Knowledge, Knowledge Work and Organizations: An Overview and Interpretation*

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Abstract

There is current interest in the competitive advantage that knowledge may provide for organizations and in the significance of knowledge workers, organizational competencies and knowledge-intensive firms. Yet the concept of knowledge is complex and its relevance to organization theory has been insufficiently developed. The paper offers a review and critique of current approaches, and outlines an alternative. First, common images of knowledge in the organizational literature as embodied, embedded, embrained, encultured and encoded are identified and, to summarize popular writings on knowledge work, a typology of organizations and knowledge types is constructed. However, traditional assumptions about knowledge, upon which most current speculation about organizational knowledge is based, offer a compartmentalized and static approach to the subject. Drawing from recent studies of the impact of new technologies and from debates in philosophy, linguistics, social theory and cognitive science, the second part of the paper introduces an alternative. Knowledge (or, more appropriately, knowing) is analyzed as an active process that is mediated, situated, provisional, pragmatic and contested. Rather than documenting the types of knowledge that capitalism currently demands the approach suggests that attention should be focused on the (culturally located) systems through which people achieve their knowing, on the changes that are occurring within such systems, and on the processes through which new knowledge may be generated.

Descriptors: activity theory, knowledge, knowledge-intensive firms, knowledge work, organizational competencies, organizational learning

Introduction

Ever since Galbraith (1967) suggested that a powerful new class of technical-scientific experts was emerging, and Bell (1973) proposed that knowledge is a central feature of post-industrial societies, the significance of experts in contemporary society has attracted much comment (see Reed 1991 for a discussion of contemporary trends). Indeed, in recent years, the importance of expertise for competitive advantage has been emphasized again by economists and business strategists who have suggested that wealth creation is less dependent on the bureaucratic
control of resources than it once was, and more dependent on the exercise of specialist knowledge and competencies, or the management of organizational competencies (e.g. Prahalad and Hamel 1990; Hague 1991; Reich 1991; Drucker 1993; Florida and Kenny 1993). This debate has found echoes in discussion about ‘knowledge-intensive firms’, that is, organizations staffed by a high proportion of highly qualified staff who trade in knowledge itself (Starbuck 1992, 1993; Alvesson 1993a), in the suggestion that organizational competencies can be nurtured by the development of inter-organizational links (Kanter 1989; Badaracco 1991; Wikstrom and Normann 1994), and in the proposal that, because of technological changes, team organization is becoming of crucial importance and employees generally should be managed as ‘knowledge workers’ (Zuboff 1988).

Within the literature on the established professions the privilege suggested by the term ‘knowledge’ and the opportunities it offers occupational groups to protect their positions and ‘black box’ their skills (for example, by claiming the authority of medicine, law, or other complex bodies of knowledge) have been well documented (e.g. Baer 1987; Abbott 1988). Writing in a special edition of the *Journal of Management Studies* on knowledge work Alvesson (1993a) notes how specialists in the new generation of knowledge firms are, in exactly the same way, attracted to the mystique associated with the terms such as knowledge and knowledge worker; knowledge-intensive firms are, above all else he suggests, systems of persuasion. Developing a similar point Knights, Murray and Willmott (1993) suggest that the growing use of such terms may be regarded as as normalizing discourse which, as it legitimates a particular division of labour, distracts attention from the knowledge that is an essential characteristic of all forms of activity.

This paper explores the relevance of the terms knowledge, knowledge work and knowledge-intensive firms for organization studies, by developing an approach which seeks neither to perpetuate the mystique often associated with abstract, codified knowledge nor to present claims to knowledge merely as normalizing discourse. Conventional images of knowledge within the literature on organizational learning are first identified and are distinguished by the assumptions they make about the location of knowledge, i.e. in bodies, routines, brains, dialogue or symbols. Recent commentary on the emerging significance of knowledge work amounts to the suggestion that, in place of a strong reliance on knowledge located in bodies and routines (in the terminology of this paper, in place of knowledge which is ‘embodied’ and ‘embedded’), emphasis is increasingly falling on the knowledge that is located in brains, dialogue and symbols (i.e. knowledge which is ‘embrained’, ‘encultured’ and ‘encoded’). Conventional assumptions about the nature of knowledge are not without their difficulties, however; a point which has emerged strongly from studies of the impact of new information and communication technologies. Inspired by such studies, and drawing
from recent debates in philosophy, linguistics, social theory and cognitive science, an alternative approach is outlined. Rather than regarding knowledge as something that people have, it is suggested that knowing is better regarded as something that they do. Such an approach draws attention to the need to research ways in which the systems which mediate knowledge and action are changing and might be managed. The conclusion of the paper is that debate about the growing importance of esoteric experts and flexible organizations should be located within a broader debate about the nature of expertise and of the changing systems through which activities are enacted.

Images of Knowledge within Organization Studies

Within the organization studies literature a variety of approaches to knowledge can be identified. One obvious place to begin exploring these is the literature on organizational learning. The metaphor of organizational learning is not new, it has attracted attention at least since Chandler (1962). Interest in the United States has been consistently high (see, e.g., Argyris and Schon 1978; Duncan and Weiss 1979; Nelson and Winter 1982; Daft and Weick 1984; Fiol and Lyles 1985; Nonaka and Johansson 1985; Levitt and March 1988; Zuboff 1988; Henderson and Clark 1990; Senge 1990; Brown 1991; Kochan and Useem 1992; Dixon 1994; and special editions of Organization Science 1991 and of Organization Dynamics 1993) although, especially in recent years, a strong interest has been developing in the United Kingdom and Europe also (Hedberg 1981; Garratt 1987; Pedler et al. 1991; Swieringa and Wierdsma 1992; Dodgson 1993, and see also Douglas 1987).

At least five images of knowledge can be identified in this literature. Adapting and extending a categorization of knowledge types suggested by Colilns (1993) these are knowledge that is embrained, embodied, encultured, embedded and encoded.

Embrained knowledge: is knowledge that is dependent on conceptual skills and cognitive abilities (what Ryles 1949, called ‘knowledge that’ and James 1950, termed ‘knowledge about’). As discussed further below, within Western culture abstract knowledge has enjoyed a privileged status, and in the organizational learning literature a number of commentators have emphasized its importance. Fiol and Lyles (1985), for example, reflect the predominant view of the distinctive status of abstract knowledge when they contrast ‘routine’ behavioural adjustments with what they term ‘higher level’ abilities to develop complex rules and to understand complex causations. Perhaps the best known theorist of organization learning who has featured embrained knowledge is Argyris, whose theory of ‘double-loop’ learning (e.g. Argyris and Schon 1978) encourages an explicit recognition and reworking of taken-for-granted objectives. A recent account in this tradition is Senge (1990) who synthesizes personal insights, models,
systems thinking and shared visions in a general account of organization learning.

**Embodied knowledge:** is action oriented and is likely to be only partly explicit (what Ryle 1949, called 'knowledge how', and James 1950, 'knowledge of acquaintance'). A contemporary account of embodied knowledge is included in Zuboff (1988): such knowledge, she says, depends on peoples' physical presence, on sentient and sensory information, physical cues and face-to-face discussions, is acquired by doing, and is rooted in specific contexts. Other accounts include Scribner's (1986) description of 'practical thinking', i.e. problem-solving techniques which depend on an intimate knowledge of a situation rather than abstract rules, Hirschhorn's (1984) analysis of mechanization and his conclusion that operators' tacit understandings of machine systems are more important than their general knowledge, and Suchman's (1987) studies of how people spontaneously construct interpretations of technologies as they interact with them.

**Encultured knowledge:** refers to the process of achieving shared understandings. Cultural meaning systems are intimately related to the processes of socialization and acculturation; such understandings are likely to depend heavily on language, and hence to be socially constructed and open to negotiation. As Swidler (1986) indicated, in periods of social transformation explicitly formulated ideologies become the main vehicle for promoting new recipes for action. Following Pettigrew (1979) and Ouchi's (1980) discussions of organizational culture there has, of course, been considerable interest in the relevance to organizations of such processes. Within the literature on organizational learning, Srivastva and Barrett (1988) demonstrated how the imagery in the language of a group can change over time: as people grasp for new insights, they experiment with new metaphors into their talk which others may take up and develop; and Czarniawska-Joerges (1990) illustrated how consultants explicitly endeavour to manage this process. Other important contributions include Orr’s (1990) account of stories shared by maintenance technicians about complex mechanical problems, and Nonaka’s (1991, 1994) discussions of ‘knowledge-creating’ organizations (these are discussed further below).

**Embedded knowledge:** is knowledge which resides in systemic routines. The notion of 'embeddedness' was introduced by Granovetter (1985), who proposed a theory of economic action that, he intended, would neither be heavily dependent on the notion of culture (i.e. be 'oversocialized') nor heavily dependent on theories of the market (i.e. be 'under-socialized'): his idea was that economic behaviour is intimately related to social and institutional arrangements. Following Badaracco (1991), the notion of embedded knowledge explores the significance of relationships and material resources. Embedded knowledge is analyzable in systems terms, in the relationships between, for example, technologies, roles, formal procedures, and emergent routines. This is how, for example, Nelson and Winter (1982) analyzed an organization's
capabilities. They noted that an individual’s skills are composed of sub-elements which become co-ordinated in a smooth execution of the overall performance, impressive in its speed and accuracy with conscious deliberation being confined to matters of overall importance; thus, they maintained, may an organization’s skills be analyzed. In addition to the physical and mental factors that comprise individual skills however, organizational skills are made up of a complex mix of interpersonal, technological and socio-structural factors. Similar approaches include Levitt and March’s (1988) development of the notion of organizational routines (which, they suggest, make the lessons of history accessible to subsequent organizational members) while other writers refer to ‘organizational competencies’ (Prahalad and Hamel 1990). A related orientation has been proposed by Henderson and Clark (1990) who distinguish between the knowledge of specialist elements in an organization (‘component knowledge’) and knowledge about how such elements interact (‘architectural knowledge’); architectural knowledge is often submerged within an organization’s taken-for-granted routines and interactions, yet is central to an understanding of its strengths and weaknesses.

Encoded knowledge: is information conveyed by signs and symbols. To the traditional forms of encoded knowledge, such as books, manuals and codes of practice, has been added information encoded and transmitted electronically. Zuboff’s (1988) analysis of the ‘informating’ power of information technologies explores the significance of this point for organizations: information encoded by decontextualized, abstract symbols is inevitably highly selective in the representations it can convey. Poster’s (1990) thesis on how the new information technologies may be ‘culturally alien’ and Cooper’s (1992) analysis of the significance of technologies of representation for the theory of organization are amongst the writings which have complemented such lines of analysis.

Brown’s (1991) account of efforts to develop Xerox as a learning organization provides an example of how the development of each of these different forms of knowledge may contribute to organizational learning. Brown pointed to the advantages for a company like Xerox of undertaking new product development in close association with potential customers (i.e. in the terminology of this paper, he identified the relevance of the embedded knowledge of Xerox’s customers for an understanding of their reactions to new office machinery). He illustrated how design engineers at Xerox learned from ethnographic studies of how people interact with machines (i.e. from studies of the ways in which encoded knowledge interacts with, and may disrupt, embodied knowledge) and he emphasized too how studies of communications between engineers in Xerox have revealed how essential dialogue is between them (i.e. encultured knowledge) to increase their effectiveness in solving problems. Finally, Brown emphasized the importance of encouraging senior managers to develop new appreciations of their company’s established
practices (i.e. he pointed to the importance of developing embrained and encultured knowledge at senior management levels).

Derived as it is from the literature on organizational learning, the five types of knowledge identified here do not focus on the commodification of knowledge into products, systems, or services. (Thus, economists' interests in the immediate competitive potential of industrial secrets, patents, etc. — see e.g. Winter 1988 — or with the cumulative advantages that such knowledge may provide, Arthur 1990, are not included within this typology). What the variety of images of knowledge identified here serves to emphasize is the complexity of issues that any discussion of knowledge within organizations must address. For example, it indicates that all individuals and all organizations, not just so-called 'knowledge workers' or 'knowledge organizations', are knowledgeable. As is discussed in the following sections, the typology can also be used to review claims that significant changes are presently taking place in the relationship between knowledge and economic success, and to introduce a critique of conventional approaches to analyzing such developments.

Organizations and Different Types of Knowledge

Drucker (1993) has offered an historical interpretation of the suggestion that, within the demands of contemporary capitalism, a shift is occurring in the relationship between knowledge and wealth creation. In the eighteenth century, he suggests, the basis for an economic system based on machines and factories was laid with the development of 'technologies'. These he describes as 'knowledge applied to tools, processes and products' (in the terminology introduced above, this involved the development of new approaches to the study of embodied knowledge, i.e. craft skills, supported by the granting of patents to inventors and entrepreneurs). Later, in the early years of this century, F. W. Taylor's development of a technology of work analysis provided the basis for a further impetus to productivity. Drucker describes this as 'knowledge applied to human work' (in the terminology used above this involved the systematic development of systems of embedded knowledge). Now, Drucker maintains, a society is emerging that is dependent upon the development and application of new knowledges. 'Knowledge is being applied to knowledge itself.' In the terminology of this paper, Drucker's thesis can be taken to imply that embrained and encultured knowledge are beginning to assume predominant importance.

Both the practical and the theoretical implications of Drucker's thesis are significant. Just as the nature of organization and management changed dramatically at the time of industrial revolution and later as a result of Taylorism, Drucker maintains that new approaches are now becoming necessary. Productivity is becoming dependent on the application and development of new knowledges, and on the contribu-
tions of specialist knowledge workers. Drucker’s thesis is that knowledge workers are unlike previous generations of workers, not only in the high levels of education they have obtained, but principally because, in knowledge-based organizations, they own the organization’s means of production (i.e. knowledge). Drucker suggests that, in these circumstances, familiar images of organizations as hierarchical, decentralized or as a matrix should be discarded. Alternative models can be developed from examples of organizations based on key specialist experts, such as hospitals, symphony orchestras or the British Colonial administration in India.

In recent years, other American commentators have presented related ideas. Shortly before his appointment as U.S. Secretary of State for Labour the political economist Reich (1991) suggested that the globalization of the world’s economy is creating a split between the production of standardized products in low-wage economies, and high value-added problem solving which may be undertaken wherever useful insights can be found. Accordingly, the maxim that a nation’s chief economic asset are the skills and insights of its citizens assumes new significance. From his discussions with a range of senior executives in major American corporations, Reich believes that the strategies of big businesses no longer focus on products as such, rather, they are endeavouring explicitly to exploit the competitive advantage that specialized knowledge can provide. High value-added depends on problem solving; in the international economy, value-added accrues anywhere around the world where useful insights can be channelled to respond to the particular needs of individual customers. The tendency for manufacturing and service companies to concentrate on the provision of speciality services has become so advanced, Reich believes, that the traditional distinction in economics between goods and services has broken down. Moreover, he emphasizes the undesirable social consequences that are likely to result from the dependency of low pay, low status workers in service industries or routine production, on highly paid, high status ‘knowledge workers’.

The skills of what Reich calls ‘symbolic analytic’ workers are varied. They command high rewards, he believes, because they are difficult to duplicate. Such skills include problem solving (research, product design, fabrication), problem identification (marketing, advertising, customer consulting), and brokerage (financing, searching, contracting). When combined, Reich observes, these skills allow technical insights to be linked both to marketing knowhow and to strategic and financial acumen. In the terminology suggested in this paper, Reich is highlighting the contemporary significance of embrained knowledge. Such knowledge can be used to support new forms of organization based on networks, partnerships or contractual arrangements.

Both Drucker and Reich attribute particular significance to knowledge workers. While Drucker’s thesis is clearly influenced by Bell’s theory of post-industrialism, Reich’s analysis is strongly influenced by the current
difficulties of the American economy, especially the reduced international dominance of American conglomerates, changes in American manufacturing industry, an influx of foreign capital, and acute social inequalities. Yet both claim their approaches reach beyond the American experience, and locate their interpretations in a world perspective, suggesting that as national economies are integrated into the global economy, similar developments are occurring in other countries as well.

A less sophisticated account than either Drucker’s or Reich’s, but one which anticipated a number of their points had been presented by a Swedish businessman and a British journalist in the mid-1980s. Sveiby and Lloyd (1987) developed an account for general managers not of knowledge workers but of knowledge organizations. Defining know-how as ‘value added information’ they suggested that ‘know-how companies’ provide a non-standard, creative, problem-solving service. To be successful, know-how companies must, Sveiby and Lloyd suggested, be high on what they called professional skills, yet in itself this would be insufficient. The new breed of know-how organizations also need a high level of ‘managerial skills’ (defined as ‘the ability to preserve added value’). Examples of professional know-how organizations that they provided included highly entrepreneurial (and very profitable) merchant banks, advertising agencies, software firms, and management, architectural and engineering consultancies.

Sveiby and Lloyd’s account is not without its problems but their analysis of knowledge-intensive organizations (rather than capital, technology, or labour intensive) was unusual. Anticipating some of Drucker’s observations they noted how such firms present particular problems of organization and management (for example, power in know-how companies stems primarily from ability and reputation; new forms of employment relationship may be demanded by know-how workers; high short-term profit is likely to be a mistaken goal for know-how companies, what matters is the company’s ability to convince clients of the value of a long-term relationship). Rather than the specifics of their observations, it was the powerful image of the ‘professional know-how organization’ that attracted the attention of academics. Starbuck in the United States and Alvesson in Sweden both preferred a different terminology, ‘knowledge-intensive firm’, but their interests covered similar ground to Svieby’s. Thus, in presenting his comments on knowledge-intensive firms Starbuck (1992) emphasized the economic significance of esoteric knowledge over common knowledge and pointed to the potential distinctions between specialist expertise and the skills of the established professions. He emphasized the importance of social skills and client relationships to the activities of knowledge workers and the success of their companies, and explored the difficulties that knowledge-intensive firms may have in developing their own learning (for example, experts may not be receptive to new ideas). In a subsequent paper (Starbuck 1993) he further explores the distinctive iden-
Alvesson (1993b), on the other hand, has reported how the managers of knowledge-intensive firms may cope with their dependency on their specialist workers. In an analysis of a computer consultancy, he identifies the ideological controls that management used, striving to create a 'strong' culture, by manufacturing a sense of community, using performance related rewards, cultivating a positively buoyant outlook, and systematically intervening in an attempt to influence the ways in which employees thought of themselves and the company.

Recent commentaries on knowledge-intensive firms in the popular management literature have concentrated less on knowledge workers as the recipients of cultural manipulation and more on their active participation within their organization's dialogue. Daft and Weick's (1984) notion of organizations as systems of interpretation anticipated many of the issues that are now being raised: to survive, they argued, organizations must find ways to interpret events. Indeed, the processes of 'sensemaking' that Daft and Weick highlighted are likely to be especially important for firms that concentrate on the solution of unfamiliar problems; thus, Peter's (1992) discussion of the consultancy firm McKinsey's points to the central role that communication plays in that organization where energetic efforts are made to share key reports, a data bank of project lessons is maintained to create 'an internal marketplace of readily accessible ideas', and experienced consultants routinely make themselves available to other staff for comments or guidance. The conclusion that Webber (1993) takes from Peter's description is that, in a sense, conversations are McKinsey's.

Drawing from four of the knowledge types identified at the start of this paper, an overview of the knowledge work literature reviewed in this section is offered in Figure 1. Organizations which depend differentially on knowledge that is embodied, embedded, embrained, and encultured are distinguished in a two-by-two matrix. This is developed by distinguishing between organizations which first, focus on problems of a routine kind versus those that are preoccupied with unfamiliar issues and second, depend heavily upon the contributions of key individuals versus those who are more obviously dependent upon collective effort. Four kinds of organization are thus differentiated in the Figure: (i) expert-dependent organizations, which depend heavily on embodied knowledge; (ii) knowledge-routinized organizations, which depend heavily on embedded knowledge; (iii) symbolic-analyst dependent, which depend heavily on embrained knowledge; and (iv) communication-intensive organizations, which depend heavily on encultured knowledge. This classification provides a way of summarizing key suggestions in the knowledge work literature. The arrows depicted in Figure 1 highlight the trends many of the commentators reviewed in this section purport to have identified: that a shift is occurring away from dependence on the embodied and embedded knowledge towards embrained and encultured knowledge.
Off of the accuracy of these very general claims can only, of course, be established by empirical investigation and it may be that current developments are not all one way (for example there would appear to be a trend in the United Kingdom to organize certain professional bureaucracies in the public sector, not as symbolic-analyst-dependent or communication-intensive organizations, but as machine bureaucracies). However there remains a more basic problem. In recent years, taken-for-granted assumptions about the nature of knowledge, which underpin the distinctions presented on Figure 1, have been exposed as problematic. Studies

### Table: Organizational and Knowledge Types

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<tr>
<th>(i) Expert-Dependent Organizations:</th>
<th>(ii) Knowledge-Routinized Organizations:</th>
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<tbody>
<tr>
<td><em>Emphasis on the embodied competencies of key members.</em></td>
<td><em>Emphasis on knowledge embedded in technologies, rules and procedures.</em></td>
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<tr>
<td>Performance of specialist experts is crucial.</td>
<td>Typically capital, technology, or labour intensive.</td>
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<tr>
<td>Status and power from professional reputation.</td>
<td>Hierarchical division of labour and control.</td>
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<tr>
<td>Heavy emphasis on training and qualifications.</td>
<td>Low skill requirements.</td>
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<tr>
<td><em>Example:</em> 'Professional Bureaucracy' such as a hospital.</td>
<td><em>Example:</em> 'Machine Bureaucracy' such as a traditional factory.</td>
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<tr>
<td><em>Current issues:</em></td>
<td><em>Current issues:</em></td>
</tr>
<tr>
<td>Nature and development of individual competency.</td>
<td>Organizational competencies and corporate strategies.</td>
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<tr>
<td>Also, computer displacement of action skills.</td>
<td>Also, the development of computer integrated work systems.</td>
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<th>(iii) Symbolic-Analyst-Dependent Organizations:</th>
<th>(iv) Communication-Intensive Organizations:</th>
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<tr>
<td><em>Emphasis on the embodied skills of key members.</em></td>
<td><em>Emphasis on enculturated knowledge and collective understanding.</em></td>
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<tr>
<td>Entrepreneurial problem solving.</td>
<td>Communication and collaboration the key processes.</td>
</tr>
<tr>
<td>Status and power from creative achievements.</td>
<td>Empowerment through integration.</td>
</tr>
<tr>
<td>Symbolic manipulation is a key skill.</td>
<td>Expertise is pervasive.</td>
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<tr>
<td><em>Example:</em> 'Knowledge-intensive-firm' (KIF) such as a software consultancy.</td>
<td><em>Example:</em> 'Ad hocery', 'innovation mediated production'.</td>
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<tr>
<td><em>Current issues:</em></td>
<td><em>Current issues:</em></td>
</tr>
<tr>
<td>Developing symbolic analysts, the organization of KIFs.</td>
<td>'Knowledge-creation', dialogue, sense-making processes.</td>
</tr>
<tr>
<td>Also, information support and expert systems design.</td>
<td>Also, the development of computer supported cooperative work (CSCW) systems.</td>
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### Figure 1

Organizations and Knowledge Types (Arrows summarize trends suggested in the knowledge work literature)

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**Encoded Knowledge, and Criticisms of Conventional Approaches to Knowledge**

The accuracy of these very general claims can only, of course, be established by empirical investigation and it may be that current developments are not all one way (for example there would appear to be a trend in the United Kingdom to organize certain professional bureaucracies in the public sector, not as symbolic-analyst-dependent or communication-intensive organizations, but as machine bureaucracies). However there remains a more basic problem. In recent years, taken-for-granted assumptions about the nature of knowledge, which underpin the distinctions presented on Figure 1, have been exposed as problematic. Studies
of the ways in which new forms of encoded knowledge have affected organizations have played a major part in this reassessment. It would be a mistake to regard the new generation of information and communication technologies as neutral tools that can merely be grafted onto existing work systems. Of particular interest to the present discussion is the way such technologies have been found to disrupt conventional practices, as Hirschhorn (1984) has noted of automated work systems, Zuboff (1988) of informed work systems, and Pava (1986) of how such technologies demand new approaches to socio-technical systems design. The way the technologies intimately interlace with the minutiae of everyday practices is exposing processes which, previously, were taken for granted, ignored or misunderstood.

Zuboff's studies, for example, document in detail how action oriented skills (in the terms used here, embodied knowledge) are being displaced by computer technologies (encoded knowledge). The new technologies bypass the use of immediate, physical responses to situated cues; instead they require operators to interpret the selective, decontextualized and abstract symbols that machines present to them. Computers require sophisticated cognitive abilities; the skills of deduction and a knowledge of systems and procedures are essential for their satisfactory operation. Zuboff (1988) and Weick (1985) have suggested that it is foolish to believe that high-technology work systems can be managed as if conventional processes of sense making are outmoded. Talk about computer-mediated information and the transformation of isolated problem-solving attempts into a shared activity are crucial to the effective operation of the 'informed' organization. It is only through such processes that the process of collective interpretation can be recreated. The point may be summarized in the suggestion that managers in informed organizations must contrive to develop the skills which are referred to here as encultured knowledge.

It is not only through their 'informing' effects, however, that technologies based on micro-electronics are transforming organizations. Such technologies are also associated with the changes precipitated by economic globalization. This is not to say that the transformations associated with contemporary capitalism are technologically determined. As Castells (1989) documents in his account of changes occurring in contemporary capitalism, governmental enactment of post-Keynesian policies in, for example, weakening trade unions, developing fiscally austere policies, retreating from policies of wealth redistribution, and reducing the size of the public sector are fundamental to an understanding of developments. By the operations they support, the new technologies are playing a vital role in facilitating the internationalization of capital, production and labour processes. Castells summarizes how modern information technologies have transformed money markets and eroded the distinctions between mass- and customized-markets, and at the same time they make it possible for organizations to develop flexible methods of production, to disperse their operations, and to compete in
alliances. The communication and control operations they support within organizations are also facilitating the demise of bureaucratic approaches of organization, promising vigorous internal networks, collaborative work relations and significantly reduced hierarchical structures of control (developments explored in detail by Malone and Rockart 1991, and Sproull and Kiesler 1991).

Thus, just as familiar working patterns are being transformed by the encodification of knowledge, at the same time, the new technologies are making it possible for organizations to operate relatively independently from geographical location, thereby blurring the boundaries between one organization and another, and freeing internal communications within organizations. During the 1980s, much social science commentary on the relationship between information technologies and organizations emphasized how technologies are not deterministic in their effects (Buchanan and Boddy 1983). Instead, it was maintained, they open a range of options from centralization to decentralization, from automation to work enrichment. Current developments suggest, however, that rather than thinking of the new technologies as flexible tools for organizations to use as they believe is appropriate, it may be better to consider the technologies as the medium for organizing itself. Organizations that are heavily dependent on the new technologies are, simultaneously, being imploded into electronic codes and exploded into (global) information networks.

Some of the tensions involved in these processes are not new. The uneasy relationship that encoded knowledge may have to other forms of knowledge has been documented before. For example, Zuboff quotes the mediaeval historian Clanchy, (1979) who recorded the slow and largely reluctant acceptance in eleventh and twelfth century England of written documentaion: 'both to ignorant illiterates and to sophisticated Platonists, a written record was a dubious gift, because it seemed to kill living eloquence and trust and substitute for them a mummified semblance in the form of a piece of parchment'. Yet the extent of the disruption to knowledge bases associated with electronically encoded information is new. As summarized in Figure 1, the new media of encoded knowledge not only affect embodied knowledge, but may also affect the nature and significance of embrained knowledge (as information becomes ever more accessible and expert computer systems are developed), encultured knowledge (as new communication systems are introduced to support group working between individuals who are separated in time and space), and embedded knowledge (through, for example, the development of integrated manufacturing systems). The close relationship between encoded knowledge and the other images of knowledge highlighted in this discussion illustrate the point that it is a mistake to assume that embodied, embedded, embrained, encultured and encoded knowledge can sensibly be conceived as separate one from the other. Knowledge is multi-faceted and complex, being both situated and abstract, implicit and explicit, distributed and indi-
vidual, physical and mental, developing and static, verbal and encoded. Analysis of the relationships between different manifestations of knowledge identified in this paper is at least as important as any delineation of their differences.

From Theories of Knowledge to Theories of Knowing

Nonaka’s (1991, 1994) descriptions of the ‘knowledge-creating’ organization provides a useful starting point for theorizing about the links between the different forms of knowledge identified in this paper. Nonaka is concerned with the management of innovation. This he regards as an ongoing process in which organizations create problems, define them, then develop new knowledge for their solution. He develops the idea that knowledge is created out of a dialogue between peoples’ tacit and explicit knowledge. Knowledge may move from tacit to tacit (e.g. in a craft apprenticeship), from explicit to explicit (e.g. when hitherto distinct but related bodies of information are brought together), from tacit to explicit (e.g. the study of craft skills), and from explicit to tacit (e.g. the internalization of new knowledge). Nonaka maintains that all four of these patterns exist in dynamic interaction in ‘knowledge-creating’ companies. He does not wish to suggest, however, that the processes involved here are merely a recycling of knowledge. Knowledge creation, he believes, is closely associated with language and communications, requiring the creative use of metaphors, analogies and models, and a resolution of the conflicts and disagreements that new approaches may provoke. In the terminology of this paper, Nonaka is suggesting that encultured knowledge is intimately related to the development of embodied, embrained and embedded knowledge. His approach traces the link between different forms of knowledge to the processes through which they are created.

In other respects, however, Nonaka’s approach is rather traditional. He insists that knowledge is a specific entity, formed in the minds of individuals (albeit generated in interactions with others), and conceptually distinct from the material technologies around which organizations are structured (see Nonaka 1994). Similarly, while his concept of ‘knowledge-creation’ pushes the distinction between knowledge and learning to its limits, he wishes to maintain a distinction between them.

To develop the analysis of the interrelations between different types of knowledge further, it is necessary to address the basic question: what is knowledge? (or perhaps as Pear 1972, asks, what is not knowledge?). In recent years there has been considerable debate about this issue. Postmodernists, for example, have challenged the idea of fundamental truth by suggesting that truth is a story (see, e.g., Lawson 1989); cognitive anthropologists, ethnomethodologists and symbolic interactionists have queried the value of abstract plans and the notion of social structure and have demonstrated the significance of situated skills and prag-
matic knowledge (e.g. Suchman 1987); and sociologists of science have challenged deep-rooted assumptions about the privileged status of explicit abstract knowledge by studying knowledge creation as a cultural process and by de-emphasizing conventional distinctions between people and technology (e.g. Latour 1987; Law 1992).

The various implications of such approaches remain to be fully described. Yet it is becoming clear that traditional conceptions of knowledge as abstract, disembodied, individual, and formal are unrealistic. Polkinghome (1992), for example, reviews the implications of postmodernism for the theory of practice. Practical knowledge, he suggests, is foundationless, partial, constructed and pragmatic. A similar outlook is presented by Lave (1993), who reviews points of agreement between cognitive anthropologists, ethnomethodologists and activity theorists. Such theorists agree, she says, that major difficulties occur when educationalists assume that knowledge can be divorced from context and transmitted either as abstract data or as universally applicable approaches to problem solving; learning is not a passive process, she argues, but an active one. Defining learning as a creative (and collective) interpretation of past experiences she summarizes the emerging consensus between educational researchers as agreement that:

1. Knowledge always undergoes construction and transformation in use.
2. Learning is an integral aspect of activity in and with the world at all times. That learning occurs is not problematic.
3. What is learning is always complexly problematic.
4. Acquisition of knowledge is not a simple matter of taking in knowledge; rather, things assumed to be natural categories, such as ‘bodies of knowledge’, ‘learners’, and ‘cultural transmission’, require reconceptualization as cultural, social products.’ (Lave 1993: 8)

Star (1992) has also presented a summary of patterns of agreement between contemporary social theorists, drawing on a similar literature to Lave’s although placing a heavier emphasis on research studies in the actor-network tradition. The emerging consensus that conventional views of knowledge are unacceptable is so widespread, Star believes, that she refers to it as ‘an invisible college’ and ‘an intellectual movement that as yet has no name’. Reviewing detailed studies of technology and work, she echoes Lave’s points in her observation that the boundaries of knowledge in complex organizations are fluid and overlapping. Star explains this by reviewing studies which suggest that cognitions are situated (as the circumstances of action shape even the most abstractly represented tasks); cognitions are collective (as practices are distributed socially and technologically); and that, rather than being a mere internal manipulation of ideas, cognitions are also forms of material practice (i.e. cognitions not only involve an internal manipulation of ideas but they involve physical, manual and interactional actions as well).

Accounts such as these (see also Brown and Rogers 1991, for a similar
approach developed for the theory of communication) provide a useful starting point for the development of a unifying theory of organizational knowledge. First, rather than talking of knowledge, with its connotations of abstraction, progress, permanency and mentalism, it is more helpful to talk about the process of knowing. Second, to avoid segregating the forms of knowing identified in this paper, old concepts (such as the split between the abstract and the specific, individuals and communities, and the social and the technical) need to be abandoned and new approaches to conceptualizing the multi-dimensional processes of knowing and doing need to be created. One approach to this task could be to develop from the insights that knowing is situated, distributed and material.

Activity Theory, Knowing and Doing

Out of the range of theoretical approaches that both Lave (1993) and Star (1992) include in their reviews which might be of value in this project, activity theory offers particular promise. Activity theory has its origins in the ideas of the Russian psychologist Vygotsky who, working in the 1920s, endeavoured to develop an understanding of mind and society which did not depend upon the dichotomies (e.g. mind versus body, thought versus action, individual versus society, etc.) that have characterized mainstream Western thought (and which lend credence to the clear distinctions assumed between embodied, embedded, embrained and encultured knowledge). Basic to the Vygotsky approach is the Marxist idea that it is not the consciousness of humans that determines their social being, but social experiences which shape their consciousness: psychological processes can only be understood by an appreciation of the, culturally provided, factors that mediate them. (Vygotsky thought, for example, that it would be a mistake to think that children pass through a stage of egocentric speech before they use language socially, his view was the opposite, i.e. that children learn to internalize speech which is, from the start, oriented to their external social environment, see Kozulin 1990).

Contemporary versions of activity theory take a variety of forms. However, all are explicit in their attempts to develop a unified account of knowing and doing, and all emphasize the collective, situated and tentative nature of knowing. Some (e.g. Brown, Collins and Duguid 1989; and Lave and Wenger 1991) concentrate on the processes through which people develop shared conceptions of their activities. Others, (Hutchins 1983; Engestrom 1987, 1993) model the relationships that exist between a community’s conceptions of its activities and the material, mental and social resources through which it enacts them. While the former approach develops a model of learning as socialization, the latter explores the circumstance in which communities may enact new conceptions of their activities.
Orr's (1990) analysis of Xerox maintenance technicians is in the Brown/Lave tradition of activity theory. He describes how the stories shared by maintenance personnel about complex technical problems is an essential part of their activities. In the first place the stories they tell each other serve a key informational function, preserving and circulating essential news about particular problems. Second, the storytelling has an educational function: not only do the technicians learn about particular faults on the machines, they also help the participants develop their diagnostic and trouble-shooting skills. Finally, the stories provide an opportunity for the technicians to establish their identity within the community of technicians itself; as newcomers contribute to the storytelling process they begin both to demonstrate their identity as professionals and to contribute to the collective wisdom of their group. In their discussion of the wider implications of this study Brown and Duguid (1989) emphasize the general significance for organizations of such processes. Learning is a socially constructed understanding, they argue, that emerges from practical collaboration. Collective wisdom depends upon communal narratives. Note that this analysis suggests that it is not just esoteric consultancies like McKinsey's (see Peters 1993; and Webber 1993, discussed earlier) which benefit from lively internal communications; collective dialogue is also an essential aspect of life in other, less glamorous, organizations, developing skills and abilities which are distributed (often unnoticed) amongst the employees within them.

Engestrom's (1989, 1991) study of a medical practice in Finland illustrates a second version of activity theory. Partly through discourse analysis, partly from observation, and partly from accounts of the history of medicine he was able to distinguish the variety of conceptions that doctors may have of their activity. Doctors may conceive of their work in biomedical, administrative-economic, psychiatric, socio-medical, or in system-interactive terms. Doctors in the same medical practice may, perhaps unknowingly, be enacting different conceptions of health care, yet attempts to refocus priorities may not be easy to achieve. In Engestrom's study, attempts to reorientate priorities towards psycho-somatic and socio-medical priorities were hampered by the resource system within which the doctors operated: (i) the division of labour between doctors and other health-care professionals proved inflexible; (ii) the way patients are randomly allocated to doctors in the Finnish healthcare system created problems of continuity of care; and (iii) the biomedical concepts and techniques that the doctors had become accustomed to using encouraged them to continue treating health-care problems as biomedical problems.

The analysis Engestrom offers of this, and other, work settings is explicitly intended to avoid separating the individual from the collective, or the social from the technical. Fundamental to his approach is the unit of analysis he adopts, namely, the socially-distributed activity system. The general model he offers of such systems is shown in Figure 2.
Essential to such systems are the relations between agents, the community of which they are members, and the conception(s) people have of their activities (the inner triangle of relations in Figure 2). Such relations are mediated by a further series of factors, including the language and technologies used by participants within the system, the implicit and explicit social rules that link them to their broader communities, and the role system and division of labour adopted by the community.

Figure 2
A General Model of Socially-Distributed Activity Systems (Based on Engestrom 1987)

A summary model of Engestrom’s analysis of the dynamics of the medical practice he studied is shown on Figure 3. Note that the relations depicted in this figure are neither static nor are they necessarily harmonious. The three points of tension noted in Engestrom’s fieldwork, detailed above, are featured on the model [see points (i), (ii) and (iii)]. Indeed Engestrom’s approach suggests that, far from being unusual, tensions such as these are commonplace within distributed work systems. His analysis of the dynamics of activity systems is reminiscent of Perrow’s (1984) suggestion that accidents are a normal feature of life in complex industrial work systems. Likewise, for the most part, everyday interruptions and breakdowns in the workings of activity systems are skillfully, regularly and normally repaired (although system breakdown may sometimes occur). It is through their collective determination and skill, both in their actions and their language, that participants enact particular frames (i.e. impose conceptions of their activities on situations they believe appropriate) and maintain a (seemingly) smooth flow of events.

Note that the incoherencies, paradoxes and conflicts that feature within activity systems provide a potential driving force for change. Engestrom’s analysis suggests that organizations and institutions are a lot less stable and rational than is usually recognized. The incoherencies and contradictions that feature within them are obscured, however, partly no doubt by conventional imagery of the organization as a rational machine, but also by the skills of participants who learn to work within the situation in which they find themselves. New ways of knowing and doing can emerge if communities begin to rethink what, in a different
context, Unger (1987) has called the 'false necessity' of everyday life, and to engage with the tensions in their activity systems. The complexities of socially distributed activity systems suggest that incoherencies and tensions are inevitable; the issue is not how can they be eradicated but how they should be treated.

Rethinking Knowledge and Organizations

As the review presented in the first part of this paper indicated, current interest in knowledge and knowledge work marks a change of emphasis within contemporary capitalism away from knowledge that is embodied and embedded, to knowledge that is embrained, encultured and encoded. The approach presented in the second part of this paper offers a different orientation. To summarize:

1. Lave suggests that knowledge should not be conceived as a timeless body of truth that experts have internalized and which organizations may harness. She suggests that the notion of 'bodies of knowledge' (with its connotations of universal truth) is a problem in its own right. General abstractions are no more than resources to be used in specific circumstances where (in actions, improvization and dialogue) creativity is ubiquitous. By focusing on knowing rather than knowledge, the distinction that is conventionally assumed between knowledge and learning is avoided.

2. Engestrom’s interpretation of the dynamic relationships between individuals, their communities and the objects of their activities provides a clear alternative to approaches which attempt to study such entities, or the factors which mediate the relationships between them, in isolation one from the other. His suggestion is that the appropriate unit of analysis is neither individuals nor organizations, but socially-distributed activity systems. People act on the world, with others, utilizing (and contributing to the development of) the linguistic, material and social resources currently available. Knowledge does not appear as a separate category in Engestrom’s model, rather, it permeates the relations he depicts. His approach models the dynamics of knowing: each
moment is a compromise, the balance within an activity system changes constantly. Participants employ their situated knowledge in a situation which is itself constantly developing. In response to this changing situation participants' knowledge and behaviour will also inevitably develop.

3. Activity theories in general argue that knowledge is constantly evolving. Analysis of the tensions that inevitably develop within socially-distributed activity systems points to the opportunities for system development that (routinely) arise. Orr, Brown and Duguid demonstrate how essential language is to this process. Talk enables collective interpretations, negotiates behavioural priorities, signals group membership, and helps to create a community. Language is an archetypal communal activity, integral to the enactment of practical actions.

Thus, helpful though it can be to characterize knowledge as embodied, embedded, embrained, encultured and encoded, the concept of knowledge is problematic. Rather than studying knowledge as something individuals or organizations supposedly have, activity theory studies knowing as something that they do and analyzes the dynamics of the systems through which knowing is accomplished. Recast in this way, knowing in all its forms is analyzed as a phenomenon which is: (a) manifest in systems of language, technology, collaboration and control (i.e. it is mediated); (b) located in time and space and specific to particular contexts (i.e. it is situated); (c) constructed and constantly developing (i.e. it is provisional); and (d) purposive and object-oriented (i.e. it is pragmatic).

Before considering how these conclusions can be used to inform debate about knowledge and knowledge work, however, it should be noted that, in at least one respect, an extension of activity theory is required. Activity theory is not alone in its attempts to draw attention to the need to rethink supposed distinctions between events and contexts, language and action, the social and the technical, etc.; as noted above, similar suggestions have also been made by anthropologists, social theorists, and linguists and others. Of the comparisons that might be made between these various approaches, one point stands out: activity theory is weak in the analysis it offers of the relationship between knowledge and power. This is not to say that power as an issue does not occur at all in the writings of activity theorists. (For example, in her criticism of the term ‘bodies of knowledge’, highlighted above, Lave 1993, adopts Latour and Woolgar’s 1979, terminology to suggest that claims to the possession of decontextualized knowledge are frequently no more than examples of erasure, collusion or domination). However, analysis of power in everyday life has featured far less in the writings of activity theorists than it has in the work of others who are theorizing practice from different traditions. This is well illustrated by the issues that preoccupied Ortner (1984) in her discussion of the relevance to anthropology of theories of practice (such as Bourdieu 1978; and Giddens 1979) that were emerging in the early 1980s. Ortner supported the attempts being
made in these writings to treat societies and cultures as integrated wholes and to avoid segregating social, economic and political factors from values, ideals and emotions, but she emphasized how it would be a mistake to treat all the elements of a social system as if they are of equal analytical significance. Social systems are fundamentally unequal. Gramsci’s (1957) notion of hegemony and Foucault’s (1980) notion of a ‘discourse of perversions’ serve as reminders that any theory of knowing as a cultural activity must acknowledge the, often self-reproducing, dynamics of domination and subordination that are a feature of everyday life.

To the suggestion just made that knowing is mediated, situated, provisional and pragmatic must therefore be added the point that it is also contested. As noted at the start of this article, this point has not passed unnoticed within the literature on knowledge work and knowledge-intensive firms (see Alvesson 1993a; and Knights, Murray and Willmott 1993).

Applied to the study of knowledge work, the approach developed here suggests that, as an alternative to focusing on the kinds of knowledge that capitalism currently demands, attention should focus on the systems through which knowing and doing are achieved. Because of the changes that are occurring in capitalism touched on earlier (such as moves towards the globalization of markets and finance, new information and communication technologies, post-Keynesian governmental policies, and new approaches to strategy, management and organization, etc.) activity systems are changing significantly. Rather than asking ‘what sorts of knowledge are needed in contemporary capitalism and how may organizations harness them?’ the question thus becomes ‘how are systems of knowing and doing changing, and what responses would be appropriate?’

This revised formulation promises to establish links between the knowledge work literature and broader studies of economic and organizational changes. The analysis of knowing as mediated, situated, provisional, pragmatic and contested, provides a basis for identifying research priorities. Taking each of these in turn:

Knowing as mediated: Research is needed into the dynamics of activity systems and how they are currently changing. As discussed earlier, changes associated with the new information and communication technologies are combining with other developments, such as new economic and organizational structures and new approaches to management to transform the contexts of action. Further work is needed into such changes. One key consequence of these developments is that activity systems which were previously segregated are becoming interlinked and, therefore, are growing larger and becoming more complex. Research is needed to document such developments. Detailed ethnographic studies are needed to illuminate the ways in which people improvize, communicate and negotiate within expanded activity systems.
Knowing as situated: Work is needed to develop the relevance of the notion of situated knowledge to the knowledge work debate. As already noted, the concept of situated knowledge avoids the problems associated with abstract, decontextualized knowledge; it emphasizes the significance of peoples' interpretations of the contexts within which they act and the key role that 'communities of practitioners' play in the acquisition and development of skill. The knowledge work debate draws attention to the differences in approach that may develop between employees whose work involves them in action skills or in the execution of procedural routines, and those who are involved in creative problem solving. Little is known about the ways in which peoples' understanding of their activities are changing as a consequence of the developing complexity of the contexts within which they are working.

Knowing as provisional: Research is needed into the idea that knowing is, essentially, provisional and developing. Activity theory suggests that developments in systems of knowing and doing will occur constantly as tensions (inevitably) emerge within them. However, changes in activity systems may or may not be planned (for example, the unanticipated impacts of advanced information and communication technologies), and may or may not be fully understood or articulated by participants (for example, computer mediated interactions may erode traditional practices in bureaucracies but people may continue to describe their organizations through a terminology that is familiar to them). Activity theory points to the opportunities that might be created to help participants become more proactive in the development of their activity systems. At a general level, research is needed into Engestrom's proposal that, by alerting people to the tensions in activity systems that would otherwise be ignored or tolerated, a process of dialogue, experimentation and collective learning can be triggered that may transform participants' understandings of their activities and the systems through which they are enacted. Issues specific to the knowledge work debate include the study of the tensions within expert-dependent and knowledge-routinized organizations at the present time, and the ease with which they may transform themselves into symbolic-analyst dependent and communication-intensive organizations.

Knowing as pragmatic: Central to activity theory is the idea that collective action is driven by the conceptions people have of the object of their activities. Further research is needed into the influence that 'informated' and 'communication-intensive' environments have on the approaches people take to their work. It seems likely that, as activity systems become interrelated and complex, traditional approaches to organizing are likely to be ineffective. Research is needed into the possibilities for developing communal narratives within expanded activity systems. Study is also needed of the anxiety that individuals and communities may experience in the face of significant, ongoing, and perhaps conflicting demands for changes in their work methods and priorities.
Knowing as contested: Finally, as noted before, the concepts of knowledge and power are interrelated. Conflicts are to be expected within and between the new generation of symbolic analysts and problem solvers, and established professionals and managers. Beyond this, the far-reaching social, technological, and economic changes that are at the heart of the knowledge work debate indicate that issues of domination and subordination are fundamental to the development of a general theory of knowing as praxis.

Enquiry along the lines sketched out here is unlikely to contradict the suggestion that symbolic-analytical work and communication-intensive organizations are of growing significance at the present time. Rather, it promises to explain why this is so and, by reframing the problem, to illuminate some of the difficulties associated with such developments. In summary, the approach introduced here extends the debate about the importance of creative experts and flexible organizations to the (more general) discussion of the nature of expertise and of the systems through which people enact their activities. The study of knowledge work and organizations is, in other words, best located within a broader analysis of knowing as a cultural phenomenon.

Note

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