Draft Working Paper

Continuity, Change and Conflict:
The role of learning and knowing in different productive systems

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ABSTRACT

This paper explores the relationship between the way work is organised, the organisational context, and learning in the workplace. It develops, in part, from earlier work where we argued that organisations differ in the way they create and manage themselves as learning environments, with some conceptualised as 'expansive' in the sense that their employees experience diverse forms of participation and, hence, are more likely to foster learning at work (see Fuller and Unwin, 2004). It argues that contemporary workplaces give rise to many different forms of learning, some of which is utilised to the benefit of the organisation and employees (though not, necessarily, in a reciprocal manner), but much of which is buried within everyday workplace activity. By studying the way in which work is organised (including the organisation of physical and virtual spaces), it is possible to expose some of this learning activity as well as examples of the creation of new (or refined) knowledge. Part of this process involves the breaking down of conceptual hierarchies that presuppose that learning is restricted to certain types of employee and/or parts of an organisation. This paper builds on the work of other researchers who highlight the importance of the context the (see, inter alia, Nonaka et al, 2005; Boreham and Morgan, 2004; Unwin *et al 2005)*, and on the work of Engeström (see, inter alia, 2001), who has highlighted the way new knowledge is created through employee interaction when problem solving and, hence, has paid attention to the important question of the quality of learning in the workplace. It also builds on Wilkinson's (2002) conceptualisation of the way organisations construct and manage the technical and social relations of production. The paper uses evidence from a current project based in public and private sector organisations in the UK.[1]

The project is employing a range of qualitative and quantitative methods to examine these issues in case study sites in a range of sectors. Initial findings indicate the need for a sharper focus on the context of workplace learning, including wider regulatory,

[1] The project, *Learning as Work: Teaching and Learning Processes in the Contemporary Work Organisation* (RES 139250110), is funded under the ESRC's Teaching and Learning Research Programme. For more details, go to: http://learningaswork.cf.ac.uk

sectoral, and organisational characteristics. In addition, it is suggesting that where people are positioned in the political economy of the workplace affects not only the types of learning in which they engage and the types of knowledge they can acquire, but also the extent to which their learning and knowledge is recognised. As a result, our research is focusing on trying to understand the nature of the productive system operating within organisations to understand the underlying phenomena that drive (or impede) learning and the creation, refinement and management of knowledge (see also, Felstead et al, 2006).

Introduction

Whilst the seminal studies of Lave and Wenger (1991) argued that learning for work was more meaningful when carried out 'in situ', the workplaces in which they conducted their research have limited resonance for researchers examining learning in contemporary organisations. Engeström (2001), for example, has argued that the seamless process of reproduction represented in Lave and Wenger's (ibid) concept of communities of practice is at odds with the fact that most contemporary organisations have to confront daily challenges to their existence and the need to innovate in order to stay in business. In the UK, these challenges now apply equally to public as well as private sector organisations due to intense pressure from government for public sector organisations to 'modernise' through adopting the management practices of private companies. Thus, they exist within the boundaries of a political economy and "face a set of coordinating institutions whose character is not fully under their control" (Hall and Soskice, 2001, p.15). We are using the image of the Russian Doll to remind ourselves of the multi-layered nature of contemporary organisations and sectors. The organisation of work in and the performance of most of our case study sites are affected on a daily basis by the nature of the national and international market economies in (and across) which they operate. Establishing the role that learning plays in the workplace and articulating the nature of that learning require, therefore, examination of a range of phenomena stretching beyond the day-to-day generation, acquisition and sharing of skills and knowledge. This is a considerable challenge, one that is further heightened by the dynamic nature of the business environment. For example, the working climate in one of our case study sites, in the automotive sector, has worsened considerably over the past 18 months due to the competitive pressure from Eastern Europe where the capacity to produce the same product at a much lower price is now strong enough to threaten survival.

In this paper, we draw on research evidence from three sectors where organisations are experiencing intense commercial pressure and where there is a continued need to innovate: food processing; retail; and software engineering. The paper is structured in two main sections. The first outlines ways of conceptualising knowledge and their relevance to exploring who learns what at work. The second provides illustrations from three different organisations participating in our project. The paper concludes by arguing that closer attention needs to be paid to developing empirically and contextually grounded understandings of the relationship between what 'knowing' in the workplace means for employees at different levels and with diverse job roles, organisational context, and the organisation of work.

Unlocking the nature of workplace learning and knowledge

For some years, surveys have provided evidence of the uneven distribution of learning opportunities across UK workplaces (see, inter alia, Beinart and Smith, 1998; Spilsbury, 2003; Aldridge and Tuckett, 2004; Felstead et al, 2005). There are writers within academic traditions as diverse as 'adult education' (see Fenwick, 2001) and 'labour process theory' (see Lloyd and Payne, 2004) who are highly sceptical about trends in the quality and availability of learning opportunities for those located in low status jobs. At the risk of over-simplifying, such writers share the view that (global) economic drivers are underpinning employers' attempts to 'sweat' more productivity from their human resources. The consequence for employees in weak labour market positions means limited job roles, little access to training and career development, and task intensification, within what Fuller and Unwin (2004) have elsewhere called 'restrictive' workplace learning environments. In contrast, others suggest that the emergence of the 'new economy', high performance and employee involvement practices (see, inter alia, Whitfield, 2000; Ashton and Sung, 2002) can give rise to more 'learning intensive' workplaces (Skule, 2004). The inclusion of diverse sectoral, organisational, and individual participants in our study is enabling us to investigate the empirical reality of both pessimistic and more optimistic perspectives.

It is well established that people with higher levels of initial education and qualifications, and who occupy more senior positions in the workforce, have disproportionately more opportunities to participate in formal training events, particularly those which lead to further qualifications (see, inter alia, Felstead *et al*, 2000). Recent survey work conducted by the research team (see Felstead *et al*, 2005) has enabled us to make connections between informal and formal sources of learning and their perceived helpfulness (in terms of doing the job better) to groups at different occupational levels. The findings confirmed that those at the top had the greatest opportunities to engage in courses and qualifications but, interestingly, also indicated that employees at all levels perceived that the learning that occurs through 'everyday' productive activity at work is the most helpful for doing the job:

> '…the relatively high importance of social relationships and mutual support in helping individuals to improve performance at work compared to the relatively low importance attached to qualifications and attendance on courses…' (Felstead *et al*, 2005: p.4)

However, those at the top end of the occupational hierarchy were more likely, than those lower down, to perceive their participation in formal sources of learning as useful. This implies that there is a relationship between the context and characteristics of specific work settings (i.e. the type of work, job role and design), the opportunities to learn to which they give rise, and the types of knowledge resources needed for workers to do their jobs effectively. In our case studies, we are developing an analysis that unpacks this further by looking closely at what constitutes 'the knowing' that people (in particular jobs in particular types of organisation) are applying at work. Hence, we are interested in the nature of knowledge in use and in context.

Conceptions of knowledge tend to relate to whether an individual or social perspective is taken. The individual perspective typically resonates with the concepts of learning as acquisition and knowledge as product (units of codified knowledge –

theories, concepts, scientific facts), which individuals acquire and store in the 'stock room' of their minds (Beckett and Hager, 2002). This knowledge is assumed to be context-independent. Evidence that the individual possesses such knowledge resides in the qualifications they possess and the curricula (codified knowledge) they have 'mastered' through participation in courses. In contrast, the social perspective resonates with the 'learning as participation' approach and the notion that knowing is embedded in and created through social relations (of production). Eraut (2004: 201-202) has observed, that a social concept of knowledge draws attention to "the social construction of knowledge and of contexts for learning, and to the wide range of cultural practices and products that provide knowledge resources for learning".

The social perspective or 'sociality of knowledge' (Muller, 2000) originates in the idea that (all) knowledge is social, because it is constructed through the social relations operating in particular socio-economic and cultural contexts. Conceiving knowledge *per se* as social in origin and context-dependent is radical as it rejects conventional understandings of knowledge as 'in the mind' (idealism) or 'in the world' (materialism). The idea that knowledge is constructed is consistent with an emphasis on 'knowing' as an active concept (Blackler, 1995). From the social perspective, scientific, disciplinary knowledge can be seen to have high currency because: it is created by high status groups; is acquired through participation in high status settings (such as universities); and because it, or its symbols (certificates), can be exchanged for high status positions in the socio-economic pecking order. Its strong currency is based on its social construction and not on any putative objectivity that makes it intrinsically superior to other forms of knowledge. Young observes:

> It follows that the specialised, codified, or discipline-based knowledge associated with the college curriculum (and off-the-job learning) is in principle no different from everyday common sense (or on-the-job) knowledge; it is just some other people's knowledge. (2004: 193).

However, accepting the conceptual argument that all knowledge is socially situated, can lead to an undifferentiated perspective where the extent to which some types of knowledge are more situated than others is overlooked. For those seeking to understand what people learn at work, why and how this is unhelpful as it forecloses analysis of the different types and sources of knowledge on which different groups in different workplace circumstances and relations might be drawing. The scientific concepts drawn on by industrial chemists in the research facility of a mining company are less situated and context specific than their knowledge of in-house procedures for and approach to health and safety or the department secretary's knowledge of how the team is organised and inter-relates.

Moreover, there is a danger that conceiving all knowledge as equal a) deflects attention away from its uneven distribution across social groups; and b) inhibits understanding of how the currency accorded to different types of knowledge is strongly related to the social settings and practices in which they are used, as well as the social groups between which they are 'traded'. In terms of the individual or group, dissimilar benefits accrue to those whose knowledge is perceived to have different kinds of value (Fuller, 1995). The exchange value of knowledge depends on where it was acquired and the value attached to it by 'users' of these currencies (e.g. in employee recruitment, selection for prestigious universities, gatekeepers to entry into

prestigious professional institutes and associations). On the other hand, being selected for promotion is likely to depend more on the individual's proven ability. In this regard, the use value of what has been learned and how it has been applied is likely to be given more weight by selectors than candidates' participation in off-the-job courses or acquisition of certificates.

Fuller and Unwin's earlier work (2003, 2004) on expansive and restrictive learning environments and approaches to apprenticeship is relevant here. It showed that those engineering apprentices who had opportunities to participate in a broad range of activities including in different departments in the workplace as well as on off-the-job courses, which covered engineering theories and concepts, were in a stronger position to progress within and between firms than those who only had access to on-the-job learning experiences. Put another way, these young people had been given the chance to participate fully in the extended social and technical relations of which this productive system comprised. Young is right to point out that:

> [although] …context specificity is a feature of the knowledge required for all jobs, many jobs also require knowledge involving theoretical ideas shared by a community of specialists that are not tied to specific contexts; such knowledge enables those who have acquired it to move beyond specific situations. (ibid: 193-4).

In our project, then, we are concerned to avoid the sort of uncritical and undifferentiated 'sociality of knowledge' that can lead to a papering over a) of the differences between who gets access to what types of knowing i.e. what is learned, how and by whom; and b) the uneven distribution of opportunities which give rise to a highly segmented socio-economic and occupational structure and outcomes for individuals and groups. *While we accept that all knowledge is equal at the conceptual level, it is far from equal at the level of outcomes.* To take this critical perspective forwards, our work is analysing particular productive systems to surface the nature of their social and technical relations, and to identify who is involved, in what ways in their continuity, disruption and change. In addition, the tools and artefacts which mediate organisational activity provide an important lens on how knowledge is actively constructed, distributed and created as an effect of workplace practices.

Eraut's (2004) longstanding interest in how people learn to do their jobs has led him to focus on knowledge. He identifies two broad types of knowledge: cultural; and personal. He links the former to the social perspective and the latter to the individual perspective. His separation of the social and individual is not one which we share. Our work is suggesting that an (ontological) approach which conceives the personal and collective as mutually constitutive is more fruitful and in keeping with our 'Russian doll' metaphor, which foregrounds the idea that the whole is in the part and the part is in the whole. Nevertheless, there are useful aspects of Eraut's analysis. In particular, he reminds us to take account of what employees bring to the workplace from their past experience. He defines "personal knowledge as what individual persons bring to situations that enables them to think, interact and perform" (ibid). Aspects of both cultural and personal knowledge can be 'codified' or 'non-codified'. Codified cultural knowledge is represented in artefacts such as academic textbooks, scholarly papers, operational manuals, and other forms of workplace documentation. Codified personal knowledge is represented in what Eraut calls "personalised versions of public codified

knowledge" (ibid). This includes 'authored' assignments, projects and tasks, which can be undertaken in diverse settings including formal education and the workplace.

The territory covered by non-codified knowledge is broad and varied and needs to be uncovered and elaborated to illuminate the nature of knowing in the workplace. There is a tendency to bracket non-codified cultural and personal knowledge with the notion of tacit knowledge, knowledge, which is taken for granted and hard to articulate. Researching the tacit certainly constitutes a methodological challenge, but the evidence being generated through interviews with our research participants is suggesting that whilst there may be some areas of workers' knowledge which are hard to uncover, respondents are often able to articulate a good deal about what they and others need to know in order to do their jobs.

In summary, then, we are arguing in this paper that there is no easy 'read-across' between types of knowledge and their availability and distribution across particular organisational settings. For example, depending on the occupational or professional context, scientific concepts or theoretical knowledge may or may not be just as crucial a resource in the workplace as in the educational institution. Second, that what is learned in what sorts of productive systems, how this is mediated and applied through the social relations of production is highly relevant not only to gaining a better understanding of workplace learning but also to the relationship between workplace learning, the organisation and distribution of work and organisational outcomes.

Illustrating who learns what at work

Our research is employing a range of qualitative and quantitative methods in case study sites which span both the public and private sectors and diverse productive systems. Fieldwork is currently underway in organisations of different types and sizes in 14 manufacturing and service industries. We are interested in employees at all levels. In line with our view that organisational context is highly significant, we are developing profiles of the wider economic, political and social landscape in which the case studies are located.

In this section, we draw on transcribed interviews and field notes taken during observation in the workplace in three companies in the food processing, retailing, and software engineering sectors to illustrate the sorts of 'knowing in practice' we are uncovering in contrasting productive systems. For each setting, we focus on the different types of knowledge developed and applied by participants. In particular, we are interested not only in what there is to know in the setting (and who knows it) but also on how knowing appears to relate to organisational outcomes. At this interim stage in the project, the analyses presented are tentative and partial.

Company A: Food Processing

Food processing is currently the largest sub-sector (13%) within manufacturing industry in the United Kingdom (UK). Within food processing, the sandwich making sector of which Company A is part, is worth approximately £3 billion to the UK economy. The company was founded nearly ten years ago by two friends and currently has around 30 employees. It now operates as a limited company, with the founders employed as joint managing directors (MDs). It turns over around £800,000 per year and makes about 25,000 sandwiches a week. The bulk of the staff are

employed as either sandwich makers/assemblers (approximately 17) or delivery personnel (approximately 9). Sandwich making is a very competitive business, characterised by low entry costs. By the volatile standards of the sector, Company A has managed to establish itself as a relatively long-standing supplier of sandwiches in the East Midlands of England. Its main customers are neighbourhood shops such as those available on garage forecourts.

In-depth interviews with the MDs revealed that they are currently grappling with how to take the business forward. This includes making strategic decisions about expansion, capital investment in automated machinery, and bringing in specialist personnel. The data reveal the extent and nature of the cultural and personal knowledge being applied in this workplace context and the essential role this is playing in day-to-day decision-making and activities. For example, in the following extract one of the MDs is reflecting on the possible advantages of employing an experienced production manager. He can do (knows) all the production tasks but questions whether he could be applying other aspects of his knowledge to develop the business:

> *The time I'm there sticking labels on etc sort of doing the quality control at the end of the line, I just think to myself "what else could I be doing with my time in terms of perhaps getting new business, looking at new markets, looking at new product lines" etc, etc, etc.* (MD)

In the next quote, the interviewee is explaining the dilemma of investing in new machinery. On the one hand, it will help bring down employee costs in what is a labour intensive manufacturing process but, on the other, he has to be convinced that the initial investment in new equipment will yield the returns that will make the financial outlay worthwhile. The MD is displaying his knowledge of the economic challenges of the sandwich making business as well as his perceptions of the pros and cons of specific investment decisions:

> *... the next bit of machinery that I'm going to be looking to buy, is a buttering machine, because that is quite labour intensive and I find that by buying a buttering machine I'll be able to work twice as fast but the downside is that they're 26 grand*[2]. (MD)

The MDs 'know' that their management style is critical to the success of the business. It is characterised a) by a highly hands-on approach - they can and often do perform all the workplace tasks, and b) by an approachable, friendly and communicative relationship with staff. Below, an employee refers to the importance of daily interaction and information exchange between van drivers and managers. This takes the form of knowledge sharing, swapping experiences and ideas and, importantly, having their suggestions acted upon:

> *Everyday we come in and talk. Can I have five minutes with you? Yeah, no problem. They've* [managers] *always got time for you…they will listen to you. One day you go in and there haven't been many salads today…next day...all your trays are full salads.* (van driver)

[2] 'Grand' is a colloquial expression that means £1,000.

Overall, the MDs observations reveal the simultaneous use of cultural knowledge about business (e.g. the relationship between capital and labour, product-market and quality) and what Eraut calls, "everyday knowledge of people and situations" (2004: 202). Importantly, their evidence highlights the challenge of reconciling strategic issues relating to the long-term development of a small business with day-to-day workload demands.

The van drivers' 'story' in Company A provides a telling reminder of the importance of collecting the 'voices' of employees at all levels of the occupational hierarchy and of not making assumptions about the relationship between what workers know and the social and occupational status of particular groups. The occupational label 'van driver' implies a narrow job role. However, the interviews contradict this by revealing the breadth and complexity of what the company's van drivers actually do and the centrality of their involvement in the relations of production. In addition to driving, their core functions include: business development, sales and administration. Each driver is responsible for a 'delivery round' comprising deliveries to fifty plus different outlets ('drops'). The following illustrates the range of 'knowledge challenges' involved for this group of workers including:

- Working out the most efficient route – order of deliveries;
- Knowing what types and prices of sandwiches sell to what type of outlet, in what type of location;
- Communicating 'field intelligence' to managers so that production can respond effectively to fluctuations in demand;
- Deciding on whether to vary prices on particular products to optimise sales to individual customers;
- Minimising waste – the sandwiches are mostly sold on a sale or return basis (once the products pass their eat by date, they become waste);
- Seeking and securing new customers;
- Arranging the products on the customer's shelf (presentation) in order to maximise sales;
- Developing and maintaining customer relations – the more well-established the personal relationship between 'van driver' and customer, the less likely the company is to lose the business to a rival;
- Recording deliveries, sales and returns for each outlet in "the book" and passing the record back to the office for processing;
- Calculating the correct amount of money owed by customers and collecting it.

There is not the space in this paper to present the full story of what the van drivers know, but the following quotes illustrate their criticality to organisational performance, particularly in terms of sales, customer service and relations, and providing the business with daily intelligence from the field. They are also indicative of the different sorts of knowledge embedded in the central role this position has in the social relations of production:

> *It's down to us [van drivers] at the end of the day. He's [MD] blind. We're like his eyes. We have to go out there and we come back with information. Can you change this, can you change that and come back to [MD] and he makes them [sandwiches]. That's how it is*. (van driver)

> *When you get your returns, because it's sale or return, what I do is then look at the returns and I think well they're not eating them and they're not eating them and they're not eating them so I keep them off and put another variety in. Change me variety as to what they're eating, you see.* (van driver)

> *Yes* [you can be trained to do the job]. *If you've got it up there and you watch someone do it. If you came with me and I go into me shops and speak to the customers: good morning. Some of me Asian shops call them brother: good morning brother, how are you?* (van driver)

To date the evidence emerging from Company A indicates the situated and contextualised nature of the knowledge created and distributed across the social relations which constitute this organisation. This is not to say that less context dependent knowledge is absent from the workplace. Issues relating to environmental health are critical to a food processing and handling business. If the company were subject to a complaint about the safety of its products, it would have to be able to demonstrate 'due diligence' in relation to such matters. Therefore, products are sent to a laboratory for testing to establish their 'safe' shelf life, and the appropriate use by date. This is an area of codified scientific knowledge, in which at least some of the employees appear to have developed significant knowledge.

Company B: Retail – supermarket

Company B runs a nationwide chain of supermarkets, employing over 50,000 staff and with a turnover of more than £4 billion. For the purposes of our research we have conducted interviews with personnel at all levels in two similarly sized stores in the East Midlands (of England), as well as with the area manager who has overall responsibility for several outlets. Broadly speaking, each store has a manager, several department managers and supervisors, and 'shop floor operatives'.

The growing availability of information technology in recent years, for example through electronic point of sale systems, has facilitated the centralisation of the buying, stock control and marketing/presentation functions. In so doing it has limited the extent to which individual stores can plan their own stock profiles and the way in which their stock is presented to customers. Stock Store Management (SSM) is implemented via a device called a 'symbol gun'. This is used to check that the physical stock available on the shelves accords with what 'the computer' states the store should have. Discrepancies occur predominantly because of 'miss picks' at the warehouse and shrinkage. The symbol gun is used to collate data on availability and to write off stock and is therefore highly relevant to stock ordering processes. Drawing on the approach developed by actor network theory to the conceptualising of social networks (Law 1994, Mutch 2002), the symbol gun can be seen as an important 'member' of the social relations of production in this firm. One manager observed:

> *…these little guns obviously are controlling…obviously we're putting all the information in to that which takes it to the computers, so I mean without these in this store, we wouldn't know what our stock levels were and we'd be in a bit of a mess, we do rely on those.*

In general terms, departments with fresh produce which is subject to spoilage over a relatively short period of time (a few days), have more discretion over stock ordering than those such as grocery (e.g. tinned food) which have a relatively long shelf life. Dairy and meat are seen as particularly critical sections for store performance because they combine relatively high turnover with the risk of high wastage if the ordering levels are inaccurate. It is the departmental manager's responsibility to maintain the integrity of stock levels (i.e. to ensure that the physical and computer stock levels match). Knowledge of local conditions and patterns of demand can have a significant impact on departmental and store performance, and this leads to a tension over how much discretion to give departmental managers to alter their centrally determined stock levels. Offering more discretion can lead to positive pay offs, when the manager's reading of local demand proves accurate, or negative when the store is left with high levels of spoiled produce. We concentrate here, then, on painting a picture of what departmental managers need to know, focusing in particular, on an account provided by one dairy and meat manager. This focus has also helped reveal what sort of knowledge is being drawn on and utilised, and the relevance of this to the outcomes of this particular productive system.

The first quote confirms that the degree of discretion accorded to department managers differs according to the fragility of the produce and how they use their cultural and personal knowledge to alter what the system suggests should be ordered:

> *...what you had is grocery where they can't amend very much, but on dairy* [I] *mean fresh* [food]*, you can amend everything, so you change it as much as you want. And the system, I don't know why, but it tends to order say too much and you just know from knowledge yourself, you sort of look at it, you get a sort of record in your own head.* (dairy and meat department manager).

The computerised ordering system has the capacity to learn, such that, *"say we've got one product, say it's ordering five cases, I thing that's not going to sell, I'll take one, the system sort of resets itself every time you do that".* In this regard, there is an inter-dependence about the relationship between 'the computer' and employee, with both aiming to manage 'each other's' behaviour.

The performance of the department is assessed on three indicators, sales, availability and waste. Optimum success is achieved when the most profitable balance between the three is reached:

> *It's hard to get* [to hit targets on all 3 indicators at the same time]*, you can normally get one without the other, get brilliant waste, cos you've cut back a lot and you haven't got the sales there. To get sales you need to spend more money, which goes... more waste, but if you want to meet your waste, you've got to try and get a happy medium, which is very difficult. Availability comes with getting sales and waste...*

This respondent spoke about the importance of experience in enabling people to achieve their targets and also about the need to 'be in rhythm' with patterns of demand. He said, "*when you come back of two weeks holiday say...what you think is right is no longer right to what it was when you left."*

In addition, to the critical function of stock management, department managers are also responsible for employees in their 'teams'. The dairy and meat manager explains what he needs to know in order to manage people effectively:

> *...being able to be a friend but yet be a boss, step away when you need to and yeah just like casual and friendly. You need to be able to separate them too if you need to, if you're too nice all the time you'll get nowhere, always be fair.*

Interestingly, the approach to people management practiced and advocated by this department manager has been strongly influenced by the style promoted by the store manager, who is an avid reader of people-oriented prescriptive management texts such as Blanchard's *One Minute Manager*. Such books focus on the idea that 'your people are your most important asset' and on ways of motivating and empowering them. The store manager makes this literature available to his management team as required reading. This provides an interesting example of codified cultural knowledge that goes beyond the expected raft of organisational textual and numerical material available in a supermarket.

It may be that both narratives can be true. Whilst the technology in both stores is the same, the way in which it is used and perceived is influenced by the organisational culture generated by contrasting management styles. When asked how he would characterise the store manager's role, the manager of our dairy and meat section respondent talked a lot about the importance of employee development. The dairy and meat department manager, himself, talked about his capacity to alter and 'teach' the system. In contrast, the manager of the other store in the case study perceives the technology as decreasing individual discretion and autonomy. She observed that, "*most of the job really is policing as it were and checking that things are being done. I meant the system checks I carry out tells me whether they're doing their job right"*. Further work is required to clarify the links between management style and technology and the implications for job roles and workplace knowledge.

At this early stage of our Company B analysis, we are trying to understand the full effect of the computerised stock system on employees' roles, and the extent to which its introduction is limiting or simply changing what they need to know. Put another way, we are interested in the ways in which the introduction of the tools and devices of the SSM system is reconfiguring the 'network' of relations and, hence, the productive system.

Company D – Software Engineering

Company D provides a contrast to the other two companies discussed in this paper as it has the characteristics of a 'knowledge intensive' organisation where the vast majority of employees are university graduates. For the purposes of this paper, we will focus on our study of the software engineers who make up the majority of employees in the company. This company develops software and hardware products and solutions for a wide range of customers including the US and UK military and several multi-nationals. It operates at the top end of the market and has built an international reputation for being both cutting-edge and able to deliver on time. It was founded some 25 years ago by a group of enthusiastic men, including the current chairman, who wanted to create their own business, having spent several years

working for one of the leading multi-national IT companies. The profits of the company are shared annually by the employees (currently 350) and the amount of profit share is determined through reviews of individual performance. The software engineers are recruited straight from Oxford and Cambridge and a small number of other top UK universities at the age of 21 or 22. They are nearly all male, reflecting the gender balance across the company where, currently, 69 out of 350 employees are female. The female employees are located mainly in service functions such as the canteen, clerical support, and human resources. There isn't space in this paper to discuss the gender dimension in detail, but it is important to note in terms of the way in which the company, to some extent, has reproduced the characteristics of a 'male' Oxbridge college.

This performance review process is intensive and involves everyone from the chairman down to the canteen assistants and cleaners. Each employee is reviewed by their immediate manager every nine months. This takes the form of a written report (around 10 pages) detailing the employee's strengths and weaknesses over the period in question. The report is discussed with the employee and, when the two parties of agreed on a final draft, it is then passed up the line to a senior manager, and then to the chairman. All the reports are then reviewed and graded by the chairman and senior managers in order for the profit share to be allocated. This review process is unusual in that, in comparison to the standard appraisal procedures found in many organisations, it is a far richer and meaningful activity. At the heart of the process is a commitment to individual career development and the role of the manager as the key facilitator of learning. The vast majority of employees are expected to participate in the management function. Once the software engineers have acquired the necessary technical competences, they are assigned a newcomer to manage, a process that is closely supervised by a team manager. The engineer has to show they can 'teach' their trainee as well as instil the corporate values, and this is recorded through the review process. They then acquire more people to manage (up to a maximum of five) and eventually progress to managing a whole team. A small number of engineers, however, are recognised as 'techies' who are not suited to dealing with people, but whose expertise is equally valued.

The overwhelming sense one gets in this company is of a strong community whose members are 'signed up' to the expectations in terms of performance, but also to the social ethos. The profit share arrangements cement the 'buy-in' of the employees. The senior managers promote clear corporate goals that seem to be a mix of profitability and creating a decent, innovative place to work where intelligent people can come together to form a community. Many of the software engineers told us they had been attracted to the company because it would give them the chance to move from university to become a member of another community of "bright people". There seemed to be a close alignment between their personal knowledge and the cultural knowledge of their occupation. The organisation of work, including the management practices, further sustained and enhanced that alignment. This relates to Baldry et al's (2005) argument that software workers demonstrate greater commitment to organisational goals in companies that respect their professional identity as software engineers and create working conditions that value worker discretion and autonomy. Where such working conditions do not exist, however, it would be naïve to assume that software workers are automatically more committed just because they are sometimes regarded as "prototypes of the new knowledge worker". (ibid:168)

The company's physical environment helps to sustain and enhance a strong spirit of collegiality. There is then an explicit management focus on developing and shaping the social relations of this productive system. The buildings are organised around open plan offices, with one or two glass-fronted offices for senior managers on each floor. Each floor also has a kitchen stocked with drinks, biscuits, fruit, fridges and microwaves, and there is a subsidised canteen. Employees can work flexible hours, but are expected to work late and longer when pressure is on. A 'Morale Fund' (at team, business unit and corporate levels) supports a large range of social activities including: an annual holiday overseas for 4 days for all employees; an annual trip for employees plus partners (for 2006 this will be a weekend in Rome); children's parties and summer barbecues; and dinners in London restaurants to celebrate a new product. Employees receive private health care insurance and gym/tennis club membership. Many of the engineers we interviewed played some kind of sport at lunchtime (e.g. squash or 'touch' rugby) and there is physical evidence of the sporting ethos in the way of racquets and kit bags strewn over desks. The company sponsors rowing clubs at two Cambridge colleges.

The engineers work in project teams, established for up to 9 months at a time, to create software solutions and solve problems for customers. Team rotation is aimed at facilitating innovation and a sense of energy, and serves to counteract potential boredom. This latter factor is important as several software engineers referred to themselves as being people who needed constant stimulation. Knowledge and expertise are captured within the teams, as in Boreham et al's (2002) concept of work process knowledge, and disseminated through everyday interaction in the form of discussions and consultation across the teams. The performance review system also acts as a mechanism for capturing ideas, and for facilitating what Boud et al (2006) call 'productive reflection'.

One of the company directors refers to the head office building as the 'Mother Ship':

> "All people who move to this company have been in (head office), have been in the mother ship if you like, and have got to know everybody else, have been brought up if you like with all the fundamentals of the mother ship and then they go out to the frontline offices."

This connects with the chairman's emphasis on a family atmosphere where people are cared for and where the social life of the 'family' is seen as key to the company's success. The director of Internet operations added to this by stressing that DC is a "long lasting career driven company" in which people's careers are seen as the driving force. This means they have taken fewer risks than they might have done in terms of the marketplace:

> "And sometimes people say well, (company name), you can make twice as much money as you make and that's probably true over a period of two, three, four years, but over time things would decay because you would be sacrificing other elements of our culture and identity in order to make more money."

There has been a long-standing expectation in the company that the organisation of work will enable potential managers to emerge out of the teams, by osmosis. There are some dissenting voices, however, as some people recognise that management is a

difficult job. The customer support team manager said she thought the company needed to accept that management skills needed to be taught as well as learned through everyday practice. A business unit manager stressed that management was a tough job and that some struggle with the "people side". He also said he felt that senior managers needed more time to manage properly and that they may benefit from some external training. The general manager said they were now separating out people managers from income generators as they need people who will bring in the business. This is a significant development as it entails recruiting experienced people from outside. There is a sense that this is a risky and potentially destabilising move.

The growth and nurturing of managers reflects the company's privileging of on-the-job training and learning. Employees can, if they wish, participate in off-the-job training, but this is very rare. Knowledge is acquired and distributed throughout the company through the use of teams and the central role played by everyday interaction within and between teams and customers. The senior managers lead workshops and seminars on specific topics throughout the year for new recruits and the software engineers are encouraged to organise ad hoc presentations to colleagues when they want to get feedback on new ideas or about long-standing problems. Many of the interviewees stressed the view that there was little need for off-the-job training, as illustrated by this comment:

> "The kind of people we have, this will sound arrogant and elitist, but they're sort of, a long way above the average you might encounter, if you go on a 'how to program course', the people working on that course generally would be of a lot lower ability than the people here. In fact, we don't really need to send people on 'how to program' courses, because 'how to program' is not really for very bright people, … And we, yeh, I guess we reckon we can do that kind of training better ourselves, in terms of the correct focus, and…I guess also the quality of training…The courses that I've been on that are run internally have been, almost without exception, outstanding."

All software engineers begin by learning the core technologies involved in the business and use this as a platform on which to build their expertise. In their first year, 50 days of an engineer's time is devoted to learning the core competencies from their mentor and manager, and so they become deeply immersed in their tasks and, hence, are involved in what Polanyi (1962) called "participation through indwelling". The experience of one of our respondents illustrates this:

> "My first few weeks and months, … I was put into a team of one, so I was given to a guy who was an experienced Techy and someone who had management aspirations and I was given to him to manage initially, and I worked with him on supporting a major customer. So that was largely a matter of us having… well we had like half a million lines of code to support and that's an awful lot of code and it was all quite obscure archaic code that had been written ten years ago and developed on ever since. And our job was basically to support the customer who was using this code if they came across problems – or what they thought were problems, we had to investigate whether they really were problems or if they'd just misconfigured something or misunderstood, and if they were then we'd to produce fixes, which was… I mean it's quite a challenge. Actually I think it gave me a very good start in the

> company because it put me immediately in a position where I was very much in the deep end because I didn't really know the ropes and I had all this incredibly obscure and difficult code to support. And I had one guy who was a clear expert to guide me through it and that…. you know, that kind of environment meant that I had to learn to stand on my own two feet quite quickly."

As ideas are developed, engineers (at all levels) place this information in a series of 'public folders' on the company's intranet. There is a sense from some interviewees that more needs to be made of this resource, as it goes some way to capturing some of the tacit knowledge involved in everyday problem-solving. Nonaka et al (2005) refer to this as "knowledge conversion" whereby tacit knowledge is 'externalised' and turned into an explicit form, then expanded, and then re-internalised through practice. Kerosuo and Engeström (2003) stress, however, that tools (such as the public folders) emerge from being part of an organisation's collective routines to become enriched and, hence, powerful resources when they are interconnected with and implemented within workplace activity.

The metaphor of the 'mother ship' used by one of the directors is particularly apt when considering both the strengths and weaknesses of this company. The company's creative and sustained management of its physical, virtual and mental space reflects Nonaka et al's (2002) concept of *ba*, one that potentially adapts the concept of communities of practice to reflect contemporary organisational realities. On the one hand, the company has created a very prosperous, stable and stimulating environment for its highly qualified crew. The organisation of work in terms of rotating teams, the continuous process of knowledge conversion, and the dedication of management time to mentoring and reviewing, have sustained a community of practice that bears many of the characteristics featured in Lave and Wenger's (1991) model of situated learning. Cook and Brown's (2005) metaphor of the 'generative dance' between knowledge and 'knowing' is relevant here as the company has developed ways of working that produce a constant interaction between the engineers' expertise and the everyday problems they have to work on. The emphasis here on the development of highly involving and distributed participation in the social relations of production has, hitherto, been a crucial hallmark of this productive system.

The company has, however, arrived at a potential 'tipping point' in terms of its size and its ability to innovate. The issue of size is significant, because the review process makes considerable demands on senior managers, including the chairman. The problem of innovation strikes at the heart of the belief that the generation and reproduction of skills and knowledge within the community of practice is sufficient. One of the directors voiced his concern about the propensity of the engineers to be too inward looking:

> "We're talking about a lot of propeller heads here you see and they want to know the next exciting technology they're going to be working on. They don't particularly want to know that I have recently negotiated so and so with customer X or whatever…that culture comes partly because…the company is full of engineers, it's very engineering dominated an they tend not to be really interested in business an awful lot, but also it comes from the fact that they've grown up with a company that's always successful, that's always stable, that

> always makes its targets and there's not that underlying paranoia if you like that I think exists in the real world. You know, is our company going to go bust next year or whatever."

The company has many of the characteristics of an expansive learning environment, but its almost exclusive reliance on learning in the workplace is now proving to be restrictive in terms of bringing fresh and challenging ideas into the existing community. Interestingly, in the company's US branch, the managers (sent over from the UK) are finding it difficult to replicate the culture of the 'mother ship'. One example is the tendency of US employees to disregard standard procedures if they think they have a quicker way to achieve their goal. The director of the US operation referred to this as "breaking the concept of agreement" that should exist between an employee and a manager. Paradoxically, however, US employees struggle with the non-hierarchical structure. It appears, then, that to maintain the success of this company, the continual ordering and organising of the social relations of production may be extended to include the introduction of new actors and tools.

Conclusion

In conclusion, we would argue that closer attention needs to be paid to who is learning what (why and how) at work; and to developing empirically-grounded understandings about the types, distribution and application of knowledge in diverse workplaces. Unpacking these issues will help a) to avoid making easy assumptions about the complexity and value of workplace learning based on employees' structural position in organisations, or the sectors in which they work; and b) to expose the range of knowledge sources available in the workplace; and c) the relationship between personal and collective knowing, the social and technical relations of production (including job design and work organisation), and organisational outcomes. The illustrative material presented in this paper highlights the 'art' involved in applying knowledge effectively to fulfil occupational roles in diverse productive systems. For the department manager in Company B, there appeared to be an art to knowing how to manipulate the ordering system to continually hit three competing and dynamic performance targets. In Company A, the van driver's job role was shown to be broad, complex and to allow for considerable discretion and autonomy. It was also a pivotal part in the network of relations which made up the productive process. Importantly, the van driver's role contradicts stereotypical assumptions about what apparently 'low level/status' employees know and can do. It provides a particularly evocative example of why it is important for researchers to look closely at what it means, for differently positioned employees 'to know' in the workplace. At the same time, however, we have continually to ensure our interpretation of what we choose to term 'learning' is located within an empirically grounded understanding of the nature of the technical and social relations of production in each of our case study sites.

Management of a small business, such as Company A, called for 'knowledgeability' in every day tasks as well as in how to manage for longer-term success. Having 'the art' (the knowing) to achieve this balance appeared critical to the sustainability of the firm. The example of Company B was interesting because it illustrates the relationship between the computerised stock management system, and the people who operate and can over-ride it. It highlights the extent to which the social relations (or network) of this productive system consist of devices (eg the symbol gun) as well as actors. The case of Company C provided a different perspective in terms of the way

organisations can construct powerful learning environments that suit the needs and circumstances of a given period in the lifecycle of a business. For this company, the challenge will be to take risks with the current community structure in order to adapt to the changing market conditions. This is likely to require a re-assessment of the essentially conservative approach to learning and knowing that has been fostered hitherto. The aim of such a process would be the production of a more elastic 'community boundary' allowing for the sorts of critical perspectives and external ideas associated with Engeström's concept of expansive organisational learning.

Finally, the illustrative material provides evidence of the highly nuanced relationships between job and occupational roles, types of knowledge, their application in practice and organisational outcomes. As the research progresses, we are probing deeper into our case study organisations to create more detailed pictures of the learning environments they are continually creating and re-creating. We see the creation of such environments as an indicator of their location in diverse and context-specific productive systems.

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