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How to 'represent' the workers: Understand the work of representations.

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The growing acceptance of the need to incorporate an understanding of the work into the design and development process has resulted in a concern with the integration of studies of work into this process. At the core of this integration is a concern with how work and work settings can best be represented as part of the design process. This paper seeks to complement this focus on the development of different notations and mechanisms to represent work by understanding the nature and role of representations in work.

In this paper we consider representation as a practical everyday activity that is undertaken in order to support work in a High Street Bank. In particular, we focus on the way in which management information metrics are drawn upon to construct a representation of the work for those involved in it. This is complemented by a consideration of the development of process maps that provide abstract

representations of the work of the Bank. Both these examples illustrate the need to consider representations as practical everyday accomplishments that are designed in practice in the workplace. We conclude the paper by briefly outlining some of the implications for the future design of systems to support work.

Introduction

The systems design community has seen increased attention on understanding the social in the design and development of systems to support everyday work to the point where it is no longer a contentious issue. With the recognition of the fundamentally situated nature of computer systems (Suchman, 1987) the majority of research in this area has seen a shift to an understanding the nature of the environment in which computer systems are to be placed. Essentially, researchers have embraced a variety of techniques, methods and theories from the social sciences to develop an understanding of the nature of work and convey this to developers.

The approaches that have contributed to this trend have included developments based on social science theories such as 'grounded theory' (Fitzpatrick, 1996), activity theory (Kutti, 1992) and distributed cognition (Ross, 1995). These have been complemented by ethnographic approaches that seek to present a rich description of the work as an everyday activity (Blythin, 1997). While often offering different stances in terms of philosophy and methodology these endeavours share a desire to convey an understanding of the nature of the setting to those involved in the development and construction of supporting systems.

It is clear that representations are central to any consideration of the design and development of systems to support work. A number of researchers have considered the role of representation in the design process in terms of the need for alternative representations to communicate system requirements to system developers (Fischer 1997; Carrol 1994). Often this is characterised as an issue of communication across a divide between the social and the technical and many of these techniques focus on the development of techniques to support this communication. This has led to some considerable debate about the role of frameworks, notations and prototypes in conveying an understanding of the social within areas such as CSCW and Requirements Engineering (Hughes 1997)

In this paper we seek to complement this focus on the development of representations to convey the social setting to developers by seeking to understand the way in which representations are actually constructed and used in work settings. Rather than present the development of particular notations or techniques (as we have done in the past (Hughes, 1995)) we consider how representations emerge and are used in practice by examining the practical accomplishment of some ‘representational’ activities in everyday work in a High Street bank. This focus on the role of representation within the ‘real time, real work’ of the bank aims to uncover the way in which representations are used as an everyday resource to support work as well as a means of representing and conveying the nature of the work taking place.

One reason for this shift of focus in understanding representation is the simple observation that systems to support work often embody representations of work as a means of supporting it. These representations vary considerably in form and include representations such as process models (Colbert 1997), organisational structures (Blyth 1993) and are often reflected in more system elements such as access roles and permission levels (Colouris 1998). More recent representations have even included virtual representations of the work setting itself (Benford 1997) to be used as a medium for cooperative work.

The representations of work embodied in these technological artefacts provide a significant resource in supporting the coordination and cooperation essential to undertaking the work at hand. Consequently, we would argue that the facilities offered to access and use these representations are as significant as the form of these representations. In order to develop these facilities we need to understand how representations are actually used in work settings and how they are used to support work. We wish to complement the considerable debate that has taken place about different forms of representation by examining the relationship between the representation of work and the nature of the work that takes place. In doing so we argue that representations are closely interwoven with work and are often achieved in practice rather than existing independently to the work setting.

In this paper we start by considering the nature of representations and how representation can be considered as an everyday activity undertaken as part of everyday work practice. We then focus on two examples of ‘representational’ activities drawn from the work of the bank. The first considers how existing metric information held as a series of numbers in a spreadsheet is drawn upon to construct a representation of the work of the bank for those involved in managing that work. The second example considers how an existing process model notation is exploited to develop a representation of the work of a unit in the bank to convey this work to those outside the unit. Each of these examples also illustrate the manner in which an understanding of work is used in practice by those involved to essentially design artefacts that represent work and provide a resource to support that work. Finally, we conclude by considering the implications for the development of future workplace systems and the role of representation in these systems.

Representation as a Practical Accomplishment

In turning to any study of work we are immediately struck with the diversity of representations of work that exist in everyday organisational settings and the heterogeneous nature of these different representations. On a day to day basis members in the Bank engage with a range of different things that might be considered to be ‘representations’. Their offices are replete with manuals, edicts, and forms, all of which ‘represent’ the organisation but get used in all sorts of different and *ad hoc* ways. There are reports and files, and a plethora of IT-mediated information and decision-making packages that together provide highly selective ‘representations’ of the Bank, its employees and its customers. So, for example, as Business Managers prepare to interview customers they will routinely examine computer generated Risk Analysis summaries; access the Customer Notes on the computer database; read through letters sent to the customer and so on. There are also the publicly available images of the Bank and its activities that might be encountered on posters and booklets, or on the screens of the ATMs. Whilst primarily displayed to customers, these sorts of ‘representations’ also get subsumed within and oriented to in the sense of what is locally understood to be the organisation and its ‘style’ (Bittner, 1965). Furthermore, there is a range of more informal representations such as instructions scribbled on post-it-notes and attached to screens, walls or filing cabinets.

These different resources are routinely drawn upon and are often used in unison to support different feature of everyday work. The routine interaction and usage of these different representations in everyday work is illustrated in the following fieldwork extract:

> *{Lending Manager dealing with a colleague’s enquiry}* - Colleague giving history of the situation - uncertainty... Checking though screens to track down the customer’s history... Questioning the figures - Reading a faxed letter - Manager noting donations on post-it-note - then numbering reasons for his decision to pass on to the customer - Crosses out point 1 and point 3 - appends a comment

What is worth noting here is that to make sense of the work to be done the lending manager simultaneously draws upon a number of resources. Each of these different sources of information are simultaneously used to allow the lending managers to orient themselves to the work taking place and each provides different representations of the work and those involved with the work.

As well as being drawn upon directly as a resource to support work, representations across the organisation provide a backdrop to many of the informal common practices essential to the work of the bank. For example the fieldwork extract below provides a simple illustration of how organisational stories - chat or gossip about what’s going on in the Bank, and anecdotes about customers - also display a routine orientation both to the range of representations available (in this case 'vouchers' - paper records of financial transactions) and to their place in the accomplishment of routine work ('keying-in' the amounts on the vouchers and balancing the figures)

> Lending Manager talking about problems at the new Voucher Processing Centre - There have been keying-in mistakes - Have become almost daily - "The only variable now is how many piles of work they don't key"

Various representations also provide a significant everyday resource in the co-ordination presentation and management of work within the bank and much effort is expounded in the production of representations of the work that is being undertaken. In particular, members working in the Bank, and especially managers, have to constantly provide accounts of how they, and those for whom they are responsible, have spent their time. These get collated and passed on. Such accounts are gathered in a number of different ways but together they get subsumed within a diffuse body of 'Management Information'. There is often considerable uncertainty about the exact destination of all this information or even its validity: as one manager put it "we know how busy our people are" so conveying the strong implication that as far as they are concerned, records of work done is of little use to them since they know this already. (Blythin and Rouncefield, 1996). Nevertheless, individuals are obliged to enter information about work activity into their screens every day. Team Leaders have to collate it for their teams; functional managers seek to pool that information in order to gain a picture of how their particular unit is 'performing'; and overall centre managers will bring information about discrete units together to answer regional concerns. In this fashion the various members of the work teams within the bank are witnessably responsible for providing the story of 'what it is we have been doing' and 'what it is we do'. Clearly manifestations of this information could be understood to be 'representations' of some kind and there is a sense in which the members in the Bank are routinely engaged in describing their everyday activities. In that way the Bank becomes a self-describing organisation.

In addition to everyone being involved in providing, within the work, an account of the work they do, they also get involved in working together to provide some description of the relationship between the work they do and the work of others. There are continual ongoing efforts to describe the 'process' of work in the bank. Clusters of staff come together to develop 'process maps' - idealised 'representations' of the workflow. These representations are routinely produced as part of a series of Quality Assurance initiatives in the Bank and these kinds of 'representations' are overseen and refined by managers too, so that their production becomes a collective enterprise.

Considering the nature of representation

The term representation has been quite deliberately used so far without any consideration of a definition of the term. In many ways to recognise the activities we have been describing as 'representational' is unproblematic. Few, one might argue, would have trouble seeing them that way. However, representations have a tremendously situated nature and many things can be considered as acting as a representation. In this regard, the punning title of this paper is no sheer act of flippancy. Its purpose is to underscore the highly contextualised ways in which the word 'representation' is used and understood. For members its use is not a theoretical or methodological problem but a practical one. What is meant by it is usually wholly evident through the situated character of its use, and, in the Bank, 'how to 'represent' the workers?' is a very real and everyday practical problem. This only serves to emphasise the extent to which, whilst clearly an issue for matters of design, 'representation' is also a matter of everyday interest and work for organisations and those who work within them. It is this situated nature that underpins the dual role of representations as a means of presenting the work to others and as a means of making sense of the work. Understanding these dual but related roles provides the central motivation for the need to understand how representations are used in practice to underpin the design of systems based on understanding the nature of work.

Our concern here, then, is with what mileage the word 'representation' as an analytic gloss might offer when considering a whole range of disparate activities where the whole sense and orderliness of those activities is necessarily situated and distinct. When one writes in general terms about 'representation' it is hard at the present moment to see what it can say about such diverse activities as painting a picture, building a model, producing numerical descriptions of some phenomenon, or describing someone you just met. All of these might readily be referred to as representational activities and consequently involved themselves in the production of representations of work.

However, the main problem in taking this view is that we are effectively accepting a presumption of commonality without any effort being made to fully explicate these distinct activities in such a way that 'meaningful' isomorphisms (if such could ever be discovered) might be pointed to. Given the intimate role of the production, manipulation and use of representations to manage and support work, uncritically embedding this assumption in the overall design and development of systems to support work is potentially problematic, as these activities are central to the support of work.

We are not attempting to deny here any possibility of 'family resemblance' between such activities but rather we are concerned about what one can say about 'the family' in general that might simultaneously say something meaningful about one of its members and inform the support of these activities. Our concern here is very much that expressed by Wittgenstein:

> "Consider for example the proceedings that we call "games". I mean board-games, card games, Olympic games, and so on. What is common to them all? - Don't say: There *must* be something common, or they would not be called 'games'" - but *look and see* whether there is anything common to all. - For if you look at them you will not see something that is common to *all*, but similarities, relationships, and a whole series of them at that. To repeat: don't think, but look! [Wittgenstein, PI66]

This assumption of commonality is often further embedded in a theoretical stance that further abstracts away from the complexity of these similarities by focusing on the development and production of appropriate representations. This is precisely the problem, for example, with Foucault's 'crisis in representation' where the 'representations' provided by language are seen as becoming increasingly divorced from the things they 'represent' (Foucault, 1970). Here the whole matter of representation becomes a critical, theoretical, and ontological issue. However, such endeavours do not so much look at things like work, as at indices that might supposedly represent aspects of the work.

For us, representation is a practical member's problem and it is hard to see what such abstractions have to say about how representations might be practically achieved and used. Like Wittgenstein we would suggest that if you want to understand representations at work you necessarily have to not 'think', but go out and 'look' at how workers represent work. In other words we are concerned to explicate and attempt to understand concrete, real-world phenomena in the workplace (or elsewhere) rather than to engage in 'might-be's' that are necessarily theoretical abstractions with an unproven — and undemonstrable - connection to the phenomena they purport to describe. No theory of representation can capture the sense of these real-world phenomena because it fails from the outset to pay attention to the representational activities themselves. As we have already commented, in the context of the Bank, how to represent the workers (and indeed the work itself) is a wholly pragmatic issue that has to be engaged with every day at numerous levels. We endeavour here, then, to provide a detailed empirical study of specific, concrete 'representational' activities that fully recognises the situated character of the work itself. We are not setting out to provide another speculative contemplation upon what it is that representation might be, but rather a detailed account of specific instances of 'representation' in action, through which the particular sense of doing that particular representation is achieved.

It has to be stressed that we are not so much arguing for total abandonment of the term 'representation' here as for a use of the word that is wholly grounded in witnessably available real-world phenomena and that wholly recognises the situated and particular ways in which 'representation' is achieved. So much as we have any working definition of 'representation' it would amount to the following: the taking of certain aspects of something that was once *present*, in order to make relevant features of it present again. 'Present' here we take to be in both the temporal sense, and also in the sense of being present rather than absent. What this amounts to is simply saying that representation is the taking hold of aspects of something from elsewhere and elsewhen in order to make those aspects available for inspection, discussion, practical use etc. etc. *here-and-now*, in the fully accountable ways that anything gets drawn into situated interaction. As such it is a gross summation of all of those accountable activities of making available, and the products of those activities, as well as the accountable orientations to, and engagements with, those activities and products, in praxis, with all of those activities, orientations etc. being investigable issues in their own right. In no way is this an attempt to provide a 'right' definition. Rather, like other members definitions, it constitutes a *modus operandi* in relation to the specific activity in which we ourselves are engaged.

'Representing the Workers' - Management Information and Self-Representation

The ongoing reorganisation of the Bank into large, centralised functional units highlighted issues of management control and the importance of management information, particularly in the identification, calculation and prediction of labour costs. Initially the Bank relied on a manual system, the Productivity Management Programme (PMP) for the measurement of productivity and efficiency and to assist management in the allocation of staff to work tasks.

Each working day, the Assistant Managers completed a PMP sheet of work pending and then calculated, using the PMP and Work Tally Sheet, how much work there was to be done. Each staff member completed a Daily Work Management sheet that detailed what he or she had accomplished the day before and how much time each activity took. These documents were then used - in theory at least - to allocate work, identify backlogs and bottlenecks. An 'Assignment Planner' used PMP and the Work Management Sheet (and sometimes the 'Customer Volume Tally Sheet') to work out how much work was accomplished 'yesterday' and was thereby supposed to form the basis for the allocation of work tasks 'today'. However, the process of tallying the work, calculating the amount of time required for completion, and then examining each section member's Work Management sheet proved a lengthy business.

As the process of centralisation got under way, electronic forms of monitoring and display became increasingly important. This was particularly evident in the development of the various 'call centres' used to support the growth of "phone banking". In these centres management information, in the form of a number of *computer generated metrics*, provides details of what individuals are doing throughout the day in terms of whether they are available or unavailable for calls, how many calls they take, average time of calls, etc.. These reports are then used to create spreadsheets, again as part of a management information pack, which effectively summarises the information for those higher in the management hierarchy. The improved communication facilities offered by computer systems are often seen as an ideal means of storing and transferring this form of information and it is through this information that members of the bank will manage both their work and the work of others.

As the Bank shifts towards more distributed co-ordination and a perceived reduction in the opportunity for managers to know exactly what everybody is up to 'on the ground', there is a growing emphasis in the Bank on producing detailed information about what people are doing, what they are capable of, and what they have achieved. In a number of the field sites we investigated across the bank this 'Management Information' was systematically gathered by the managers and collated on Spread Sheets and Word Processed Documents into 'products' that they referred to generically as 'MI Packs'.

Within the Bank MI Packs contained a diverse set of information of different forms and styles. These focused particular on metrics and measures and included

- *Financial information* such as arrangement fees for certain months, refunds, provision-loss figures and amounts transferred to their Insolvency and Debt Recovery Department;
- *Internal Quality information* such as staff utilisation, processing standards and risk management; Customer Information such as sales performance;
- *Organisational Development* information such as their own performance in dealing with and completing A & Ds (Appraisal and Development Reviews).

A lot of the information gathered for MI Packs was simultaneously shared between other documentation and a targeting and performance document called a Balance Business

Scorecard (or BBS). Indeed, several managers used the BBS format as the basis for the presentation of their management information.

In the following fieldwork extract, the Manager of a Monitoring and Control section of a Lending Centre is discussing backlogs (work, chiefly printouts to be checked and processed, that is left over from previous days) and work for the day ahead at a meeting with the Team Leaders in the section. Throughout the meeting he flicks through various Spreadsheets on his computer, making reference to figures that the Team Leaders have entered or requesting and discussing the figures on the spot:

> **Liz**: "We having our meeting now Rob?..." (Liz , Mel, Linda, & Ruth are Team Leaders for teams denoted MAC1, MAC2, MAC3, and Bad Debts respectively, Steve is manager of the Monitoring and Control floor)
>
> Steve entering details on Office Organizer (a general staff administration package) regarding staff leave
>
> Mel and Linda sit down to side of desk - Steve goes out of Office Organizer and into Excel - Comments on slowness of machine
>
> Steve brings up the MAC data 'book' and clicks on the 'Backlogs' tab - Introduces 'backlogs' as the topic and relevances the method for entering the details
>
> ***Steve***: MAC2?
>
> Mel provides the relevant figures - Steve asks why they look like that - Mel tries to explain
>
> Steve double-checks the figures are right, then expresses surprise - Mel accounts for the way they look
>
> ***Steve***: Are they worse than the day before? Or at the same level?
>
> Mel affirms they are at the same level
>
> ***Steve***: Right, MAC3?
>
> ...
>
> Steve asks if they are comfortable with the backlogs, then goes to next screen - MAC data
>
> Linda gives details, then Mel
>
> Steve asks about Sickness - Ruth answers regarding member of staff off, then Steve discusses the matter with Mel
>
> Steve checking it's mirror image of yesterday then saying: 'I don't want the Grade 6s to do MAC stuff' *{The 'Grade 6s' were a 'floating' group of 4 members of staff who had not been firmly allocated to any one team}*

This extract reflects the means by which individual members will arrive at 'the meaning behind the metrics represented as numbers in the collated information'. This process of negotiation surrounding the interpretation of collected metrics is a common feature of the work of the bank. For example, negotiation between a manager and a member of staff concerned just what story it is that the numbers tell is a standard device used in bringing individual cases to a manager's attention. In addition, as we see illustrated above just what a set of numbers might mean is something that is also applied in increasingly sophisticated ways to staff and teamwork as well. In essence, *these numbers are made in practice into a representation of the work of the bank.*

The rationale behind gathering all this metric information is not always as clear cut as it might seem. Frequently the perceived objective was to provide information for, say, the overall Manager of the Lending Centre so that he in turn could use it as a basis for negotiation at some higher regional or even central level. However, it could also be drawn on as a justificatory or rationalising document in a manager's own appraisal and development.

In other contexts managers were often observed to show one another parts of their MI Packs and enter into discussions about what they were doing and whether they were doing it in more or less the same way. During our observations the Manager of the Sanctioning section of the Lending Centre received a telephone call from the overall Manager of the Centre, Phil, who was unable to return to the office that day. He was asked to ensure that a comprehensive MI pack be put together and got to Phil that evening so that he could have it in readiness for a meeting in London the following day. The Manager of the Sanctioning section advised other section managers of the need to do this then spent the rest of the afternoon chasing around staff and putting together something on the basis of what he understood to be the conventional format. In the following extract the Sanctioning Manager (Clive) has just gone with the Phones Manager (Chris) to the Centre Manager's office to put the pack together:

> Clive flicks through Phil's MI Pack - Chris highlights what he's got
>
> Clive looking at a section in the pack - Clive flicks through the different sections (they are grouped in separate plastic sleeves inside a folder)
>
> Clive comments on them and pulls out the (old) Telephone Standards documents (as manager of the 'Phones' floor this is the particular body of information that Chris is going to have to replace)
>
> Chris is sorting through and reordering documents - inserting new for old - He reaches for a stapler and staples some together
>
> Chris explaining figures to Clive - Relevances the March figures in relation to February's
>
> Clive mentioning switch from 'not ready' to 'ready'
>
> Chris formulating his understanding and explaining a further set of figures to Clive - Clive checking it's also been explained to Phil - Chris confirms
>
> ...
>
> Chris goes - Clive concludes, closes the folder, and stands up
>
> ...
>
> Clive goes to see Graham (one of Clive's Team Leaders) - Graham discussing with him the figures for Personal Lending - Clive discussing the format of the MI and how the rest have done it their own way *{Work on the Sanctioning and Phones floors was divided up between teams relating to 'Personal' lending and 'Non-Personal' lending - 'Personal' related to individual, personal accounts whilst 'Non-Personal' handled things like business accounts}*

This extract reveals a number of interesting aspects of the production of Management Information, not least the mundane activities it implicates and the way that 'what the numbers mean' is far from self-evident but rather requires 'explanation' by the parties involved. We can see this in the way both Clive and Chris try to account for the difference between the February and March figures. Clive's proposal here about the 'switch from 'not ready' to 'ready' was one recurrent account provided for the way the monthly figures had yet to 'stabilise' in any sense. It was a way of putting it down to the very newness of the centre and the fact that it had only recently gone 'live', with the work of many smaller centres still in the process of being 'migrated' into it. However, perhaps the main point to observe about this particular instance is the way that, even when the managers sought to achieve standardisation in their production of Management Information, it required as much co-ordinated negotiation and achievement as any other task. Left to their own devices and put under pressure the managers had resorted to producing the information according to their own understandings, competencies and relevances. Under the circumstances the end result was that no two packs looked even remotely the same.

Of course, as we have already seen in the use of Management Information in the context of a Team Leaders meeting, information that is gathered under an MI rationale can be, and often is, directed back to staff further down the managerial scale in order to simultaneously assess performance and to propose ways of working. In this way materials that are primarily intended to be representations of the work that people do - virtualised manifestations of the teamwork one might say - can become themselves implicated in a number of complex ways in the actual achievement of that teamwork from day to day. This amounts to a recognition amongst staff that MI is a resource for the day to day management of teams, both amongst managers and with the teams and team leaders themselves. Not only does the representation subsumed within the MI amount to a simple ‘story’ of ‘the work we have done’. It becomes a resource for both rationalising future work and, indeed, a description of the work to be oriented to and achieved within the ongoing work they do - and increasingly to predict or anticipate volumes of work and staffing. The description is not simply a description of a certain body of work done over a certain period of time. It is a description that necessarily informs their understanding of just what the work they are doing might amount to. Subsumed within it are local understandings of organisational goals as revealed in comparative percentages that can be construed to represent performance. And also subsumed within it are representations of what a normal amount of work to be received and got through might consist of, revealed in both periodic totals and averages. Of course the numbers that lie behind these representations are provided by individual team members and team leaders in the context of the work itself. In that way part of the work is to provide a description of the work. Inevitably the production of an ‘adequate’ description of the work requires some sort of previous knowledge of just what ‘adequacy’, in the terms of the organisation, might amount to. In that case individuals are required to orient to how they understand the organisation in order to describe it. The descriptions they produce, together with other ‘adequate’ descriptions being produced around them, become themselves a resource for understanding the organisation. It is partly in this that the very sense of there being an organisation is produced, hence our suggestion earlier that the Bank might be thought of as a ‘self-describing’ organisation.

What we are proposing here is that the totals, statistics, performance measures, etc. that together make up any particular artefact describable as Management Information, amount to something more than just a ‘truthful depiction of the work we did’ (if any of the staff ever do take such a view). The pragmatic value of such number work resides in the way it comes to inform work allocations through understandings of what is and isn’t practically achievable, and to provide for rationalisations of particular instances of failure or success (see the example below). In other words it is one way in which members in the Bank can go about rendering the day-in, day-out vagaries and contingencies of the work they do to some extent coherent and manageable. So the outcomes of gathering Management Information are not simply ones that amount to accounting to one’s superiors. The information also provides for just how many printouts arrive on someone’s desk in the morning (in the extract below a printout known as the 'eight') and what particular work someone might be asked to do:

> ***Mel*** I’m calling Debbie in to help with the eights because there’s two hundred and thirty three lines today and she’s not going to cope
>
> *{the eight is a computer printout that details all of the accounts that are currently ‘out of order’ in some way - each account constituting a ‘line’}*
>
> ***Steve*** Right (.) Two hundred and thirty three (.) total lines of eight is that?
>
> ***Mel*** No, Personal *{ie this number only applies to the 'Personal' customer accounts and not the 'Non-personal' business accounts}*
>
> ***Steve*** Really? God, that’s high

This underscores the way in which numerical representations of this order have no inherent ‘truth’ or ‘value’. Rather they become a tool through which practical decisions can be made each day about things like how much work to give any particular worker and whether to phone another manager for some extra staff to ‘help’. So not only does MI describe (or ‘represent’) the work of particular teams, it is also used by them. In that way particular representations of teams come to have a negotiated and highly contingent relevance to the work of real teams, a relevance that is always subject to situated, interactional work.

All of the above reveals the extent to which Management Information is not something that unproblematically resides within the computers, to be accessed at the simple push of a button. In fact Management Information is a 'representation' of the work of individuals, teams, and whole sections that has to be worked up and achieved in a rich interweaving of computer-based materials, paper documentation, and physical noting down and drawing as the following extract - of a manager working up the management information in preparation for an appraisal and development review - reveals:

> Gets BBS documents out of briefcase then turns to his Workstation, goes into Word and opens a document *{The BBS or Balance Business Scorecard was the Conventional Means of 'representing' the targets and performance of a particular unit throughout the retail division of the Bank}*
>
> Goes to Excel, and opens 'MACData' - Prints - Goes to printer and brings back printout of MAC BBS 1998
>
> ...
>
> Goes back to Word document and highlights and deletes portion of text - Repeats for Financials,
>
> Customer Perspectives, and Organisational Development pages - Leaves bullet points at bottom
>
> Prints and goes to the printer to get documents
>
> ...
>
> Comments that he could put in Word Tables or could do embedding of Excel, currently trying to work out if he's got all the information he needs to put in
>
> Looks in a desk drawer, then borrows a ruler from Martin who sits opposite
>
> Uses ruler to draw a line across at the top of the Utilisation sheet - Makes it a box - Counts over measures - Puts marks on the line and the same on the line below - Draws verticals with ruler - Hand draws a small box above - Writes 'Target' to left of it and puts '%' in box
>
> Enters in boxes as below:
>
> JAN FEB MAR . . . . CUMM
>
> % % % %

It often also involves not just these skills but a great deal of talk, involving many tacit social competences and activities along the way. The following extract demonstrates some of these practical, everyday activities being brought into play:

> Chris is talking about what management information is required and looking at a hand-written outline of the kinds of categories and calculations he thinks they should include. On one sheet of paper he has written a number of ideas; 'non-utilisation periods', R/E (reasonable expectancy) how many calls could we have taken?', 'what does the productivity gap equate to in man hours', speed/quality/control', industry comparisons' and so on. On another he has divided the sheet into columns as the precursor for producing a spreadsheet. Heading the columns are categories such as 'calls offered', 'staff required for 100% calls handled', 'staff required for 90% calls

handled'. A series of comments are written down the side - these are later to form the basis of their discussion - 'figures as at certain date with customer base of X'; 'do subsequent charts/spreads for take-on of Centres for rest of year multiplying calls offered by factor of X (customer base in future divided by customer base now'; 'when new 'actuals are obtained from future ACD information revise figures for comparisons and compare to model'; 'do we want to put in model numbers of staff to see divergence?'. A final sheet has a complicated calculation by which they might obtain a measure of effectiveness.

Whilst this is going on Les is looking at the BBS (Balanced Business Scorecard) as it will be important that the measures reflect elements of the BBS both for the section and him personally and at a basic set of management information spreadsheets that they produced last week for the managers' meeting which forms the basis for this current MI pack.

Chris uses the computer to get an Excel spreadsheet on screen - 'AOBT accuracy' (advice of borrowing terms) - they then chat about the layout of the spreadsheet. The talk centres on how much information they need to display and how to present it; the emphasis is on 'totals', totalling columns because "... all he'll (the Centre Manager) be interested in is that (pointing at total)". They then work together setting up the various 'macros' (calculations) for the various parts of the spreadsheet, talking about its use for making predictions with the suggestion that *"that would be good for 'Hours by Design"*(a new initiative on hourly working within the Bank). They then turn to the MI figures they produced last week - *"these are great . . . but I think we need the graphs and a comments box . . . he (the Manager) doesn't need all that (the detailed figures)".* They then use the computer to access the spreadsheets they produced last week -

For the above managers preparing the MI Pack was very much a matter of working up 'the story of what it is we've been doing and what we plan to do'. Centrally, however, it is important to see how all of such Management Information - whether it is being used to account for particular situations, to justify certain decisions, as a basis for rationalisation, or as a means of arriving at some sort of assessment - relies on an underlying assumption that *work activities are ultimately reducible to figures*. But, of course, just what these figures amount to is far from self-evident. In that case the MI effectively becomes a resource for discussing and arriving at some sort of understanding of what it is we are doing, other ways of doing it better, and just how good what it is we are doing might be. This use of Management Information as a representational method for informing understanding, a heuristic use of it one might say, is well demonstrated in the following extract:

Clive sorting through MI papers - Looks at the calendar under his keyboard and writes 'P/E 27/2' *{Period Ending 27/2}* on 4-Weekly Total printout

He then continues to write on a sheet from his notepad:

P/E 27/2 P/E 27/3

ASH % HE ASH* %

He enters the total from the 4-Weekly Total sheet for Non-Personal, then does the same for the others

Clive draws a line down to split up the 'P/E 27/2' group, then shifts the other 4-Weekly Total Sheet in front of himself and notes the figures similarly for the 'P/E 27/3' group

Clive draws a line at the right hand side to separate the figures and percentages - He does the same for the 'Backlogs' - He writes the 'Backlogs' as a total, then puts the P/Es, then notes the figures from the sheets (averages for the 4 week period)

Clive comments that the figures for the backlogs don't relate to any specific allowance - He needs to see if they are retaining the backlogs at a 'manageable level' - He admits it's 'not rocket science' - He is just using it to give him an idea

* *{'ASH' = Actual Staff Hours, 'HE' = Hours Earned - The distinction here recognises the way that the work measurement system in the Bank provides a particular allowance for certain activities, but these do not necessarily tally precisely with the actual hours worked}*

Two points are particularly worth bringing out from the fieldwork extract above. Firstly, the manager does not just faithfully copy the numbers he has been provided with by his teams across into his Management Information pack. Not only has the work of individual members of particular teams been transformed into a numerical representation, but that representation is now being subjected to a further 'transformation' in order to make the numbers specifically relevant to, and meaningful for, the task in hand. In other words he transforms the numbers into percentages so that particular totals for things like the actual number of hours people have worked or the total quantity of backlogged work can be expressed as a proportion of something else such as a targeted amount of work to be done, or the number of hours you actually get an allowance for, or the total amount of work received, in order to facilitate, in this case, a comparison of performance across periods. Part of what this transformation process is about, as one traces its movement between individuals, is the achievement of "co-ordination through appropriate representations of the 'basic information'" (Hughes, Rodden and Rouncefield, 1996). This transformation process is something that is deeply involved in all kinds of co-ordinated activities. It enables co-ordination within and between the different functional units by making the work available to others in a format that they can work with.

A second point is the way the manager was quite specific about what he was trying to do with the figures for 'backlogs'. They 'don't relate to any specific allowance', he wants to see if things are being kept at a 'manageable level', and he is just using them to 'give him an idea'. In other words he is using the figures as a heuristic for assessing trends. By transforming everyday working phenomena into numeric depictions the persistent variability and unpredictability of those phenomena can be eliminated to some extent. Real teams, subject to the everyday vagaries of working life, are in this way transformed into 'virtual teams'. That is, they become representations within the machine that are open, just as in Lynch's observed mathematisation by scientists of 'recalcitrant, "naturally occurring" phenomena' (Lynch, 1990), to systematic description, standardisation and mathematical operations. In a discussion of scientific diagrams from various journals, Lynch suggests that such illustrations have a lot to do with transformation of particular representations in order to synthesise form and identify "'universal' properties which 'solidify' the [represented] object in reference to the current state of the discipline" (Lynch, 1990). And he details a number of ways in which this is achieved. The process of making something 'useful' through its representation involves the ordering of it through such things as [to paraphrase] 'exposure, seizure upon, clarification, extension, codification, comparison, measurement, and subjection to mathematical operations' in relation to the pre-existing order that was somehow resistant to the intended 'use' (Lynch, 1990).

> ... "as we trace through the sequence of renderings, we see that the object progressively assumes a generalised, hypothetically guided, didactically useful, and mathematically analysable form. It becomes progressively less recalcitrant to the textual devices of describing, displaying, comparing, causally accounting, mapping, and measuring."
>
> (Lynch, 1990 , 168)

This mathematisation is something that we might say is 'accomplished' through representation. So in this sense representation could be seen as amounting to a hybridisation of the particular and the ideal. And this telling of it in a way that is understandable to the discipline is altogether similar to the orientation in the Bank towards producing a representation of the work in terms of 'the way bank work (or more specifically lending work) like this' can be understood by those who do it, in a way that anyone else like them, working in a bank and doing the activity of 'lending', might well understand it and reasonably represent such things. In other words the representations are accountable in terms of the way they are worked up, just as there are appropriate and inappropriate ways of working up any kind of story. This way of putting the material together, it must be stressed, is a common-sensical organisation rather than it being self-evidently necessary to put it together that way. And, vitally, it is through such shared depictions of the work they are doing that some sort of common-sense understanding of what ‘lending’ might amount to continues to be arrived at and oriented to. Not that managers laboured under any illusion as to the possibility of there being some disparity between the figures and what actually occurred. We have already seen one manager readily admitting, "it’s not rocket science". Instead MI was one way in which managers sought to practically achieve a displayed orientation to the much vaunted principle of standardisation, to provide ‘adequate’ accounts of the work that their staff do in particular circumstances of accountability, and to arrive at practical decisions as to *how to mete out between real teams and team members the ongoing influx of work*. And, of course, the very practice of mathematising and rendering real work phenomena open to further transformation and manipulation in ‘standard’ and ‘generalisable’ terms makes MI a resource for the discussion of a huge range of other issues such as Centre-wide performance and staffing.

This brief examination of the use of Management Information Packs has revealed a subtle set of arrangements and accommodations between the information used to represent work and how to convey the nature of this work to those involved. While one might consider the management information to be a simple representation of the work taking place we actually see that it is a resource to be drawn upon in constructing appropriate accounts of the work often targeted for particular parties. Thus members of the bank interpret and alter the representation of the work to reflect particular issues and concerns and to allow for the contingencies likely to arise in the everyday undertaking of work.

For workplace systems the complexity of the various arrangements between those that undertake work and the various representations of the work they manipulate is significant. For us this raises a real question about the nature and role of models of work and the notation used in the representation of work within CSCW systems. Considerable debate has focused on the issues of notations and categories (Suchman 1994; Winograd 1994) in CSCW. However, to date this is often characterised in terms of the coverage or flexibility of the representations of work. We would suggest that rather than focus on how well a notation provides a depiction of the work to those involved in it we need to consider the use of these depictions in practice. In particular we need to consider the way in which various material is made into *representations of the work* and how people *exploit and use* these. This has significant implications for the way in which we might see different views of the work being developed and certainly it suggests that we need to be vary careful about the linkage between the notations and representation used and the facilities provided to access and manipulate them.

Our examination of the development of Management Information Packs has considered the way in which units in the pack develop and use representations of the work they do. The representations developed within this setting are intended to be used as a means of representing the work of the bank to those involved in it. The development of these packs was a significant tool in the management and co-ordination of the work taking place and provided an important resource to allow managers to understand the work taking place and design and develop solutions to work problems.

In the following section we would like to complement this consideration of self-representation by focusing on how the sorts of notations that are normally used for conveying work to others across and outside the organisation are used. Essentially, we are interested in understanding how the representation that might normally be used in processes such as system development are actually devised to understand the work taking place and how they are drawn upon to provide a representation of the work of the bank.

‘Representing the Work’ - Process Modelling

One of the preoccupations that came to light in our fieldwork, especially in a new Lending Centre, was that of process modelling and the production of process maps. The Lending Centre in question is currently taking on the work of a number of somewhat smaller Lending

Centres throughout the North West of England in one large centralised unit that is spread over three floors of a modern office block. Given the large numbers of temporary and part-time staff the objective behind process modelling was claimed to be one of ensuring that, for every single process the bank engaged in, there would be a process map so that anyone could come in and do the job in exactly the same way as anybody else. Clearly the backdrop to this objective is a drive towards standardisation but it does reflect the need for representations of work in systems development and systems such as workflow.

In this section we wish to focus on the tremendously rich way in which Lending Centre *'process maps'* were developed and used to facilitate co-ordination. In particular we wish to highlight the way achieving adequate representations of workflows was itself open to far from standard considerations, and frequently the product of *ad hoc* and wholly contingent interpretations and activity.

The very newness of the Lending Centre (it was the first centre of its kind to go 'live' in the Bank and still had a long way to go before all of the smaller Lending Centres had 'migrated' into it) meant that a disproportionately large amount of management time was concerned with discussing just how to make something like this sort of Lending Centre work. Within the Lending Centre itself there was a basic division of labour between the three floors along the following lines:

- *'Monitoring and Control'* where there was a basic processing of various printouts relating to the current status of loans and overdraft facilities etc.;
- *'Phones'* where most incoming calls to the centre from the customers were fielded and where staff might have to deal with anything from a request for a loan to a complaint; and
- *'Sanctioning'* where requests for loans etc. were either approved or declined.

The process maps used in the lending centre where essentially a diagrammatic notation showing various processes as sets of interconnected activities. Each activity in a process map was represented as a box with the dependencies shown as connections between the boxes. In practice, when managers and their staff worked on process maps, it was far from immediately obvious to them how the process map might relate to the activities in other parts of the Lending Centre and how different process maps might connect up.

Something particularly worth pointing out about a representation like a process map is that it is not simply a logical representation of the best way of achieving some particular end. Instead for the Bank it was the negotiated product of individual perspectives and experience. In one particular instance we witnessed the manager of the Sanctioning floor overseeing the production of a process map by two of his staff. The process in question was a complex one regarding how to eliminate or reduce the level of 'hard-core' debt run up by customers using a certain kind of Credit Card, while simultaneously turning it into an opportunity for what was effectively 'a sale' by offering the customers loans to clear the debt. In order to achieve this overseeing facility and the production of suitable advice, the manager in question was obliged to physically visit the managers of both the Phones and Monitoring and Control floors in order to discuss the best way to model the process:

> Clive goes upstairs to MAC and waits while Steve is talking to Mel
>
> Clive gets chair then sits and explains to Steve about the Monday 'process map' meeting, and shows Steve a rough copy from the whiteboard - Then he gives Steve the Stage 1 sheet
>
> Steve Looks it through and Clive explains as he adjusts his chair
>
> ***Clive*** what they've done is they've come up with a three stage process map (.) but I don't think it's quite there yet (.) errm (.) so there's (3.0) that's what they're lookin at fer Stage one (.) being (.) in MAC (.) but there isn- (.) that- er i- (.) it's not quite right that (2.0) ((cough)) (1.8) coz the one- the thing that I tried to get them to do just to say

well (.) what are yer e- what are yer expectations of (.) of your people (.) y'know and at least start off (.) y'know (.) the process

Steve mm

(13.0)

Steve so?

An immediate thing to observe about this is that, as with anything else being mooted as relevant to interactional work, that relevance cannot be simply presumed to be self-evident, it has to be accounted for (Sacks, 1992). Clive's first stab at prefacing the relevance of all this to Steve is a signal failure, as the thirteen second pause and Steve's 'So?' make evident. Under the circumstances Clive has to do some more work to get Steve to engage with the activity. This he does by specifically relevancing aspects of the first sheet of the rough draft of the process map (Figure 1) that he has given Steve:

(fig missing) XXXXX

Figure 1: The first draft of the process Map

Clive Yeah (.) Theirs (.) to me (.) u- (.) you look at that ((points to end box that says 'YES')) and you think (.) right okay well (.) now need to follow on

Steve mm

Clive er and (.) when I follow on here I think (.) things will be a lot (.) simpler (.)

Steve right=

Clive =but

Steve the only thing I think is what you've got on that=

Clive =yeah=

Steve =as far as I'm concerned (.) I get there ((points out box with no parameter)) (.) there's no parameters inside this hardcore (.) any risk grade* (.) any amount

* *{Each customer was allocated a certain risk grade by the system based on a number of variables that together might indicate the potential 'risk' of lending to them}*

From this point onwards the various sheets that make up the draft version of the process map become implicative for a whole range of disparate activities. They engender heated discussion about just what the process really does entail, much of which is heavily informed by wholly parochial considerations, such as 'if I buy into this are my staff going to have to do more work?' and 'if they do, are they going to get any sort of allowance for it so that it doesn't undermine our performance figures?'. Much of this, as will be visible from the printout, revolves around the pros and cons of using a particular printout called a WE017 which was a standard diary printout used to throw up certain kinds of recurrent activities for attention. Clive, whilst adamant that he would not get any kind of allowance for using that printout because it was not a process allocated to the Sanctioning floor, felt sure that if Steve used it he *would* get an allowance. The point here for Clive was that if someone was doing this work then they should be getting an allowance of some kind for it so that it didn't simply add up to so much lost time and undermine the performance figures for the Centre as a whole. Steve, however, was not convinced he would get any allowance for using it and was, in any case, reluctant to devote any time to the process:

Steve I'm being selfish here ((Looks at Clive))

Clive yeah ((leans back in chair to listen))

Steve I will not diary it on a Seventeen (.) I do *not* have to have a response (2.0)

Clive Sorry (.) say again

...

Clive But (.) if we- If we look at (.) If we're lookin at er improvin the efficienc-- the operational efficiency of the unit (.) we need the (.) We Oh Seventeen (.) t come in (.) becoz the We Oh Seventeen generates an allowance for an activity which is (.) diarising for a response to a letter (.) and if we don't (.) if we don't bring in the We Oh Seventeen we're undertakin a process for which we're not gettin a measurement

...

Steve Look (.) write this information down that you've already got

Clive yeah

Steve you set the loan up

Clive mmmm

Steve Yeah?

Clive Yeah

Steve And give you the result you know about any way (.) Coz you've dun it (.)

Clive Yeah

Steve So *that* (.) isn't effective (.)

Clive But (.) what you're asking me to do isn't effective (.) *coz* I'm not gettin an allowance for it but by using the We Oh Seventeen (.) .hh you're get- you're goin to get an allowance for the activity that you're undertakin (.) whereas I'm not goin to get any allowance (.) but *you will*

The sheets also implicate a great deal of physical experimentation, drawing bits in, and crossing other bits out, along with verbal projections and collaborative 'imaginings' of scenarios in order to 'see' what might work:

Clive we're still having to go into the sys- into the system

Steve but=

Clive =to find out (.) who has responded (.) on a (.) on a negative basis= *{said 'no'}*

Steve =yeah so yo- you're list then i- is partly completed en't it? (.) P//artly

Clive //Yeah (.) So?

Steve the one- So you start off with ten *{customers}* ((Demonstrates numbers and divisions with hands on desk))

Clive Yeah

Steve Four have responded=

Clive =yeah (.) yeah

Steve and you've got those there's six left

...

Clive Right (.) Okay? (.) So (.) Let's see What we need to do here now MAC ((appends box and oval on stage 1 document*)) (.) so then what we then ((crosses out YES/NO)) (.) send them M S Qs and then blah//blahblah ((scribbles over end ovals and draws fresh lines))

Steve //yeah

Clive and i- (.) all that there then s down to (.) an action en't it?

Steve Mm

Clive Mark yer log (.) update (.) spreadsheet (2.8) and (2.0)

Steve Mm (.) In a way that lines up wi- (.) with all the bits to do fer sales

Clive Yeah

Steve Then (.) can I put this in here? ((appends further box))

Clive Yeah (.) Right (.) Okay

* *(See Figure 1 for the outcome of all these changes)*

An interesting point is the way that hugely informal representational activities in their own right are used here. The scribbles, circles, lines, and frequent movements over the sheets to indicate specific notions but which leave no mark behind, are all wholly local and contingent and often abstract to the extent that they have no connection to any external phenomena beyond the nominal connection that is in operation here and now.

Ultimately the sheets containing the process maps came to serve as a resource through which the managers found themselves able to negotiate a model they felt they could both 'live with'. They also resolved the problem of the WE017 by adopting Clive's suggestion that they use a screen-based log using shared Excel spreadsheets as the most appropriate and, more specifically, workable (both in terms of its production and use) 'representation' of the current status of customer responses:

Steve On here It said (.) You've sanctioned it (.) note it on the (.) Managed Rate Log Pro Forma located on the Gold Card desk (.) so he's got it in (.) on a number of places in //his process

Clive //Right (.) ((takes Stage 1 document)) Well we don't (.) w- we'll change that (.) we'll work on a spreadsheet (.) so we'll come up wi a spreadsheet (.) we'll probably end up (.) puttin it in customer (.) put it on Excel

Steve It's got to be available t everybody

Clive Yeah (.) Put it on Excel (.) and then: in:: sorta Customer Keep *{one of the shared server locations for the whole centre}* (.)

Steve mm

Clive er:: (.) errm (.) your guys could instead o doin a (.) coz the thing is the only thing that they're goin to be puttin in there (.) is

Steve Details

Clive Sorta (.) like (.) sorta like the date ((appends Date Column)) (.) t- t- the date of (.) er the letter (.) the account number (.) and the sort code (.) so that 's your inputs (.) yeah? (.) and then it's over to us

Steve Mm

Clive as opposed t manual- manual bits o paper (.) Happy wi that? (.)

Steve Yeah I mean as I say there's two options you can run

Clive Yeah

Steve and it's either manual log (.) or somethin on there ((gestures to Workstation)) (.)

Of course, a vital feature of all this is the way that the representational activity they are engaged in is not somehow separate to and apart from other activities and the ongoing achievement of their work. That was, of course, partly evidenced in the surfacing of parochial concerns that had nothing to do with representing 'best practice', let alone some idealised notion of how to do a process model. But it is also visible in the way Clive had to provide for the relevance of Steve engaging in the activity in the first place; the way various asides have to be entertained during the discussion; and in the way it is brought to a close.

The particular thing to note about all this, at least in the context of the Bank, is that a process map is not something that is simply a definitive consequence of the rational deduction of processes and implications. Instead it is a 'representation of the work' that has to be collaboratively achieved *as a part of the work itself* in situated interaction, with all of the here-and-now preoccupations that parties to it will inevitably bring to bear. A description of just what the work should amount to, just what is 'the right way to accomplish a particular work process' ('best practice') is itself an accomplishment within the work. So, to extend upon Suchman's observations regarding the situated and contingent realisation of 'the sense within the plan' (Suchman, 1987), we might further observe that the very making of the plan (or in this case the process map) is a situated and contingent affair. The representational activity of process modelling, in that case, provides one way of arriving at 'best practice' for a particular work process, through intensely situated negotiation, practical experimentation, practical projection and collaborative 'imagining' of scenarios. More significantly perhaps, it also provides one way of moving beyond the strict 'egological' focus of work in order to gain some insight into the implications of one's own work for the work that others have to do - what in CSCW has been characterised as 'awareness of work' (Blythin et al 1997).

Summary

In this paper we have used ethnographically gathered materials in order to examine in detail the accomplishment of some 'representational' activities in the everyday working practices of a High Street bank. In particular we have focused upon just two activities: the production of Management Information; and Process Modelling. We have particularly considered how the different representations of the work and those involved in the work have been produced as a practical activity rather than as a theoretical or abstracted interpretation of the work.

In fact, we would suggest that abstract and theoretical notations fail to capture the sense of specific representations we have observed because they do not adequately attend to where such 'sense' actually resides, that is, in the representational activities themselves. We have pointed out that representation of workers, teams, and work practices is not at all the concern of some external 'expert', but rather a very real matter of everyday concern for members of the Bank at all levels

Bank work (and other kinds of work of course) often involves the 'telling of stories' through numbers and we saw instances of this in the production of Management Information. Although the stated rationale for gathering such material is the passing of information progressively up the line, as we have seen, this kind of representational work is not, in a practical sense, at all specific in its use but rather hugely varied with it being potentially turned to all sorts of contingent needs. And we particularly noted the way in which MI becomes a resource for informing hugely practical matters such as the day-to-day allocation of work. So it is not just a representation *of* the teams but also a representation *for the* teams.

Overall, MI provides members of the Bank with a means to practically achieve displayed orientations to such things as standardisation, to produce 'adequate' accounts of the work they do, and to arrive at practical decisions about such things as work allocation. This is all achieved in numerous and contingent ways and is dependent upon a wide range of situated considerations and social and practical competencies. Furthermore, the mathematisation of real work phenomena so that it is rendered open to further transformation and manipulation in 'standard' and 'generalisable' terms makes MI a resource for the discussion of other, potentially Bank-wide, issues.

Process maps, rather than being representations of the work of particular clusters of individuals are intended to be 'representations' of complete workflows. We particularly noted here the way in which their production was a non-'expert' affair that particularly served to facilitate co-ordination, and we also saw how their production, despite the aim to produce idealised, 'standard' representations of 'best practice', was subject to a whole battery of ad hoc and contingent considerations where local, and even parochial concerns could be seen to preside. In this way it quickly became clear that something like a process map is not simply a logical representation of the best way of achieving some particular end, but rather a negotiated product of individual perspectives and experiences. This negotiated character has two particular outcomes. Firstly, individual concerns inevitably surface and must accountably be provided for. Secondly, this is necessarily intensely collaborative work, often across sectional or organisational divides. In that way process modelling can be seen to substantially enhance practical matters of articulation and appreciation of other people's work.

Process modelling, then, involves numerous situated and socially interactional activities. In that way, regardless of the status of the finished process map as a representation of 'best practice' and as an artefact that gets circulated throughout the Bank, the actual activity of process modelling is something altogether richer and more heterogeneous than that might imply. It is emphatically not about the disengaged rational deduction of process. Rather it is a members' activity that is just one possible way of getting together and trying to arrive at some sort of understanding of what is that we are collectively trying to do. A process map, then, is just one way of coming up with the story of a particular division of labour and one way of trying to 'plan' what an effective division of labour might be. And the very arrival at just what that 'plan' might be is a wholly situated and contingent affair.

Conclusions

We have used this paper to consider the situated accomplishment of two particular kinds of representational activity. The two activities have, of course, certain superficial similarities and differences. They both require substantial informal transformative work on paper and through the use of IT. They are also both hugely implicative of social interaction and their production requires certain kinds of social competences. And they are both about arriving at a certain idealised kind of representation that can be readily recognised as an adequate representation of 'the work' throughout the Bank. However, whilst Management Information revolves around the production of relevant bodies of numbers that can be seen to meaningfully represent the work of certain bodies of individuals, Process Modelling involves diagrammatic representations of whole workflows where the objective is not to tell a story about the performance of individual workers and sections but rather to tell a story about how a whole division of labour should be. One is a 'history' from which certain lessons might be derived (both strategic and from day-to-day). The other is a 'utopia', a story of how it should be rather than a story about how it has been.

But, of course, this clutching at metaphors is in many ways beside the point. So much as there is anything meaningful to be brought out by such a comparison it is the simple, but nonetheless important observation that representations of both workers and work are necessarily different because they are a product of the different sets of relevances that are inevitably brought to bear in different kinds of activities, and indeed in different settings. So what if workers tell both historical stories and tales of utopias? What does this tell us about the accomplishment of their work? What is far more important to consider is both how the particular representational activities are actually achieved within the workplace and, just as importantly, how those representational activities are rendered implicative for the further accomplishment of work. And it is just those kinds of questions that we have attempted to address within this paper.

At the outset we suggested that the 'sense' or 'meaning' of any representation is inevitably bound up with the situated ways in which it is engaged with and that the 'sense' of any particular representational activity is similarly situationally bound, so that generalisations about what is being represented or representation itself are largely meaningless. The 'sense' of Management Information, for instance, could reside (amongst other things) in providing for accountability and for apportioning work. The 'sense' in process modelling could reside in locating notions of best practice and negotiating in highly specific detail the co-ordination of work. When we set out to try and understand something about the orderly production of bank work such that it is recognisable as bank work (rather than something else) and oriented to as just that, then we can see that such observations are wholly adequate in their own right without any need for theoretical accounts to propose some underlying 'meaning' or 'purpose' behind any of the particular representations. The meaning and purpose, as we have seen, is wholly evident within the context of their use.

What these observations suggest is that the understanding of work is something that is seen as an everyday feature of doing the work and that the systems developers need to consider the development of notations and techniques in that light. We have seen in both of our examples that the development of different representations was accomplished in practice and drew upon everyday concerns of the bank. These representations were used locally within the bank and made sense to those in the bank because of the localised nature of these representations. This is somewhat in contrast to the need expressed by some CSCW developers for general notations that can be used to represent a wide range of contexts.

A potential danger exists in systems development in focusing on an understanding of work as a means of communication between the setting and those involved in development. In this paper we have focused on how representations of work are constructed and used by those involved in the work to understand it, and how these representational activities draw upon a range of resources. This suggests that systems to support work also need to consider the development of facilities to make the representations of work they use available to those involved in undertaking that work. For example, process models where used in the bank as a resource to design new work arrangements.

In terms of systems development we would also stress that any system is developed from a particular understanding of work at a given moment in time and representations are used that reflect this understanding. However, as we have seen in this paper, work is also understood as an everyday achievement, and those involved undertake a range of activities to accomplish an understanding of work. In addition to supporting work, system developers need to consider how these activities are supported and how the notations and representations they use within the systems they develop can be in turn presented to users as a resource to support this form of work.

Achieving and using representations like Management Information and Process Maps is, of course, a wholly mundane matter for members and such problems as arise are wholly practical ones i.e. is the representation adequate to my purposes here-and-now? In that case it is hard to see what is gained, other than a substantial loss of clarity, by moving away from those practical considerations and towards the more abstract and speculative considerations generated by theoretical accounts. To conclude, in that case, if one wants to understand something about representations at work, in work, or anywhere else we would repeat Wittgenstein's injunction to 'look and see'!

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