admissions for members. Members work with a high admission rate, and patients can re-present with further episodes of self-harm often over a time scale measured in days or even hours. The follow-up care arranged immediately following admission is perceived to be crucial for patients who are often in crisis, and the lack of continuity and repetition associated with re-assessment if details of the previous assessment are not immediately to hand is perceived to be unsatisfactory.

Over time, through repeated cycles of discussion, proposal and review, additional 'problems' or 'requirements' emerged. Information gathering is perceived to be a key aspect of members' work. This involves a brief psychiatric assessment of the patient, and establishing contact with others involved in the patient's care, e.g., GPs, social workers, care workers, and other medical professionals. Members typically do not offer treatment themselves, but "link" patients into other services that are able to provide appropriate treatment. The number of possible "disposals" is extensive, ranging from admission to a psychiatric hospital (which might involve a series of complex negotiations) to giving the patient details about services

that they can contact if they find themselves in 'crisis' again. Possible disposals are available from both statutory and voluntary organisations. Matching a patient with an appropriate service is a skilled decision-making task. A number of interrelated factors will be taken into account, including the seriousness of the episode, the likelihood of a repeat, and the extent to which a patient can be expected to comply with the treatment programmes on offer.

A number of elements of the information gathering and disposals work emerged that might benefit from IT-based support.

- Knowledge about available services is distributed between members. No one member has a detailed knowledge of all the services that might be appropriate in any given situation. Determining an appropriate disposal route is often the result of bringing this distributed knowledge to bear through formal and informal discussion of cases.
- Staffing levels vary, e.g., weekend cover is usually provided by only two members, reducing the opportunities for bringing this distributed knowledge to bear.
- In addition to members' memory for disposal routes, there are a large number of resources 'culled' from many sources and made available in various formats and locations in the ward. Making an appropriate disposal may depend on members' familiarity with these resources, and their skill in using them.
- Achieving a disposal often depends on understanding the formal procedures, e.g., for making a referral to services provided by another hospital.
- The resources to support information gathering activities are similarly numerous and distributed, and specific tools available are often difficult to use.
- Although computer databases exist of details of community based resources, it is may difficult for members to locate the subset of resources relevant to a specific case. Details of relevant resources are often printed out and circulated -- a practice that reflects members' ad-hoc, 'pick and mix' approach to managing information resources.

Design work began with a series of group meetings, supplemented when their schedules allowed, by meetings with individuals. These centred on the discussion of a series of design scenarios, including a resource database of information about services and contact details of other professionals involved in patients' care, the use of speech recognition, and a minimal electronic patient record system that could be used to recall basic information about previous attendance. After some discussion, it was decided that the first project goal should be the resource database. Members agreed that this represented an appropriate compromise between ambition and feasibility, in that it could provide immediate assistance in their work and



afforded early deployment and use. They could also see possibilities for evolving this modest beginning into something more sophisticated, e.g., details of information given to patients could automatically be included in the patient record, thereby supporting clinical governance and accountability.

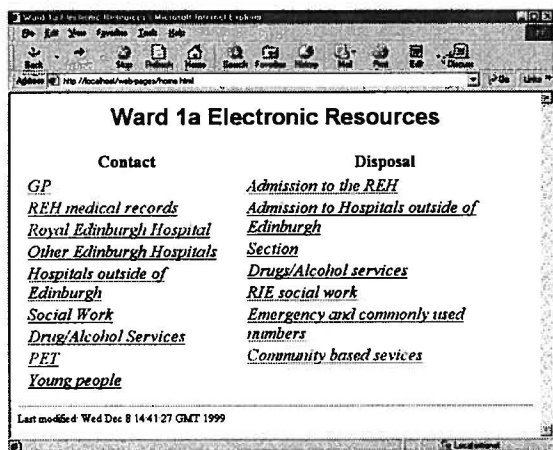


Figure 1: First Prototype Home Page.

Following this, a web-based prototype of the database was developed and demonstrated to each of the team members. The home page for this first prototype is shown in Figure 1. Here resources are organised into two categories -- information about making contact with various agencies, and information about possible disposals. This organisation reflected a broad distinction between members' information gathering activities and their subsequent decision as to an appropriate disposal.

A number of changes to the organisation of the database were suggested, and ideas were forthcoming as to what it might or might not be appropriate to include. Figure 2 shows the 'home page' reflecting the alterations suggested by members. The wording has changed ('Contact' to 'Information gathering') and the inclusion of an additional category 'Protocols' referring to standard procedures used on the ward. Note that the implementation is 'incomplete' -- rather than working up this second prototype in its entirety we decided to make the tool available as soon as it provided a minimum of useful functionality. In this way members could benefit from its use, and also be in a position to test the concept, and then drive the development effort that would be the focus of the second phase.

#### SECOND PHASE: BEING THERE AND DOING IT

The first phase did not provide a set of detailed requirements that could be taken away and turn into useful tools. Rather, it yielded insights into the nature of ward work to take forward into later development work, and provided the opportunity to create a dialogue with members about what their requirements might be. In

normal circumstances, maintaining this dialogue when the balance of technical work shifts to development activities poses problems. The locus of technical work moves away from the users' workplace, hampering or eliminating opportunities for informal interaction (see e.g., [1]). Moreover, when, as in this case, users' work is unpredictable and demanding, attempts to arrange meetings are likely to be frustrated by the exigencies of unfolding events. In any case, our aim methodologically is to move from such intermittent and over-formalised participation to a situation where participation, through the routine, informal interaction between users and IT facilitator, becomes a part of the daily activities of both parties. (This does not mean that we have abandoned the meeting or workshop as a vehicle of user-IT facilitator communication, only that we have recognised their limitations as settings for interaction.)

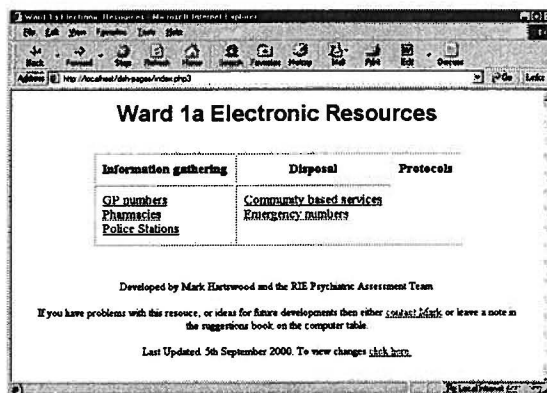


Figure 2: Second Prototype Home Page.

This calls for a strategy of informed opportunism that can only be afforded by 'being there' in the workplace. Our solution has been to explore ways in which technical work can be taken into the users' workplace, if not completely, then at least routinely and over a sustained period of time: i.e., to formulate and organise 'being there' in the workplace as an activity that is compatible with the performance of technical work. By exploiting the mobility afforded by modern laptop computers, we have sought to establish parity between IT facilitator and user, by not just making the former accessible, but also the work that he or she does. This, we argue, is an essential condition for users to be able to interact with IT facilitators as their peers, for IT facilitators to be able to shift their efforts smoothly between their various tasks as circumstances dictate, and so support user-led innovation and system evolution effectively.

#### Evolving Requirements

Bowers and Pycock use the notion of 'gradients of resistance' to explain aspects of how requirements are negotiated between users and designers [5] and there is some evidence in the fieldwork transcripts to support this.

However, contrary to Bowers and Pycoc's assertion that requirements are rarely explicitly formulated by the user as "I want X", in our experience users do make these demands for modifications to, or expansions of, the system to articulate more closely with aspects of their work. We can illustrate this with three examples of (simplified) extracts taken from the 'project diary' kept by the IT facilitator.

**Extract 1:** I demonstrated the system to the New Locum Consultant (NLC). She asked if the system 'could give her all the counselling services in a particular area'. I said not currently – but that this was something we were thinking about. (She had immediately clicked on the "Counselling services" link and examined its contents.) The NLC then queried whether the counselling service 'Number 52' actually does offer free services. Says that she knows this service ... and is aware that they offer a sliding scale of payments. 'Donations' are expected and these might be expected to be 'sizeable' if the patient is 'well-off'. I ask the NLC what the best way to word this might be – the NLC said to contact the service and ask what they think – and then suggested that she might do this herself. She also suggested that the information system could offer details about the current status of waiting lists for 'counselling' services.

**Extract 2:** I am in the doctors' entering more data onto the system. A Psychiatric Senior House Officer (PSHO) said that the "system's great" (in passing) "you only have to put the first couple of letters in". Referring to the electric matching using the 'dochelp' facility. The Psychiatric Liaison Nurse (PLN) suggested that it would be useful if could list 'contacts' (named people) in a 'directory' similar to the way the 'dochelp' system works. (She had been preparing such a list herself). The charge nurse (CN) came into the doctors' room wanting to know the number of a homeless hostel. The PLN said 'we don't have that one' -- then looked up the Local Council on the system and phoned them for the number. The PLN talking to the CN -- "It only takes a bit of thought."

**Extract 3:** A Consultant Psychiatrist (CP) said that he had tried to use the computer to find information on support groups for 'cutters'. I said that that information wasn't on the computer. CP says that PLN has the relevant info, and that he will ask her about it when she gets back. I ask if it should be under the category 'Self harm'. The CP says 'cutters' -- that it's a fairly 'well defined specialised group'.

An important task of 'requirements talk' concerns establishing the boundaries of the system, e.g., what should the system, as a resource database, include and what should it exclude? Like any requirement issue, this can give rise to differing views, as illustrated in the following two (simplified) diary extracts.

**Extract 4:** PSHO: "Is there any point in transcribing all these social work numbers..."

[interrupted by telephone calls]

I ask him again about this. He equivocated about whether would be useful – since they are 'already there' on the notice board. 'Unless you want the system to be an all-encompassing massive...'

**Extract 5:** I ask a PSHO whether he could have a look at something for me. I show him the page I had developed showing the telephone numbers for police stations and ask his advice about laying it out. The consultant who had originally asked for telephone numbers for police stations to be included had suggested two geographical regions that should be covered. The PSHO says 'that looks OK', dividing it up by region was good. I ask about the 'East' region, he comments that it is large area. The PSHO asks about 'West' region numbers. We have a look in the phone book at how the divisions are laid out. The PSHO then says that they are rarely likely to need 'West' region numbers since patients from this region would normally go to [a different hospital]. He says this information need not be included.

Deciding where the boundaries of the system should lie is obviously a complex design issue that may involve reconciling different views. There is a temptation to make

the database as 'comprehensive as possible' with the attendant danger of producing a system that is as cumbersome to use as similar 'comprehensive' electronic resources already available to members. This would also be counter to the original concept of an information resource that is *tailored* to members' requirements. Although there are no easy solutions to the problem, 'being there' affords opportunities to encourage and respond to this debate in a flexible and incremental way.

### The Importance of Context

We frequently observed that the recognition of defects and deficiencies arises from trying to use the system in the context of doing the work. When a member needs a piece of information 'to hand' it is precisely then -- when the options are foregrounded -- that consideration will be given to the means of solving *this* problem, using *these* available resources. Particular artefacts and methods then become relevant to the staff member that were previously part of the unconsidered background of the work setting. The problem is made concrete and the contingencies associated with 'solving the problem' become recognisable. To this extent it is difficult to obtain details about requirements in the abstract in formal user/designer requirements prototyping exercises, as the following simplified project diary extract illustrates.

**Extract 6:** A CP is dealing with a 'self-discharge' last night. The patient had been thought to be detainable. Had initially agreed to stay, but then changed her mind. She tried to leave the ward while her boyfriend tried to break down the door from the outside. A Mental Health Officer (MHO) was called who decided that she wasn't detainable. They were then taken away by the police. CP is trying to trace both the people and records relating to the incident.

The CP asks me to what extent hospitals outside of [the local area] are on the resource database. I say that they have yet to be put on. The CP says this is an example of where he is trying to get hold of a doctor who was on [i.e. working at this hospital] last night but is working in a hospital in [a different part of the country] today.

CP: "Going to have to look through paper directories, and suspect that it isn't on the [intranet] web pages."

Another example (simplified diary extract) also illustrates this point -- that designers, even as they modify the system to incorporate user requests cannot possibly anticipate all the circumstances in which a system might be used.

**Extract 7:** A CP reports that he wasn't able to find details of student counselling services. I ask the PLN where such details might be found - she tells me that these details are available from a leaflet on the leaflets rack.

I enter these details on the database and inform the CP that this has been done. The CP examines the entry and identifies a shortcoming (that there are only [the main local university's] numbers available) and asks the PLN if she remembers a specific episode where they had to find details of a student from another college.

The PLN recalls this incident and also recalls a wealth of detail about different colleges [locally] and the complex relationships between different student counselling services.

The IT facilitator's abstract enquiry failed to elicit the same level of detail that the recall of an actual episode and its associated difficulties was able to do. The interactions documented in this example took place over a number of days, illustrating the advantages of maintaining a

sustained presence in the work setting. When deficiencies come to light it is not always possible to formulate a remedy 'on the spot'. Recognition of a deficiency does not by itself necessarily imply a remedy -- rather the character of the remedy emerges over time and through the situated exploration of possible solutions.

### **Supporting The Dialogue Process**

We are aware that the work of creating a system only provides an opportunity for building a shared practice between users and IT specialists, but does not guarantee that it will happen. Unlike the work of ward staff, which is largely visible (or for reasons of accountability is often rendered visible), IT work retains significant opacities. This is undesirable if we want users to gain an understanding of the technology and of technical work, and so be better able to judge what is possible and what is not, what is simple and what takes time. Thus, the IT facilitator must explore ways and opportunities to actively engage users -- to explain what it is he or she is doing -- in order to make his or her work understandable by, and accountable to, others.

Without some understanding of the technical aspects of the development process, users will be less able to lead it. We recognise that this problem is rooted in the lack of a shared understanding of technical concepts, and concomitantly, the lack of a shared language for discussing technical matters. We are exploring various ways of bridging this 'gulf of understanding', e.g., preparing, and having to hand, sketches of the system's components and how they interact, etc., as a basis for grounding discussions and explanations.

Because the IT facilitator is not present all the time, we are exploring different ways of communicating progress and obtaining requirements from users in the facilitator's absence. So far, we have made use of newsletters (on an office notice board) and a suggestions book. Both have proved to be useful, not only for the dissemination and gathering ideas, but also as devices for initiating and providing a focus for discussions. We plan to develop these resources as a further means of drawing members into the design process, e.g., by listing suggestions and asking for members to prioritise their completion.

### **The Varieties of Facilitation Work**

Experience to date reveals the role of the IT facilitator being shaped and elaborated by the ongoing process of dialogue with users. Thus far, it includes aspects of 'operational support' and 'system maintenance' as well as system design and development. For example, a ward member might ask if a particular resource is available rather than checking its availability for herself. (Note that the facilitator needs to be alert to the multiple interpretations such a remark might entail, including that it is a tentative or disguised expression of a requirement.) Through such interactions, we see the facilitator's role becoming redefined to include aspects of using the system,

rather than simply developing it. Our experience suggests that it is constructive for users to enlist and appropriate the facilitator's skills in these diverse ways, at least initially, or until users feel more comfortable and are able to be more self-sufficient.

It may be argued that if user-led processes are to be sustained, there is a need for users to take upon themselves some of the roles of facilitator and create their own 'tailoring culture' [21]. So, it is a matter of some interest that once instructed in the system's use and functional capabilities, members themselves then adopted the role of operational support and instructor for one another. This is illustrated in the next three (simplified) diary extracts.

**Extract 8:** Later [a nurse] says "That doctor was using the computer over there and I said 'It's much easier to use this one -- don't need to go through so much stuff to get to it'" [This was with respect to looking up GP phone numbers -- there is an existing system that is able to do this]. (A PSHO was the doctor in question). I asked the nurse if the PSHO had used the system eventually. A said that she thought that she had done. (This had happened over the weekend, prior to me demonstrating the system to this PSHO)

**Extract 9:** A CP said that the system was good. Said that the PLN had 'took him through'.

**Extract 10:** A PSHO said that she and a CP had been discussing the resources database yesterday and they were of the opinion that there should be a category "adolescent resources" -- suggesting that the 'family mediation' service might be included under such a heading.

Even in the IT facilitator's absence there is discussion about the system's capabilities and advocacy concerning its utility. Conferring a real sense of ownership through users' direct and ongoing participation in the system's development will, we hope, encourage further the sorts of social learning exemplified above.

A final point concerns the types of interaction occurring between ward members and the IT facilitator. The fieldwork observations suggest two broad classifications. First, as already documented, is talk concerning deficiencies and omissions concerning both interaction and information. Second, is talk concerned with managing expectations, both of ward members and of the IT facilitator, relating to and defining the obligations on the facilitator to rectify deficiencies and omissions of the system. For example, the IT facilitator might indicate how difficult making changes might be, or explain when the member might expect to see changes brought about. In a similar vein members will set expectations and priorities, for example, by saying that a suggestion 'isn't important', 'just a detail', 'we're building the system up'. This is illustrated in the next (simplified) project diary extract.

**Extract 11:** I explain that this tool is not something that I have written -- I say that that I would have to 'reverse engineer' the system to get the data out, make changes, then re-build the system. The PSHO says that this sounds like a lot of work. I replied that I might just try and get the raw data from the people who supplied the program. The PSHO says not to worry about it as it is just 'fine tuning'. I respond that these things are important and that the purpose of getting the system into the ward quickly was to see these glitches come out in practice. Not any problem to make changes, just that it might take some time. PSHO -- "no rush".

The IT facilitator must be sensitive to the work patterns of the DSH team in order to maximise the potential of 'being

there and doing IT'. For example, although the team has a meeting every morning to discuss cases and to divide up the work, this event does not necessarily afford opportunities for discussions concerning IT -- members are keen to 'get on with' their work. It is also not necessarily the time that the system (as it stands) is likely to be put to use -- usually information gathering and locating details of possible disposals are activities that occur later in the day. Early morning is also the busiest time of the day -- the doctors' room is at its most crowded and the potential for 'being in the way' at its greatest. Currently, 'being there and doing IT' is scheduled for mid-morning to mid-afternoon, a period when some of the cases will have been dealt with, members usually take coffee, and often make or wait for phone calls. The atmosphere can be more relaxed and opportunities for engaging members can be more readily found. Adjusting this schedule to fit in with predictable variations in work patterns is important. Similarly, as the system evolves to include functions that impact on different aspects of members' work, then the pattern of 'being there' would need to be adapted to reflect these developments.

#### **DISCUSSION**

So far, our findings are that, both for IT facilitator and ward members, moving the former's work into the latter's workplace has improved accessibility and understanding, and has facilitated a user-led, co-development approach. At the very beginning of the project, the notion of users taking an active role in development was a goal, rather than a reality. At this stage, it proved necessary for us to take the lead, but over time, this balance of control has changed significantly.

The project diary extracts provide some illustration of the bilateral character of the process that is afforded by the interaction between facilitator and ward members. The conversations range over many topics and serve multiple purposes; members make comments about the tool, talk about what information they think should be in the database, how the information should be organised and how it should be accessed; the facilitator seeks clarifications of members' remarks, informs members about new features and about features that are planned for implementation. Sometimes, talk moves onto issues of implementation as members try to gain an understanding of what is technically feasible, or the facilitator attempts to manage members' expectations of what is achievable in the short or longer term.

What the diary extracts collectively point to, as instances that occur spontaneously in interaction between the facilitator and members of the DSH ward, are emerging components of the skill of facilitation that need to be developed. The facilitator is required to reflect on how his or her role within the setting has evolved in relation to the goal of co-developing the technology that members need to become competent in using. Similarly, there is an onus on the facilitator to reflect on how expectations are

produced and dealt with, and how this process might be managed to encourage, and help resolve, debates and differences of opinion about the system's requirements. Since many of the interactions between the facilitator and ward members are struck up spontaneously and opportunistically, there is a danger of the facilitator finding him or herself dealing with conflicts of opinion. So far, instances of this have been few, but we may expect this to change as members come forward with more ideas. More formal interactions such as review meetings have a role to play here, but it must be the facilitator's responsibility at other times to articulate and make understandable the 'status quo', i.e., 'how things have come to be this way' when alternatives are proposed.

Our observations suggest that as users become more familiar and more experienced with the system they generate ideas for its further development. What we document in our account of the system's evolution are the ways in which the emergence of requirements extends beyond 'formal' user-designer meetings, and that there is a multiplicity of ways in which new requirements can emerge. Our argument is that the competencies of users need to be considered over time as they develop and become more sophisticated in system use. The point is not simply that experienced users provide 'better' feedback, but that as users acquire certain competencies in using a given system, a range of design possibilities can emerge.

That user competence is learned, the product of long and painful experience and many 'iterations', is worth remembering in the rush to early evaluation of systems and system use, and is evidence for the need for a nuanced view of the appropriateness of user-centred evaluative techniques. One cannot call upon 'lessons learnt from use of the system' as a design resource without a consideration of the specific nature of that resource. Use, as well as the system itself, changes with experience and competence. As users become 'experienced' they develop new ways of using the system that in turn generate ideas for its further development and in so doing move from 'naive' to 'regular' users. Rather than the one sided change in user behaviour put forward by Woolgar in his notion of 'reconfiguring' the user [32], our research stresses a change not only in the user, but also their use of the system as a set of work practices evolve through use. This may even give rise to 'unanticipated use' -- the utilisation of the system in an unexpected manner -- particularly when used in a novel environment [26].

The focus on constructing systems through the cooperative prototyping endeavours typical of PD is likely to yield initial functionality close to the demands of users. However, even a process as close to users as this does not necessarily consider how a completed system is put in place and the implications of its use in practice. As Berg comments, for systems to be workable and usable they have to be adapted to local circumstance [2]. All kinds of organisational work consists of flexible adaptation, of



'fitting together' various elements, of using 'ad hoc practices' and, in so doing, the work itself changes. Implementing systems not only changes working practice but also impacts back on the system itself. According to Robinson's notion of 'design for unanticipated use', work is "best supported by the provision of resources" rather than "trying to anticipate its specific sequentiality" [26].

The process by which system design and requirements emerge, change and are adapted to, raises interesting problems and possibilities in the context of the re-design of commercial systems in use. Above all, we wish to problematise the notion of employing a single concept as a 'catch-all' for the description and explication of the requirements specification process, taking particular account of Button and Sharrock's assertion that "a 'requirement' is a gloss for a swarm of changing contingencies" [7], believing that it is crucial to examine the myriad of organisational factors which in some way contribute to the constitution of design.

#### CONCLUSIONS AND FURTHER WORK

Those who make the case for greater user involvement in IT systems development processes accept that user knowledge and expertise are critical to success. However, we argue that most prescriptions for increasing user involvement succumb to the 'design fallacy', i.e., that IT failures are due to insufficient involvement of users during the design phase and can be addressed by pouring more time and effort into this part of the lifecycle. As IT systems and artefacts penetrate more and more into people's working lives, however, the 'design problem' is not so much concerned with the creation of new technical artefacts as it is with their effective configuration and integration with work practices. What is needed is not more user involvement in design, but more involvement of IT expertise in the rest of the system or artefact lifecycle and, in particular, in implementation and deployment. The emphasis here is not on PD, but on co-development: the IT specialist acting as a facilitator for user-led innovation and social learning processes, enabling the process to be driven by those who are directly affected. As Trigg et al. [30] write: "... co-development of CSCW technologies ... means more than engaging prospective users in the design of new computer systems to support their work. It requires that we as designers engage in the unfolding performance of their work as well, co-developing a complex alignment among organizational concerns, unfolding trajectories of action, and new technological possibilities."

We have outlined how we are exploring ways of operationalising co-development in the context of an IT project within a healthcare setting. We will continue to experiment with, and assess, modes of 'being there, doing IT' as the implementation and deployment phases of the project unfold. Here, we expect the demands made upon the IT specialist to escalate as the different modes of facilitation: design consultant, technician, trouble-shooter and handyman are increasingly called into play. This is a

demanding combination of roles and raises issues of skill repertoires and the possibilities of over-loading.

As we noted earlier, there is evidence of considerable and significant local, user-led innovation happening in healthcare IT systems, albeit mainly at their margins. Arguably, containing user-led innovation in this way is at best a short-term strategy that will fail to capitalise on its benefits in the long-term. The question of how the balance between local and central control of IT innovation and evolution should be managed, and whether it can be moved from the margins, closer to the IT system core, is an important one. The installation of a new hospital information system during the period of the project provides us with an ideal opportunity to explore strategies for integrating localised, user-led projects with large scale organisational IT infrastructures and management.

Related to this question is the issue of how changes in IT systems development processes can be made self-sustaining. As Clement and Van den Besselaar noted in their retrospective study of several PD projects, the process innovations they spawn are fragile, and often do not survive the completion of the project [9]. They advise that two factors are critical to survival: users must gain in their ability and willingness to be active participants in change processes, and careful attention must be paid to organisational communications and politics. Our methodological approach is intended to address the former. To begin to address the latter, various fora (e.g., project steering and liaison committees) have been organised for the regular dissemination of information about the project to the wider healthcare community and to hospital IT services management. This is one more role for the facilitator and one that we expect to become increasingly important as the project continues.

#### ACKNOWLEDGMENTS

We would like to thank staff from the DSH ward, Royal Infirmary of Edinburgh for their help and participation. This work is funded by the Engineering and Physical Sciences Research Council, grant number GR/M52786.

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