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'ON BECOMING A DNP USER' - SOME REFLECTIONS ON THE DEVELOPING USE OF A COMPUTER SUPPORT TOOL[1]

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" ..the first step in the sequence of events that must occur if the person is to become a user is that he must learn the proper.. technique so that his use .. will produce effects in terms of which his conception of it can change"[2]

ABSTRACT

This paper considers the development of a tool to support the presentation of the material forming an ethnographic report. The paper focuses on the way in which use of the system has evolved to offer appropriate facilities. The use of viewpoints to present material from a number of studies is described. The paper concludes by reflecting on the need to consider the way in ethnographers have become users of the tool.

Keywords: Ethnography, role of the user, viewpoints, unanticipated use.

Introduction

In this paper we offer some reflections on the evolution of a support tool, Designer's Note Pad (DNP), for supporting ethnography in the design process. It also offers reflections which have a wider relevance for understanding the process of tool use and, through this, the evolution and evaluation of a design. We do, of course, recognise that there is more than a minor element of reflexivity in the account which follows in that it is based very much on our own

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[1] We apologise to Howard Becker for the stealing the title of his well-known paper, 'On Becoming a Marihuana User'[2]. Athough the similarities between marihuana and DNP are, to say the least remote something of the spirit of Becker's analysis remains.

experience in the development of the tool. However, what is of interest, and we suggest that it has relevance for the ways in which we might think about the system design process, is the manner in which the design of DNP evolved *through its use* as a tool.

Originally, the Designers Notepad [10] was conceived as a support tool for designers engaged in the software engineering process. The DNP is essentially a flexible hypertext system that supports the rapid construction of the directed graphs widely used in structured methods. The focus of the DNP is on the rapid construction of networks to support the generation and structuring of ideas in a manner similar to Cognoter[4]. It has been widely used across a number of domains to support the structuring of concepts and ideas. These domains have ranged from software design to the writing of essays in the arts and humanities [11].

In this presentation of the DNP we wish to examine the role of the user in exploiting the DNP to present ethnographic material within the design process. In particular we wish to focus on the longitudinal effects of tool usage of users and the way in which the user and tool both change. Initiated in late 1992 the usage of the DNP has undergone significant change. Its use as a presentation device and means of communicating the results of ethnographic studies has enabled a more systematic approach to informing system design.

The approach to structuring and presenting ethnographic information embodied in the DNP is itself a significant methodological result. However, in this account we wish to focus on the way in which the ethnographers involved became users of the DNP and the techniques to present ethnographic information emerged. The starting point for our discussion is a early study of the DNP undertaken by Bowers and Pycock[3] in late 1993 which highlighted a series of limitations of the tool.

We wish to build upon that study by considering the long term development of use and the way in which many of the limitations highlighted are no longer considered problematic by users of the DNP. While some small scale development of the tool has taken place many of the requirements suggested by the earlier study have been met not by amendments in the tool but by its users learning techniques and practices to best exploit the facilities it provides. The techniques to emerge have been successfully used across a number of studies and the DNP is now considered a useful tool. This shift from a problematic tool to successful facility suggests a need to consider carefully the role of the user in the adoption of systems and has implications for evaluation. We move beyond the point suggested by Woolgar[12] of reconfiguring the user. Rather than the one sided change in user behaviour he suggests we would like to stress a change not only in the user but their use of the system. A set of work practices evolve through use of the system which is more than a simple retraining of the user.

Early Prototyping: 'Talking Through Design'

Bowers and Pycock [3] present an account of the social interaction between designers and prospective 'end users' of the DNP. While their emphasis is on the nature of the *interaction* between designers and users our focus is both different and simpler, concentrating merely on what the various transcripts reveal about how the DNP is being *used*. What these transcripts of the very early use of the DNP reveal, in particular, is the attempt to import wholesale into the design process and into the tool, current ethnographic practise with its heavy textual bias, the emphasis on textual annotation, naming and description, the privileging of text over graphical representations and so on. Consider this first transcript and the subsequent analysis for example;

Transcript (simplified data)

TR right so that's currently generating a report for this ok. so you'll see what subdesigns can go ( ) ok

JB right <JB taps fingers> can we see the report?

TR you will when its printed ha ha

JB oh it just prints=

TR =just print=

JB =it doesn't

TR doesn't actually

JB er show them on screen

TR doesn't show them on screen

JB yer

TR you reckon it should show them on screen before printing

JB ummm well I could imagine that you you (.) oh yes oh yes

TR ok then (.) that's not that difficult (to do at all)...

TR you could just show show all this text (.) before (printing) it

SM you mean just as a reinforcement that something is happening or

JB well=

SM =to be generally useful?=

JB =yer I was wondering yer I was wondering

SM cause maybe it's first time you've seen report and you want (.) you're not sure what going to get (.) may be if you use the system another time you'd know what sort of report you're going to get so you just want confirmation that it's doing something

JB well there's another way of looking at it and that is that what comes out as a report is another view on (.) a more textual view on ( ) right whereas here is visual <JB points to screen>

TR yer yer

JB and certainly for certain ways of dealing with things it might be nice to actually see that kind of textual view

TR ok

SM um

Without necessarily disagreeing with the analysis of the interaction which appears in the paper that;

"JB does not explicitly disagree with SM but his *well* prefaces an alternative account which fashions a contrast between graphical and textual 'views'. He then provides an extended account of why textual views may be important: under some circumstances textual views may be clearer than graphical (*paradoxically*), information which is separated graphically may come together textually. Most of this talk is met with tokens such as *yer, um* and *ok*

from TR and SM which mark moments where they could intervene and respond but do not, thereby allowing JB to continue to assemble a number of reasons for the utility of a 'textual view"

What is also being manifested in the talk about the usage of the DNP is a fundamental misconception of the nature of a 'DNP report'; a misconception founded upon and imported from, experience of ethnographic fieldwork 'reports'. Without wanting to appear overly critical - DNP 'reports' bear little resemblance to ethnographic fieldwork reports and are of value only as a temporal index of idea generation - it might be suggested that this and the other transcripts (such as that about 'bang in loads of text' (below) illustrates how disciplinary based thinking impacts on the utilisation of the tool. It is, to put it another way, a testimony to the fieldworker's 'natural' instinct to write everything down. In other words, it was difficult for these users to regard DNP as anything other than a text manipulation tool as the following extract illustrates:

Transcript (simplified data)

JB   now another way I mean I could envisage using something like DNP would be to just bang in loads of text

TR   um

JB   you know just to you know=

TR   =yer=

JB   =then draw boxes around ( ) and have entities emerge

(.)

JB   do you see the idea?

TR   ( ) that would be quite interesting to do <TR writes on pad>

... <TR tries out some possibilities on screen>

TR   thank god SM's not here cause he's got to do ( ) code it

JB   ( ) ha ha ha

However, with increased experience of DNP use, particularly in a complementary mode to traditional ethnographic techniques, new ways of thinking about data and its representation began to emerge. So, for example the concern expressed in the extract above is addressed in the figure below, in this case consisting of 'loads of text' about computer use at a particular site;
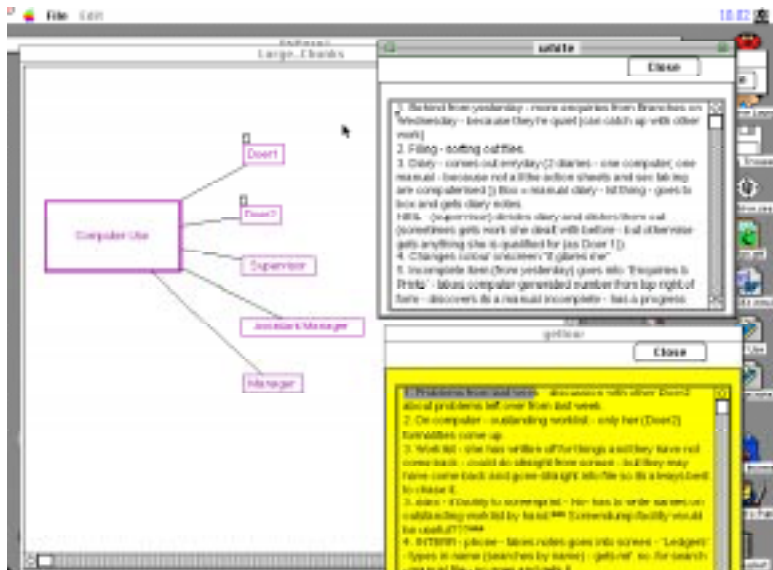
Figure 1: Text in the DNP

The core message to emerge from this study is a perception of the problematic nature of the primacy of graphics over text . One implication of this study would be to develop the tool to allow greater text manipulation facilites and to focus on the provision of text based facilities. In the case of the DNP development resources were limited and a decision was made to support the development of facilities only when they were confirmed by actual usage in the structuring of fieldwork material. However, figure 1, illustrates that without the development of additional features these facilities were 'found' by the users. This paper wishes to consider how this apparent paradox has occured.

Evolving Use of the DNP

After the sessions reviewed above, DNP languished for a few months until two ethnographers working on other projects decided to see if the tool could be extended even though, at this stage, their awareness of its previous history was vague.

> "Well, my understanding was that part of the rationale behind us using [the DNP] was software designers were having problems handling ethnographic texts and that, what might, what might be good for them would be for us to present ethnographic studies in a kind of format that they're more familiar with and so, it's a kind of bridge between these two areas ... that was my understanding anyway"

It was, however, reasonably clear that using DNP merely as a text manipulation tool offered few worthwhile advantages over a word processor or dtp package. There was also some considerable discussion about the kind of support tool fieldworkers might need over and above a taperecorder, pencil and note book. What was, however, reasonably clear was that the tool ought to be able to support communication within an interdisciplinary design team. At this stage what this might involve was vague although in its original incarnation as a software design support tool, DNP had been equipped with a standardised graphical tool set of the kind familiar to system designers. The task was to think about how DNP could support the movement from the predominantly textual presentation of ethnography to the more graphically based representations of system designers.

Another issue which emerged was whether the tool could be designed to be used 'in the field'. As the extracts below illustrate, there was some debate about this possibility.

B: "Personally, I'd be worried about [using DNP in the field], I think it's, I don't know, I think people feel more threatened by someone typing away, I'd also be more worried about having, part of it is just my familiarity and therefore ability to use it correctly, I'd be worried about losing, well like I was saying, the ability you have with a pencil and paper to jot things down, to be all over the place and then to come and organise it on this [the DNP], if you were doing it straight onto this [the DNP], I'd be worried that you would get, constantly start arranging things in this highly schematic manner and would lose the richness of your original fieldnotes."

A: "Well, I dunno, I suppose you could do it but it's familiarity...I think it could be quite a useful device, I mean the other thing it can do, it chop up your document into word and put it into textnotes, you could probably do the diagrams quite quickly, it would save time because you're going to type up your notes anyway."

Eventually, it was agreed that due to the varying and unpredictable practicalities of fieldwork as well as the lack of interpersonal delicacy of typing away while talking to someone, DNP should be seen mainly as a presentational tool for organising ethnographic material in ways which could be made relevant to a design team.[2] In other words, DNP was not intended to replace the traditional tools of the ethnographic trade such as note books, tapes, fieldnotes. Rather, its aim was seen as a means of supporting the design process subsequent to periods of fieldwork.

It would be misleading to suggest that even this overall design aim emerged fully fledged and specified in these initial stages. Certainly, for some months there was a lingering expectation that eventually DNP might yet be made to serve 'in the field'. However, the decision to focus on DNP primarily as a presentation tool was fateful in ways that eventually ruled it out as a field work assistant. By then other design principles had emerged which made it virtually impossible to use as a fieldwork recording system 'in action'.

Ethnography of an ethnographic tool

One of the problems which emerged quite early on, as said previously, was how to address the communication issue which had emerged as one of the major rationales of DNP. As indicated earlier, this was seen, albeit roughly, as providing a means to move between the rich and sometimes dense textual methods of presentation of ethnography and the sparser graphical formats favoured by system designers. However, how this problem might be approached was less than clear. DNP had been equipped with functionalities for both text and graphics, but how these might be systematically connected was elusive.

A solution arose quite accidently and in a way which proved to be serendipitous for the eventual design. The graphical tools had originally been envisaged as a selection of more or less standardised shapes as used in system design to represent nodes, connections, servers, etc. but which, for the non-system designers not versed in this notation, simply looked to be ways of drawing squares, oblongs, circles, elipses, arrows, etc., that one typically finds in any drawing package. In what can only be described as a 'playing around', it occured to one of the ethnographers that these tools could be used to portray the layout of an office in the bank where he was currently doing his fieldwork. That is, the graphical tools could be used to represent a 'bird's eye view' of the desks, filing cabinets, doors, partitions as well as the persons using these office artefacts, and the relationship between them, as they were laid out in the bank (See Figure 2).

Although this was, in some ways, a very simply use of the facilities of DNP, it provoked what turned out to be an important idea in developing the organising principles which eventually emerged in the DNP. Drawing the layout of an office in the way just

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[2] Another important factor was that, as a prototype, the early versions of DNP were not very stable nor optimised for fast performance.

described, is a way of representing in plan form what was visually apparent to the ethnographer doing the fieldwork in the office. From the ethnographers point of view, it also proved to be a convenient way of structuring the often chaotically acquired field notes.

In the screen shot below (Figure 2) what we see is a representation of the ecology of the workplace in the bank. What is also important to note is that the location of the individuals who staff the office is also recorded.
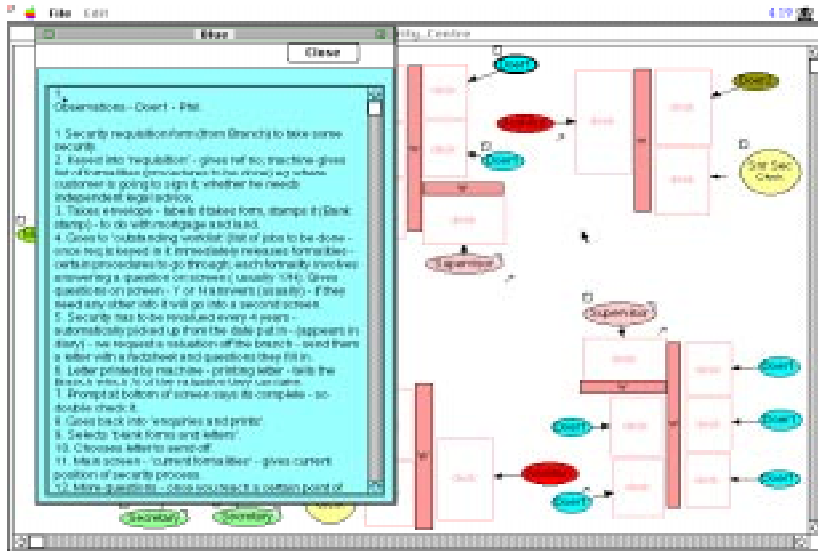

Figure 2: Representation of Office Ecology

The major step was to attach fieldnotes pertaining to each worker to their job descriptions as represented in the ecological diagram. As one of the ethnographers described it:

> "... if you look at the security centre which is what I've been working on, this is basically the first stage, this is an outline of the room where they work, (...) but, and their various desks, you've got two teams there, team one and team two and each team is made up of nine workers at different grades so there's doers ones, doer twos, senior security staff and supervisors, so that's the kind of organisation and what I'm now doing is if you look at the top there underneath that doer one basically I'm going through my notes and attaching to workers that I was observing at the time so there's little text notes attached to them, so, these diagrams are basically straight out of my fieldnotes,. So this a text note of my observations of this guy Phil and the various things that he does and again this is straight out the fieldnotes"

What is of interest here is the principle underlying the structuring of the fieldnotes. The details of the observations of particular workers are attached to their representation but within, or alongside, a contextualising ecological 'schematic' derived from sketches of the worksite in fieldnote books. Moreover, it is a principle which has close parallels with the practise of ethnographic fieldwork in two main ways.

First of all, although there is no particular methodological justification for this, as it happens one way in which a fieldworker can gain familiarity with the research site is by collecting, even as first impressions, details of what we have termed its 'ecology'. By this we mean not just the layout of desks, filing cabinets, typewriters, etc., but also where people are located within the site. That is, what the site looks like as a daily working environment, and an essential aspect of this has to do with its spatial arrangements as the arena or the stage upon which the work is performed.[3] Also worth noting is the way in which the DNP is used very

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[3] We have tentatively explored the possibility of using digitised photographs of work settings instead of line drawings. However, on the whole these convey less information while providing a more realistic 'feel' for what the setting actually looks like. There is, of course, no

much in tandem with the ethnographers' fieldnotes. It in no way replaces, or even displaces them as the primary source of information in the study. What the DNP does do is offer a new means of organising and presenting these fieldnotes, and it was the implications of this that were of interest as use of the package progressed.

Second, one of the main rationales of ethnography is to obtain an effective understanding of the actual work done and this, inescapably, will involve close observation of particular individuals; individuals not simply in the sense of isolates but importantly as members of a division of labour whose work has to be coordinated with that of others.

It was this combination of a graphical way of representing the ecology of the work (never envisaged in the original conception of the tool) with the facility of attaching descriptions of the person, the work and their interrelationships which proved a fruitful means of structuring fieldnote materials. In other words, this simple device showed considerable promise in thinking about one of the problems of relating the textual representations of fieldnotes and the more graphically based modes of representation used in system design. In this case the textnote transcriptions of the fieldworker's own notes are attached to the relevant 'entities' in the ecological overview and, accordingly, available to other members of the design team.

However, even though they are notes, the textnotes can be of a variable and indeterminate size. The fieldworker may also wish to add to the notes as the fieldwork progresses. In which case, it became clear that users would be likely to have problems finding just where particular items of information might be. Accordingly, a search facility was incorporated into the system so that the notes could be searched for terms defined by anyone enquiring into the design. In the example below, the ethnographer speaking here is, in fact, mistaken as DNP does bring up the textnote and highlight the term searched for, as can be seen from the following screen shot.
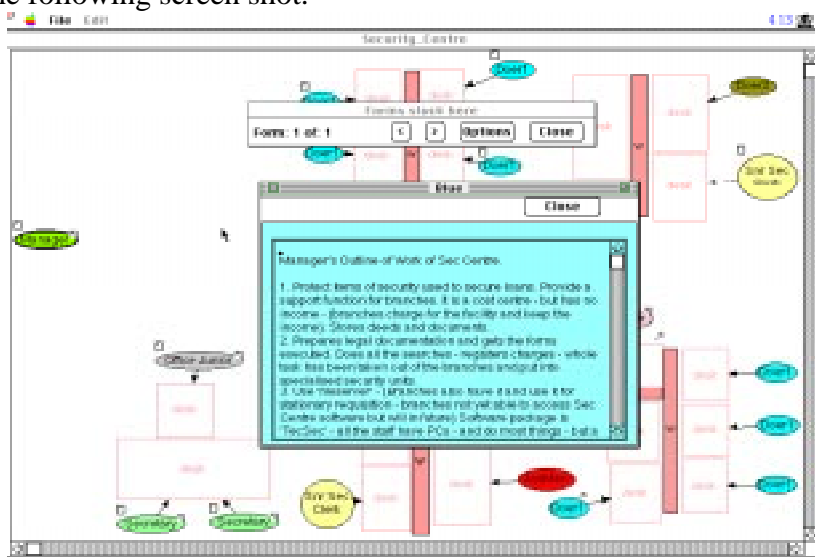
"If you bring up the security centre...um, let's say, uh, look at that manager text note ... "

_____

reason why both types of representations could not be accomodated allowing users themselves to make the choices as to which they find the most useful for various purposes.
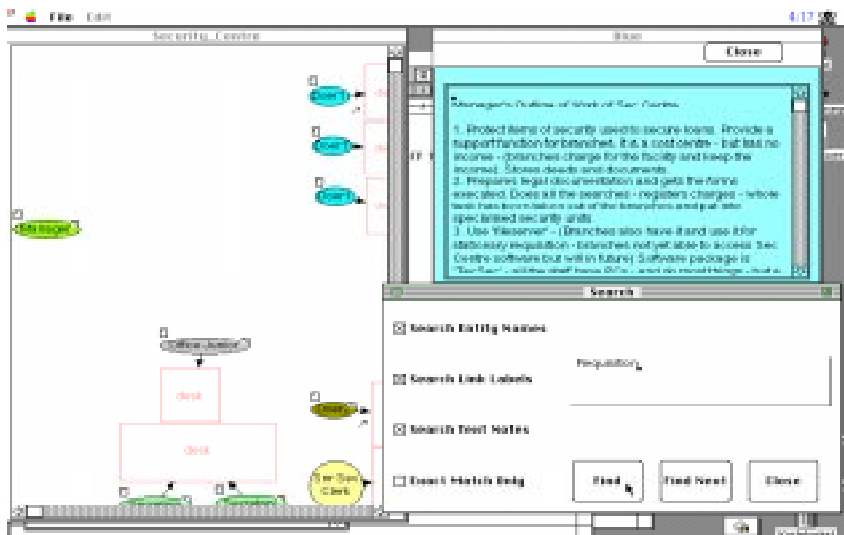
" ... and search it for something like, uh, software, or does it search for words, requisition that will do...it only brings up the text note it doesn't search for the word, you have to look through it, so that means it's worth keeping text notes very small"
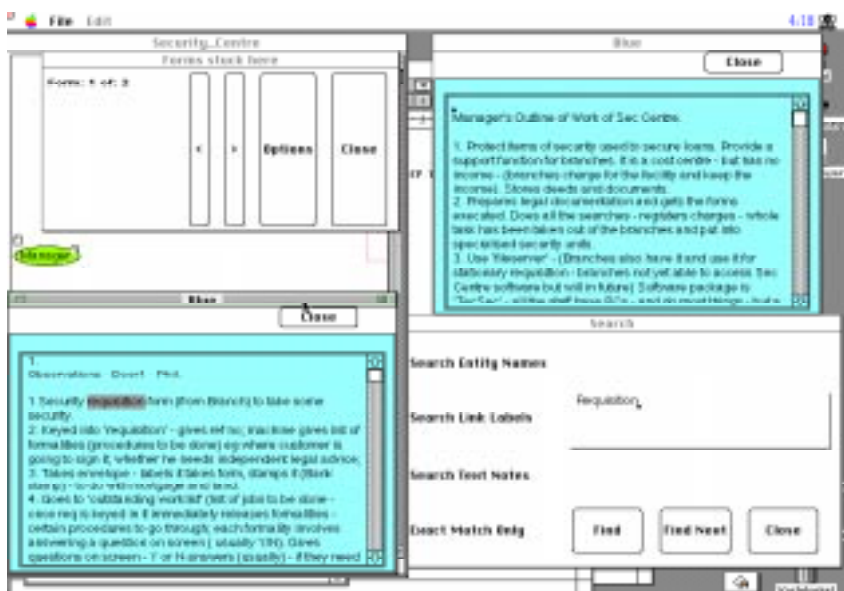

Figure 3: Searching Text Notes

This search produces all the textnotes in which the selected work occurs, in this case those relating to the job of a 'Doer1' in the Securities Centre. Here the fieldworker, having started a search based upon the activities of a manager, is also able to refer to those relating to other workers. Whilst this kind of search facility clearly encourages those considering the ethnography to 'compare and contrast' similarities and differences across accounts of the activities of different workers it would be wrong to think that a crude form of analytical 'search engine' is being offered here: these search facilities are used more for gaining quick access to a particular section of fieldnotes, with a known set of terms associated to it, stored within the diagram. No analysis of search results is offered by the DNP in the form of hierarchies or the like. The search is an organisational facility, simply providing alternative ways into the text notes, replacing the need to manoeuvre through several layers of design.

The emergence of viewpoints

We stressed earlier that DNP was envisaged as a flexible support tool which, in effect, meant that it would not itself provide a structured way of organising the materials but, rather, provide the means for the fieldworker to organise these. Unlike many other tools for handling qualitative data such as NUDIST [7] and Ethnograph [9], DNP was not intended to displace the judgement and the analysis work of fieldworkers but would support the work of representing and recording these analyses for a multidisciplinary design team.

In placing material within the DNP a structure emerged for the presentation of information. Users placed information from fieldwork material within a number of distinct contexts, each of which emphasised particular perspectives on the fieldwork material. This partitioning of material led to the emergence of 'viewpoints' within the tool and the adopting of particular practices to support viewpoints.

The notion of viewpoints is used as a sensitising and structuring device on a corpus of common ethnographic information. A small set of viewpoints emerged; - the setting of the work(ecology), the social context of the work(flow of work) and the practical organisation of the work(egological) taking place; - each presenting a particular focus on the social organisation of work activities and chosen in order to highlight relevant aspects of the sociality of work.

The 'ecological view' proved to be a useful way of building up and representing analyses in alternative ways. In the following example, the ethnographer is recounting some of these alternative ways in which detail can be added to ecological overviews by attaching 'subdesigns' to entities to show the constitutive elements of the latter.
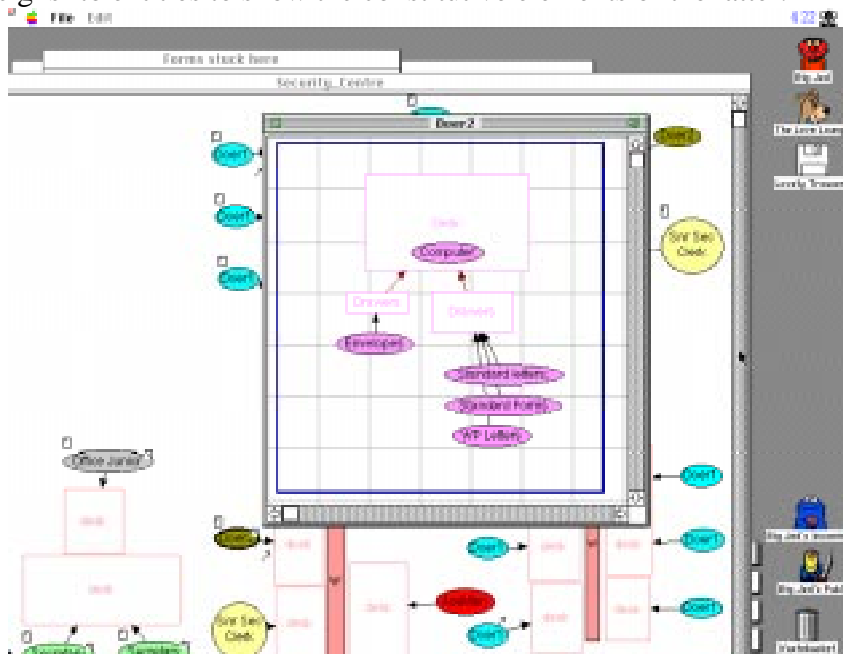
" ... the other thing that we do, is attached to a doer two is, there's a subdesign, now one of . The things that I did was, this is the desk, the organisation of their work, how their desk was organised, as a standard ... "

Figure 3: Adding subdesign detail to the ecological view

It was 'playful experiments' such as these which began to firm up some ideas which had been provoked by the very visual use of the drawing tools to represent the ecology of the worksite. These were related to the notion of viewpoints which, at the time, was being discussed in the

system analysis literature.[4] In particular, the move into 'deeper' subdesigns relating to individuals in the worksite seemed to be a move from the 'ecological' to the 'egological'; that is, offering a perspective, or viewpoint, of the work from that of the individual worker. Thus, while the 'ecological viewpoint' provides an overall sense of how the individuals within the work site coordinate their activities, the 'egological' provides an insight into how that 'overall sense' is constituted out of the coordinating activities of individuals working within a division of labour. [1]

It is important to note that the relationship between the 'ecological viewpoint' and the 'egological' is an intimate one in that they are both constituted out of the same materials and analyses. What is different is the viewpoint on that material and on that analysis. For example, in the above case, the fieldworker's task was to try to understand and describe how the process of processing securities was actually managed as a division of labour in which the separate but interdependent work of individuals workers was coordinated as the work of a team. Thus, the analysis in this particular case is bringing out how the organisation of each person's desk was standardised throughout the team and, as such, exploited as one of the ways of coordinating the complex stages of processing securities. It is based on a series of observations made by the fieldworker of each member of the team over a period of a few days. As these fieldwork materials accumulated, these were added as 'subdesigns' for each individual but, of course, shaped very much by the focus of the research on coordination activities. And it is out of these that the 'ecological viewpoint' could also be constructed.

The same egological approach also underpins a more 'procedural' account of the practical accomplishment of an individual's working activities observed during the study, as can be seen in the next screenshot:
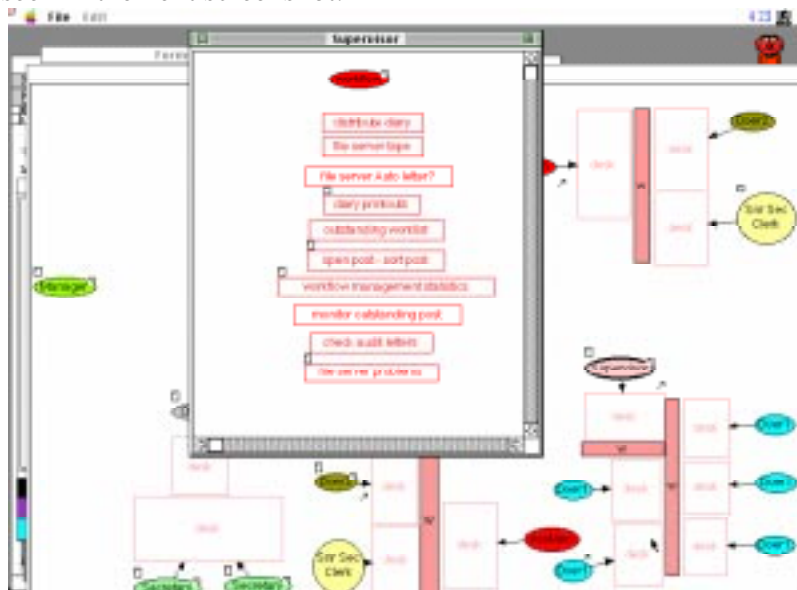
" ... the other sub-design would be that I asked them about what the general pattern of their day was so their day would start with them working through computer printouts and working through diary items and the post would come in and they would work through that and so I mean it Just gives a kind of general picture of the patterns that are there which I take from my fieldnotes ..."

Figure 4: An Egological Viewpoint

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[4] In this we were fortunate to benefit from discussion, in another context, with Professor Ian Sommerville at Lancaster University.

What is interesting to note here, then, is the shift from representation of physical entities and artefacts associated with the work to an account of the actual practices undertaken by a worker (in this case a supervisor) as they proceed throughout the day. A different view on the work is offered here, but once again the rationale for its description is clearly based in the fundamentals of ethnographic study: the observation of the daily routine of those who are party to the work.

These two viewpoints, the 'ecological' and the 'egological' very much grew out of the sociological concerns of the ethnographer and represented using the graphical interface of DNP to organise the textual data of the fieldnotes. Although in a sense, from the point of view of the system viewpoints are arbitrary in that they are not predetermined as system properties, the viewpoints which did emerge were very much geared to sociological ideas which had emerged over a number of years researching into CSCW; in particular, trying to develop ways of relating analyses of the social organisation of work to design processes [5]. However, they constitute but half of the task of design as set out in the albeit vaguely formulated ambitions for DNP. These viewpoints are thoroughly sociological but they had yet to demonstrate how they might be incorporated into the design of systems.

The idea was to see if this abstract representation of the work could be aligned with the ethnographic reports of how the work was actually done in order to bring out those aspects of the work to which the model makes no reference, so as to better evaluate the contribution of, for example, local knowledge and experience, informal coordination, and so on. This is illustrated in the extract showing the DNP in use below.
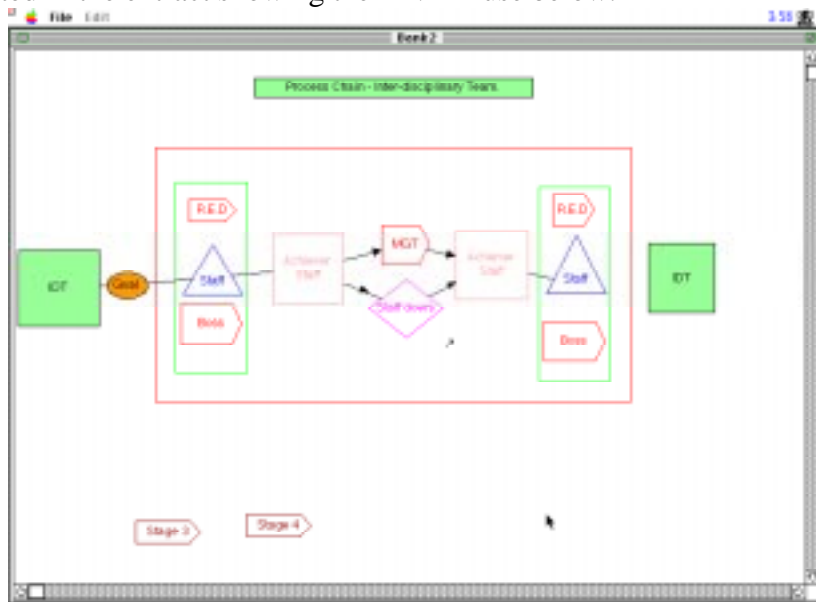
"Take the security centre, what they did was, they designed, they outlined the data process chain and they told, gave us examples from various sites that we were going to of action following this process chain...now what I thought of doing here was attaching to these process chains observations of the chain in action, that is they say, again this is an example, they might say that processing security requisitions is an example of an achievement of a process chain so I would attach that to here from - the doers so you could see this from the fieldnotes and how this model doesn't take reference to this ... these are all examples of how in reality the work gets done whereas the process chain is, of course, an idealised model ... I mean what you've got here is an attempt to use this device to show two or three different ways of looking at the same phenomena so you've got the process chain, which is a fairly standard business model of how the work gets done compared with an ethnographer's account on the screen you've got two different ways of looking at the same phenomenon"

Figure 5: A DNP view of a Process Chain

The process chain is, of course, an idealised model built out of a range of considerations in order to represent, as an abstraction, the work of processing securities. But, as with all idealised models, there are often important issues as how, in fact, they represent aspects of the 'real world' character of the work. Accordingly, by attempting to use the process chain model as a viewpoint to align with fieldworker's account of the same process of work, the idea was that these issues could be systematically explored as part of the design process. As one of the team put it:

> "I think it might be useful for a comparison of different methods, for example, this is the banks view [turning to the screen] of, of how it works, how certain operations work and clearly we could bring in from the fieldnotes examples of these operations and in that sense it would be kind of useful and you would do it in a more briefer other than reading the, the whole ethnography"

Of course, it was but a simple step to move from representing as a viewpoint the bank's process chain models, to using DNP to build the abstractions and graphical representations for system design by exploiting the ethnographic viewpoints. The following screenshot shows the final developed representation of the work in terms of flowgraphs showing the loan process. This abstracted view is bound to the ethnographic presentation through the use cross referencing facilities provided by the DNP.
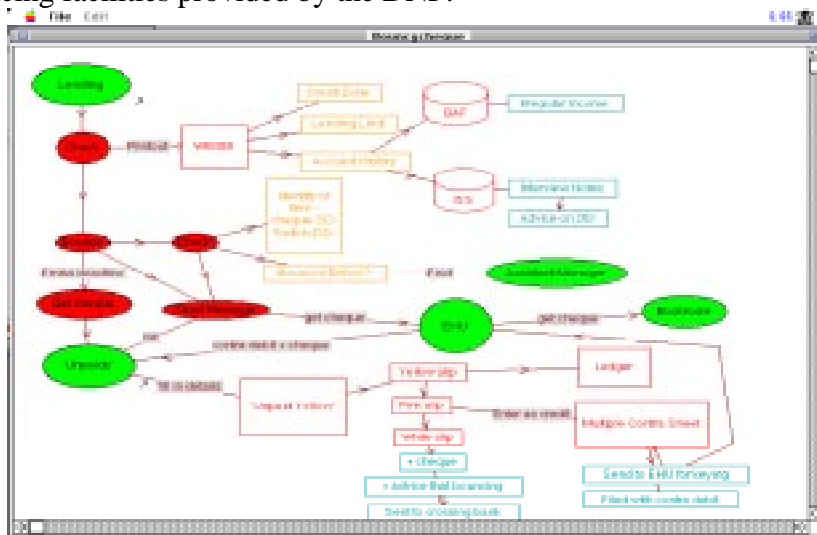

Figure 6: Flowgraphs of the Work

The Viewpoints in ACTION

In this section we present some of our experiences of using our viewpoints more systematically to structure the presentation of information within a different study. This presentation is provided as a contrast to the discussion of the formative usage. In addition to demonstrating some breadth in usage of the DNP this study also allows us to present the way in which the matured patterns of use were build into the DNP to support the presentation of ethnographic material.

The focus for this study was a technology centre within a large multi-national manufacturing company. Until recently, the company's policy was to locate technical expertise in particular centres which would provide consultancy on specific problems and technical issues as they arose in various manufacturing sites, as well as undertaking product related research and development. The company is currently actively seeking to provide more direct

access to this expertise using electronic communication facilities. A central part of this initiative has been the migration of information from existing paper based technical reports to an electronic representation. This involved the development of an electronic data system into which existing reports were scanned. The company had invested in electronic storage facilities and scanning software to undertake initial prototyping trials.

The technology centre comprised three organisational elements: the office, the laboratories, and the Pilot Plant. The centre serves various manufacturing businesses that are part of one of the divisions of the multinational company. Links with the various businesses are through a combination of regular formal meetings, informal personal contacts and 'firefighting' problems as they arise.

The office is a large open plan on the first floor of the technical centre building. The Pilot Plant is a large factory building adjacent to the office and labs which contains a variety of testing and production line equipment. It is occasionally used for the post-development production of highly specialised products. The nature of the work of the technology centre requires a sophisticated technical infrastructure including not only the equipment concerned with research and development but also workstations for each of the technical staff.

The Presentation of Information

Given the nature of their role in the larger organisation as a service provider, the technology centre places considerable emphasis on the importance of quality control and has invested significant resources is gaining accreditation for its work processes from a range of professional bodies including ISO-9000 certification. This feature of the technology centre is often crucial in securing contracts for the manufacturing division and the organisation wishes to preserve it.

One result of the focus on the work process is that a number of representations and flowcharts currently exist as part of the work of the technology centre. These representations provided a useful starting point for structuring the results of our study given their general acceptance across the organisation. The screen shot in Figure 7 shows the representation of the development and accreditation of a technical report and the archiving of technical reports within the centre. These representations are based on documents used across the organisation which were transposed into our system. One way of considering our task was the development of more detailed models of work to support the construction of requirements based on these initial process outlines.
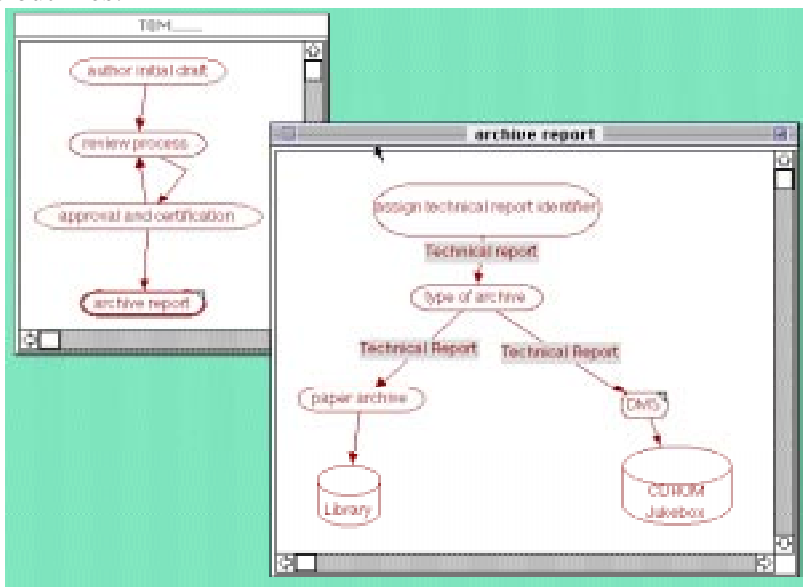
Figure 7 : The technical report process.

Our particular focus in reporting the results of the study is on the document management system. This is the point in the process where documents are converted to an electronic form and stored in a CD-ROM jukebox for later recall. This part of the process was unspecified and our work required us to develop an abstract representation of the work involved. This provided a natural focus for this part of the study and allowed us to exploit the simple viewpoint structuring facility shown in Figure 8. This allowed users to collect together the information associated with three viewpoints and the abstract representation of the process resulting from an examination of this part of the process. In this case we see that we have recorded a selection of different views of work associated with different participants and two parts of a setting of work viewpoint, the document management system, and the setting of a worker called 'Bob'.
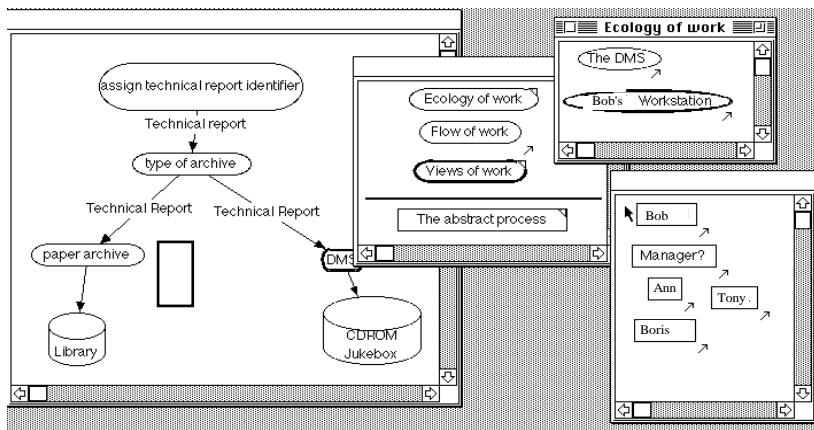

Figure 8 : Representing the viewpoints.

The setting of work is principally represented as a plan diagram of the work setting, 'the ecological viewpoint'. This representation shows the principal participants and resources involved in the work setting and their physical relationship to each other. The plan is annotated with a series of notes that are placed in the diagram using 'post it' facilities. Figure 9 shows an example of the setting of work associated with the document management system and the form of annotations placed on it. The open annotation contains a summarisation of an interview with one of the participants represent in the setting of work.
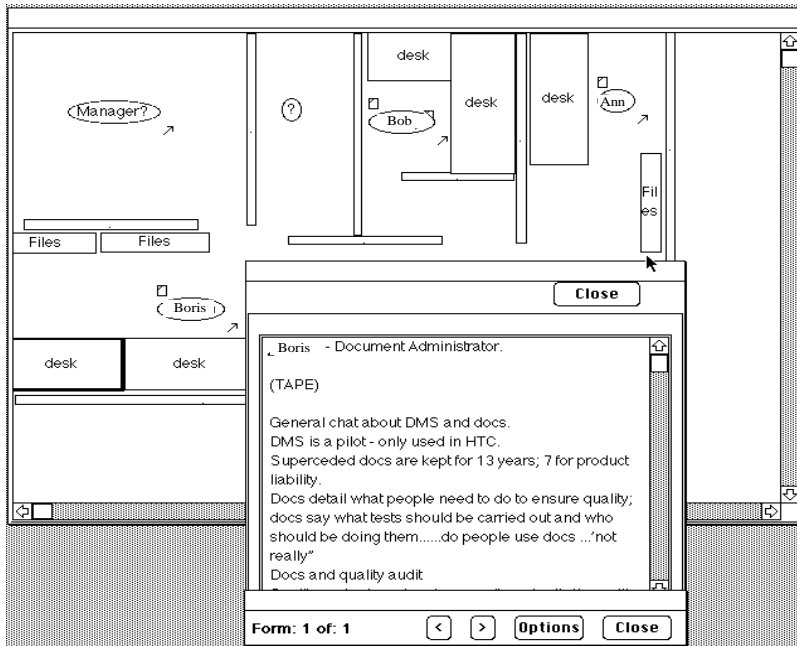
Figure 9: A setting of work viewpoint.

Each of the views in the viewpoint windows exploits cross reference facilities provided to users by the tool to provide direct access to comments and interview information that the observer has decided to convey to developers. This not only allows for the comparison of viewpoints but also preserves some of the richness of the fieldwork materials. In the case of Figure 10, the view of work associated with Ann shows the portion of the setting of work and a part of the ethnographic record which includes a summary of an interview.
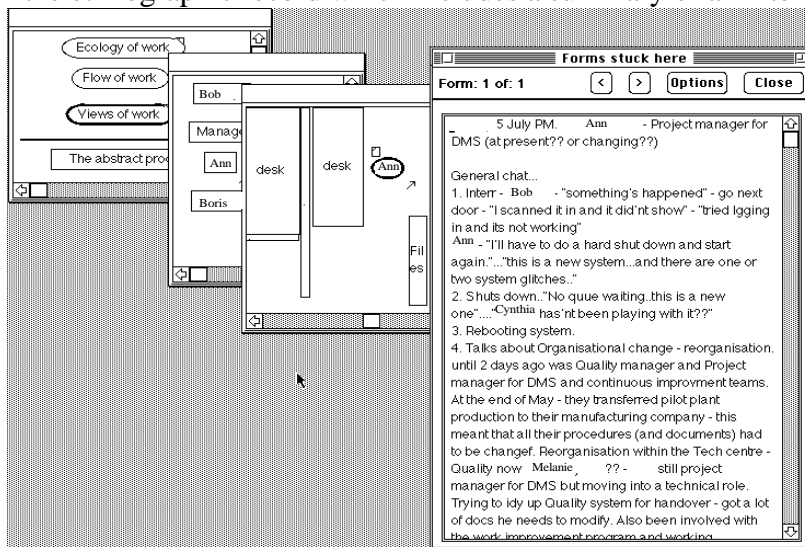

Figure 10 : The view of work associated with Ann.

Our final viewpoint is more closely connected with the abstract representation of work developed by the requirements engineer and recorded along with the three distinct viewpoints. The flow of work viewpoint (Figure 11) represents the work taking place in archiving documents at the document management centre, this is presented graphically to show the general sequencing of work and the resources used. This viewpoint often provides a starting

point for more standardised abstract representations (Figure 12). Users make significant use of cross referencing facilities to link elements of both these representations and to associate them with items in the other viewpoints. This is important in order to maintain the idea that this abstract representation is done for the purposes of engineering and can be cross-checked, validated, and assessed against other viewpoints stored in the system. To facilitate this process the users of the DNP exploit different forms of cross-referencing. The construction of a hypertext network between different entities and designs in the system is indicated by a small arrow. The attachment of sub-designs and 'post-it' notes to particular entities provides a second source of cross-referencing; and finally, designs, sub-designs and 'post-it' notes can be perused and compared through the use of a search facility. So, for example, in figure 9, the process of scanning can be cross-referenced to particular views of work; to the 'flow' of work; to particular folders or individuals within the work process. In turn, for particular individuals, the process of 'scanning' in the egological organisation of work will be recorded in a sub-design, while an account of the scanning process will appear in a 'post-it' note, and the use of the search facility will reveal other individuals connected to the scanning process.
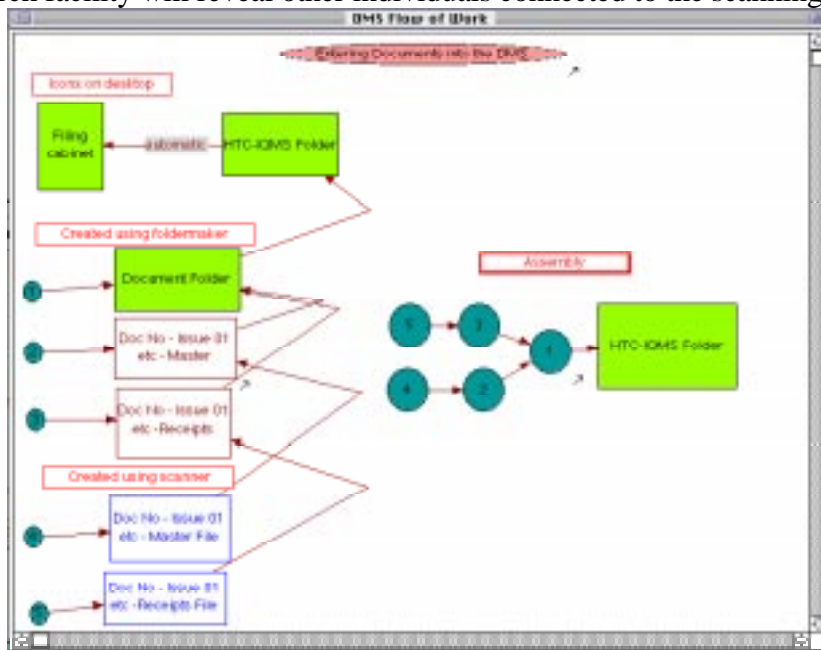

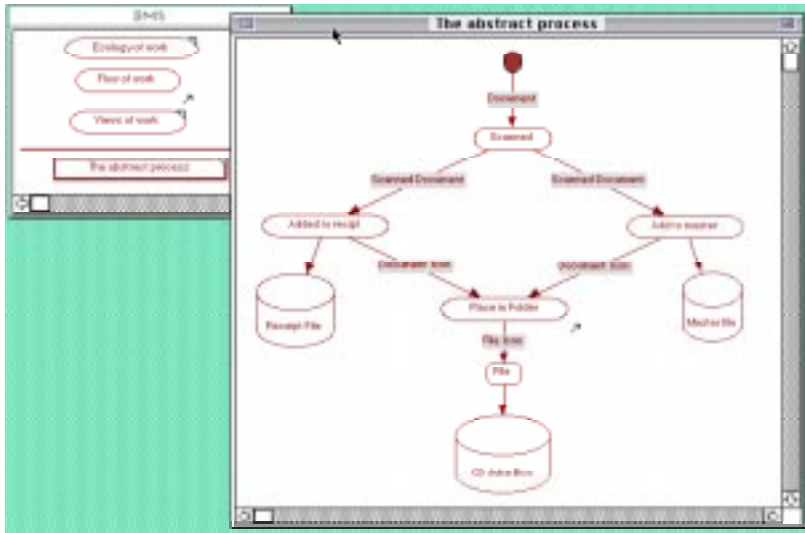**Figure 11: The flow of work viewpoint for the DMS.**

Figure 12 : The abstract representation of work

Conclusions

" ... there's nothing here that isn't in your notes, it's just that this is one way of organising it and maybe something useful may come out of it and maybe it won't"

In this paper we have presented an account of the emergent character of the design of DNP through its use. The tool, although originally envisaged for some other but not entirely unconnected purpose, became part of a research endeavour concerned with scaling ethnographic studies of work to the needs of commercial CSCW system development. It was felt that an important aspect of this, though by no means the only one, was making ethnographic materials and analyses available to multidisciplinary design teams. It was also felt that any solution(s) to this should also preserve as far as possible sufficient of the richness of the analysis and the materials in order to provide an adequate sense of the 'real world' character of the work. The tool should also support the accumulating character of ethnographic analysis, and thereby support the direction of further fieldwork, and present these materials in a form which could be used by other members of the design team.[5] Finally, the tool should also enable designers to move from the textual materials to graphical representations while retaining the link with the former.

As we have been stressing throughout, the tool developed if not quite haphazardly certainly serendipitously through its use by ethnographers. The first point that emerges from this account - that 'competence' is the product of experience - is, or appears to be, so obvious as to almost constitute a truism. Nevertheless it remains a point worth remembering in the rush to early (or should that be 'too early'?) evaluation of systems and system use. What struck us as we thought back on our experiences of using the DNP was the growing and amusing similarity with Becker's [2] classic study, 'On becoming a marihuana user' - that 'becoming a user' requires a number of competencies; of *producing an effect*, of *recognising an effect* and of *enjoying an effect*. As Becker argues

".. for use to continue, it is necessary not only to use the (drug (*or the DNP*)), so as to produce effects but also to learn to perceive these effects when they occur."

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[5] These are, of course, a gloss for the ideas which gradually emerged through many conversations, playing with the system and wrong turnings.

Whilst this is a playful, 'tongue-in-cheek' analogy, the central point, that competence is learned, the product of long and painful experience and many 'iterations', remains pertinent. This iterative process, a feature of the original design and prototyping of the tool [10], was also manifested in its use. The comment that the facilities of the support tool need to be changed in accord with designers using the system; "because the computerised design tool is likely to change the nature of the design process as the word processor has changed the nature of writing" has its reflection in the manner in which *use,* as well as the tool itself, also changes with experience, with familiarity. As users become 'experienced' they develop new ways of using the tool that in turn generate ideas for its further development and and in so doing move from 'naive' to 'regular users'.

A second, and obviously related, point concerns 'unanticipated use'; that is, with experience and growing competence comes 'unanticipated use' - the utilisation of the tool in an unexpected manner - particularly when, as in this case, the tool is being used in a novel environment. This might conceivably be regarded as providing support for, and as an example of, Robinson's notion of 'design for unanticipated use' [8] with its suggestion that work is "best supported by the provision of resources" rather than "trying to anticipate its specific sequentiality". And this is what DNP as a support tool for the presentation of ethnographic analyses does; it makes no attempt to impose any 'specific sequentiality' on how viewpoints may be articulated or how they may be related together. In the case of the DNP this 'unanticipated use' extended from linkages with 'viewpoints approaches' [6], through the 'framework for the analysis of work'to its potential employment in participative design. The extent to which these 'unanticipated uses' may ultimately prove to be valuable in the design process is still a debatable matter and yet to be demonstrated.

Thirdly it is worth noting that Bowers and Pycock's paper is more directly concerned with outlining the interactional mechanics underscoring the emergence of requirements in a session comprising users and designers and offers conclusions with which we entirely concur. What we are pointing to in our description of the evolution of this particular tool are the ways in which the emergence of requirements extends beyond interaction occuring in such 'formal' user-designer meetings, and that there are a multiplicity of ways in which novel requirements can emerge. We would argue, then, that in terms of the evolution of design possibilties meetings of the kind described by Bowers and Pycock, and referred to earlier in this paper, might perhaps be better suited to the later stages of users' familiarity with the system under development. To argue this is in no way to assert the lack of utility of such an evaluative approach, but rather to call for a more nuanced view of the approriateness of certain 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. Our argument here is that the competencies of users need to be considered over time as they develop and become more sophisticated. This point is not one which argues simply that experienced users provide 'better' feedback, but rather that as users acquire certain competencies in using a given system a range of design possibilities can emerge through the deployment of those competencies. Reflecting again on Becker

> ".. the taste for such experiences is a socially acquired one, not different in kind from acquired tastes for oysters or dry martinis"

Finally, and somewhat ironically, DNP has in some respects realised its original intention though by a different route. Its original aim was to provide a flexible tool to capture the progress of the rationale of design and, as part of this, archive design decisions. In its current incarnation is does not serve this purpose as originally envisaged, but what it does do is provide a means of supporting CSCW design to the extent to which this depends upon studies of the social organisation of work activities. One of the major problems in this respect is analysing and recording what is in the fieldworker's 'head', his experiences, his analysis, 'war stories', vignettes, and so on, which go far in representing the richness and the subtlety of socially organised work. DNP does not resolve this problem entirely, partly because it is not a problem that *can* be resolved entirely, but by making the materials accessible within a

viewpoint framework of the kind sketched above to other members of the design team it does offer a considerable potential to bring ethnographic analyses more fully into the CSCW design process.

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